# VALUATION HANDBOOK – INTERNATIONAL GUIDE TO COST OF CAPITAL

## 2022 SUMMARY EDITION

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KROLL

CFA Institute Research Foundation

# International Guide to Cost of Capital

## 2022 Summary Edition

Interpretive Analysis and Insights

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# About Kroll

As the leading independent provider of risk and financial advisory solutions, Kroll leverages our unique insights, data and technology to help clients stay ahead of complex demands. Kroll's team of more than 6,500 professionals worldwide continues the firm's nearly 100-year history of trusted expertise spanning risk, governance, transactions and valuation. Our advanced solutions and intelligence provide clients the foresight they need to create an enduring competitive advantage. At Kroll, our values define who we are and how we partner with clients and communities. Learn more at Kroll.com.

The **Valuation Digital Solutions** group within Kroll, LLC ("Kroll"), strives to empower companies and finance professionals with high-quality valuation data that enables them to make sound business decisions. We share similar beliefs with CFA Institute Research Foundation in that a focus on education, research, and dissemination of data on financial markets benefits the overall investment profession. Personally, as a CFA® charterholder, it is an honor to have Kroll with CFA Institute Research Foundation in this endeavor.

**Carla S. Nunes, CFA**

Managing Director

Valuation Digital Solutions at Kroll

# CFA Institute Research Foundation

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**Bud Haslett, CFA**

Executive Director

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# About the Kroll "Cost of Capital Navigator"

Kroll has transitioned its U.S. and international (i) cost of capital data resources and (ii) industry-level statistics data resources to a new online platform, the "Cost of Capital Navigator." The Cost of Capital Navigator is an interactive, web-based platform that guides finance and investment professionals through the process of estimating cost of capital, globally. The Cost of Capital Navigator includes four modules:

### ►U.S. Cost of Capital Module

Provides U.S. size premia, equity risk premia, risk-free rates, betas, industry risk premia, and other risk premia that can be used to develop U.S. cost of capital estimates. Studies included: CRSP Deciles Size Study, Risk Premium Report Study.[1] Excel Add-in Included.

### ►U.S. Industry Benchmarking Module

Provides industry-level cost of equity, debt, and WACC estimates, performance statistics, valuation multiples, levered and unlevered betas, capital structure, and additional statistics for approximately 170 U.S. industries. Industries are defined by GICS codes.

### ►International Cost of Capital Module

Provides measures of relative country risk for over 175 countries from the perspective of investors based in over 50 countries. Other data includes equity risk premia for 16 countries, risk-free rates for developed markets, industry betas for a global index as well as for developed markets, and long-term inflation expectations and corporate income tax rates for over 175 countries. Full country risk premia (CRPs) and relative volatility (RV) factor Tables by country.[2]

### ►International Industry Benchmarking Module

Provides industry-level cost of equity, debt, and WACC estimates, performance statistics, valuation multiples, levered and unlevered betas, capital structure, and additional statistics for approximately 90 industries in four global economic areas: (i) the World, (ii) the European Union, (iii) the Eurozone, and (iv) the United Kingdom. Each of the four global economic area's industry analyses are presented in three currencies: (i) the euro (€ or EUR), (ii) the British pound (£ or GBP), and (iii) the U.S. dollar ($ or USD). Industries are defined by GICS codes.

To learn more, visit www.kroll.com/costofcapitalnavigator.

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2 Depending on subscription level.

# About the Authors

### James P. Harrington

James P. Harrington is a Director at Kroll (www.kroll.com). James provides technical support on client engagements involving cost of capital and business valuation matters and is a leading contributor to Kroll's efforts in the development of studies, surveys, online content and tools, and firm-wide valuation models.

Previously, James was director of valuation research in Morningstar's Financial Communications Business where he led the group that produced the *Stocks, Bonds, Bills, and Inflation® (SBBI®) Valuation Yearbook*, *Stocks, Bonds, Bills, and Inflation® (SBBI®) Classic Yearbook*, *Cost of Capital Yearbook*, various international cost of capital reports, and created a website dedicated to cost of capital issues.

James is co-author of the (previously published) Duff & Phelps "Valuation Handbook" series with colleagues Carla S. Nunes and Roger J. Grabowski. The Valuation Handbooks were published as hard covered books starting in 2014; as of 2020 the information and data previously published in the Valuation Handbooks has been transitioned to the Kroll Cost of Capital Navigator. The Cost of Capital Navigator (www.kroll.com/costofcapitalnavigator) is an interactive, web-based platform that guides analysts through the process of estimating cost of capital, globally.

### Carla S. Nunes, CFA

Carla S. Nunes, CFA is a Managing Director in the Office of Professional Practice of Kroll. She has over 25 years of experience. In that role, Carla provides firm-wide technical guidance on a variety of valuation, financial reporting and tax issues. She also co-authors Kroll's annual U.S. and European Goodwill Impairment Studies. In addition, Carla is the Global Leader of Kroll's Valuation Digital Solutions group, which produces cost of capital thought leadership content and data housed in the Cost of Capital Navigator.

In 2011, Carla completed a one-year rotation in Duff & Phelps' (now Kroll) London office, where she promoted the firm's IFRS education efforts and marketing initiatives, as well dealing with IFRS implementation issues.

Prior to this role, Carla was part of the Valuation Advisory Services business unit, performing engagements primarily for financial reporting and tax purposes at Duff & Phelps (now Kroll) and its predecessor firms, PricewaterhouseCoopers and Standard & Poor's.

Carla has conducted numerous business and asset valuations for a variety of purposes, including purchase price allocations, goodwill impairment testing, M&A, corporate tax restructuring and debt analysis. She has been involved in multiple valuation assignments for a wide range of industries, including pharma & biotech, healthcare, vitamin retail, specialty chemicals, industrial manufacturing and gaming & hospitality. Carla has substantial experience with cross-border valuations, working with multinational corporations to address complex tax, international cost of capital and foreign exchange issues.

Carla is one of Kroll's experts addressing valuation issues related to cost of capital. She is a co-author of the "Valuation Handbook" series and is a co-creator of the Kroll Cost of Capital Navigator. Carla is a frequent speaker in webinars and conferences on the topics of cost of capital, goodwill impairment and valuation in general.

Carla is a Kroll Institute Fellow, a Practitioner Director in the Financial Management Association (FMA), and a member of the Education Committee of the International Institute of Business Valuers (iiBV).

Carla received her M.B.A. in finance from the University of Rochester's Simon School, an honors degree in business administration from Lisbon's School of Economics and Management (ISEG Lisbon) and completed coursework for a Masters of Taxation from Villanova University School of Law. Additionally, she holds a Chartered Financial Analyst (CFA) designation and has passed the exam and fulfilled all the requirements for the Certified in Entity and Intangibles Valuations (CEIV) credential.

### Anas Aboulamer, Ph.D.

Anas Aboulamer, Ph.D. is as a Director of research at Kroll, working within the Valuation Digital Solutions team. Anas has more than 15 years of experience in economic and financial research, specializing in the areas of empirical asset pricing and cost of capital. He authored multiple peer-reviewed journal articles on financial markets and presented his research in multiple conferences. Previously, Anas worked as a senior research consultant for the Macro Research group in Brandywine Global Asset Management and as a currency analyst for BCA Research.

Anas holds a Ph.D. in finance from the Joint Ph.D. program of Concordia-McGill-HEC Montréal, in Canada. He was a visiting assistant professor of Finance at Smeal College of Business in The Pennsylvania State University. Anas taught finance in executive programs in North America, Europe and the Middle East.

### Roger J. Grabowski

Roger J. Grabowski, FASA, is a Managing Director at Kroll. He was formerly Managing Director of the Standard & Poor's Corporate Value Consulting practice, a partner of PricewaterhouseCoopers LLP and one of its predecessor firms, Price Waterhouse (where he founded its U.S. Valuation Services practice and managed the real estate appraisal practice).

Roger has testified in court as an expert witness on matters of solvency, the value of closely held businesses and business interests, valuation and amortization of intangible assets and other valuation issues. His testimony in U.S. District Court was referenced in the landmark New Morning Ledger decision decided in his client's favor (Supreme Court of the United States, No. 91-1135). His use of the discounted cash flow method for valuing a closely held business was accepted by the U.S. Tax Court in the Northern Trust Company decision (87 T.C. 349 (U.S.T.C. 1986)); this was the first time that Court accepted its use in valuing a closely held business.

Roger is co-developer of the Kroll "Risk Premium Report – Size and Risk Studies" for estimating cost of equity capital, now available exclusively online in the Cost of Capital Navigator.

Roger is co-author with Shannon Pratt of “Cost of Capital: Applications and Examples”, 5th ed. (Wiley, 2014); co-author with Shannon Pratt of “The Lawyer’s Guide to Cost of Capital” (ABA, 2014); and contributing author to the upcoming Shannon Pratt’s “Valuing a Business – The Analysis and Appraisal of Closely Held Companies”, 6th ed. (McGraw-Hill, 2021). He is also a co-author of the “Valuation Handbook” series and is a co-creator of the Kroll Cost of Capital Navigator.

Roger lectures often for professional organizations.

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# Foreword

It is with great pleasure that CFA Institute Research Foundation introduces another edition of the *International Guide to Cost of Capital Summary Edition* (*IGCC*) from Kroll. This publication, which examines the important difference in risk characteristics of investing in various countries, is now a valuable part of the Research Foundation's Investment Data Alliance, which includes data and content designed to help you more effectively perform your work in the investment profession.

Although the Research Foundation is offering this publication free to all, it is the great folks at Kroll and co-authors Jim Harrington, Carla Nunes, Anas Aboulamer and Roger Grabowski who deserve the credit for developing the content for this valuable research, and to Kevin Madden, Kevin Latz, Molly Jennerman, Zach Rodheim, and Aaron Russo (all of Kroll) who were also instrumental in its publication. The Research Foundation is delighted to be entering a long-term partnership with Kroll for the annual publication of the IGCC, and we hope that year after year it becomes a valuable addition to your portfolio of investment knowledge.

The methodology used in the *IGCC* is based upon a CFA Institute Research Foundation monograph titled *Country Risk in Global Finance Management* published in January 1998 and co-authored by Claude Erb, CFA, Cam Harvey, and Tadas Viskanta. We are delighted that the authors of the original monograph contributed the Preface for this publication and offer our sincerest thanks for the great work they have done.

### Why IGCC?

The *International Guide to Cost of Capital Summary Edition* contains a robust offering of international data that will be of interest to all investment professionals. Since this publication is an abridged version of the tremendous research and data that is available at the Cost of Capital Navigator, those of you seeking additional research in this area are encouraged to visit this section on the Kroll website: www.kroll.com/costofcapitalnavigator.

### Special Thanks

At CFA Institute Research Foundation, many thanks to our past-chair Ted Aronson, CFA, for his tireless work on behalf of CFA Institute and the Research Foundation and his generous, multi-year donation that helped fund the Investment Data Alliance. Thanks too, to our current Chair and Vice-Chair Aaron Low, CFA and Joanne Hill, our Research Committee Co-Chairs Bill Fung and Lotta Moberg, CFA, and all of the Research Foundation board members. And of course, we couldn't do all that we do without the great work of our Research Directors Larry Siegel and Luis Garcia-Feijoo, CFA and our Associate Director of Data Science Francesco Fabozzi.

CFA Institute is critical to the operation of the Research Foundation and provides much of our funding and staffing needs. We thank Margaret Franklin, CFA, Paul Andrews, Rhodri Preece, CFA, and Allison Adams for their continuing support of the project and Jessica Lawson for her work as the Research Foundation Project Manager. We would also like to thank the thousands of CFA Institute Research Foundation donors whose contributions have gone directly to support this project and the publication of the Research Foundation's content.

Our goal for this publication and the whole Research Foundation Investment Data Alliance is to increase the global investment community's knowledge of quantitative investment strategies by providing the data, and tools to analyze the data, to CFA Institute members (note that in the mainland of China, CFA Institute accepts CFA® charterholders only) and others in the investment profession. We hope you find the research provided here valuable to your work and your career, and welcome your comments and suggestions on this, and all Research Foundation publications.

**Bud Haslett, CFA**

Executive Director

CFA Institute Research Foundation

# Preface

It has been 21 years since the publication of our *Country Risk in Global Financial Management.* It seems appropriate to reflect on our research and assess the progress to date.

In the early 1990s, there was a surge of interest in international investment, initially with institutional investors and later individual investors. While some investors had diversified across developed markets, all of these markets were highly correlated, especially during periods of market and/or economic stress, limiting their diversification potential. However, in the early 1990s the International Finance Corporation released new indices on emerging market equity returns. MSCI followed with their own versions. These markets offered volatile returns but relatively low correlations with developed markets.

One challenge was how to assess the “risk” of investing in international markets. An approach informed by modern portfolio theory was to figure out the “beta” either against the U.S. market or a world portfolio (dominated by the U.S. and other developed markets). However, for many emerging markets, the betas were indistinguishable from zero – or even negative. It did not seem right to us that the risk of investing in a volatile emerging market was on par with investing in a U.S. Treasury bill.

The capital asset pricing model applied to emerging markets is, and was, problematic. First, a crucial assumption in its application was perfect market integration (meaning the same risk project, say a factory in a particular industry, should have the same expected return in integrated markets). Given all of the barriers to investing in emerging markets, this assumption surely failed. The model also imposed distributional assumptions on the asset returns that seemed unrealistic given the skewed and fat-tailed nature of emerging market returns.

We were not alone in being skeptical of the standard-bearer model in finance. Practitioners evaluating projects in emerging markets found that a country with a negative beta produced a discount rate less than the U.S. T-bill – and delivered preposterous results when applied to the calculation of a net present value. The first models augmented the capital asset pricing model by adding a “country risk premium” – which was the yield spread typically between a 10-year sovereign bond issued in U.S. dollars and the U.S. 10-year Treasury bond.

The addition of the sovereign spread seemed intuitive; indeed this is how these bonds are quoted among market participants, but was also problematic. First, adding the sovereign spread to a discount rate less than the U.S. Treasury bill often produced a discount rate that was still unrealistically small. Second, the spread is derived from bonds and given that bonds are less risky than equity, there was an apples and oranges problem (adding a bond spread to equity). Third, there was no empirical evidence to show that this model worked.

We began exploring for other measures of risk. Our first stop was country risk ratings. These rating originated from sources including: Standard and Poor’s, Euromoney, Institutional Investor and Political Risk Services’ *International Country Risk Guide*. Country risk ratings were forward looking (beta is backward looking) and dynamically evolved through time as perceptions of risk changed. These were desirable characteristics for any risk model.

While the country risk ratings seemed a logical measure, we were interested in verifying there was a relation between risk ratings and expected returns. To do this, we looked at the link between various measures of risk and future equity returns. We first showed there was no significant relation between market beta and future returns for emerging markets. While this model works adequately for developed markets, it fails in emerging markets in that higher risk is not associated with higher expected returns.

Most of our empirical work focused on Institutional Investors' Country Credit Ratings. In contrast to sources like Standard and Poor's, Institutional Investor offered coverage (at the time) of 135 countries. We found a highly significant relation between the current credit rating and future average returns. This means that the lowest rated countries (highest risk countries given the scale goes from 0-100) had the highest expected return. Indeed, the explanatory power was strikingly similar to the explanatory power that the capital asset pricing model has when applied within the U.S. to industries.

While this model seemed to do well for emerging markets, we were curious as to whether it would also fit developed market returns. To our surprise, the country credit risk model fit (applied only to developed markets) was nearly identical when applied to only emerging markets.

We also recognized that a linear model was not appropriate. If a country had the lowest possible rating, no one would want to invest there (think of an active war). Hence, we focused on the logarithm of the country credit rating.

At the time of writing our monograph, we had no idea that practitioners evaluating both investments and capital projects in international markets would find this model useful. Indeed, a country did not even need a stock market (or sovereign bond market) to get a cost of equity capital from our approach – all that was required was the country risk rating. Our model with its two coefficients delivered the cost of capital based on the country risk rating.

We were also interested in active management. In the early 1990s, active management focused on turning proprietary research into value-added performance for clients for a fee. Some active and quantitative asset managers saw an opportunity to enhance portfolio return through country selection. These efforts usually focused on using proprietary research and information.

This proprietary research is a known unknown. That is, it is known to the proprietor but unknown to others. We focused on the known known – because country credit ratings were widely and often, freely available. The known known connections amongst stock and bonds markets around the world could be shared with others.

Our research established robust links between the forward-looking ratings and the cross-sectional of expected equity premia as well as bond premia. We dug even deeper by decomposing country risk into three components: political risk, economic risk and financial risk. Our CFA Institute Research Foundation monograph explored how each of these measures impacts both the cross-section of equity and bond expected returns.

We are proud that twenty years later our country credit rating model is one of the standard models for determining the international cost of capital and has been implemented by the world's premier company specializing in cost of capital research, Kroll, LLC.

**Claude B. Erb**
**Campbell R. Harvey**
**Tadas E. Viskanta**
November 2022

# Chapter 1 International Cost of Capital Overview

*Practitioners typically are confronted with this situation: "I know how to value company in the United States, but this one is in Country X, a developing economy. What should I use for a discount rate?"*

**– Shannon P. Pratt and Roger J. Grabowski**, co-authors of *Cost of Capital*, 5th edition.[1]

*Measuring the impact of country risk is one of most vexing issues in finance, particularly in emerging markets, where political and other country-specific risks can significantly change the dynamics of the project. It is absolutely essential to incorporate these risks into either the expected cash flows or the discount rate. While this point is not controversial, the key is using a reliable method to quantify these extra country risks.*

**– Campbell R. Harvey**, Professor of Finance at the Fuqua School of Business, Duke University; Research Associate of the National Bureau of Economic Research in Cambridge, Massachusetts; President of the American Finance Association in 2016.

## Cost of Capital Defined

The cost of capital is the expected rate of return that the market requires in order to attract funds to a particular investment.[2]

The cost of capital is an opportunity cost and is one of the most important concepts in finance. For example, if you are a chief finance officer contemplating a possible capital expenditure, you need to know what return you should look to earn from that investment. If you are an investor who needs to plan for future expenditures, you need to ask what return you can expect to earn on your portfolio.[3] The opportunity cost of capital is equal to the return that could have been earned on alternative investments at a similar level of risk and liquidity.[4]

The cost of capital may be described in simple terms as the expected return appropriate for the expected level of risk.[5] The cost of capital is also commonly called the *discount rate*, the *expected return*, or the *required return*.[6]

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1 Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital: Applications and Examples* 5th ed. (Hoboken, NJ: John Wiley & Sons, 2014).

2 Ibid.

3 Richard Brealey, London Business School, as quoted in the Cost of Capital Navigator. To learn more, please visit kroll.com/costofcapitalnavigator.

4 Roger Ibbotson, Yale University, as quoted in the Cost of Capital Navigator. To learn more, please visit kroll.com/costofcapitalnavigator.

5 Modern portfolio theory and related asset pricing models assume that investors are risk-averse. This means that investors try to maximize expected returns for a given amount of risk, or minimize risk for a given amount of expected returns.

6 When a business uses a given cost of capital to evaluate a commitment of capital to an investment or project, it often refers to that cost of capital as the "hurdle rate". The hurdle rate is the minimum expected rate of return that the business would be willing to accept to justify making the investment.

There are three broad valuation approaches: (i) the income approach, (ii) the market approach, and (iii) the cost or asset-based approach. The country risk premia (CRPs), equity risk premia (ERPs), and relative volatility (RVs) presented in the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator can be used to develop cost of capital estimates for use in income approach-based valuation methods. Of the three aforementioned approaches to estimating value, only the income approach typically requires cost of capital estimates.

The cost of capital is a critical input used in income approaches to equate the *future* economic benefits (typically measured by projected cash flows) of a business, business ownership interest, security, or intangible asset to *present* value. The income approach is most often applied through a discounted cash flow (DCF) model.[7,8]

A basic insight of capital market theory, that expected return is a function of risk, still holds when dealing with cost of equity capital in a *global* environment. Estimating a proper cost of capital (i.e., a discount rate) in developed countries, where a relative abundance of market data and comparable companies exist, requires a high degree of expertise. Estimating cost of capital in less-developed (i.e., "emerging") economies can present an even greater challenge, primarily due to lack of data (or poor data quality) and the potential for magnified financial, economic, and political risks. A good understanding of cost of capital concepts is, therefore, essential for executives making global investment decisions.

**Are Country Risks Real?**

Why should there be any incremental challenges when developing cost of capital estimates for a business, business ownership interest, security, or intangible asset based outside a mature, developed market like the United States? If investors are alike everywhere and markets are integrated, then there is no extra problem. However, if markets are (entirely or partially) isolated (i.e., segmented) from world markets, then we need to address the perceived (and real) risk differences between markets.

"Segmentation" in this context refers to markets (i.e., economies) that are not fully integrated into world markets (i.e., are to some degree isolated from world markets). Markets may be segmented due to a host of issues, such as regulation that restricts foreign investment, taxation differences, legal factors, information, trading costs, and physical barriers, among others. Experts do not agree on the extent or effects of market segmentation, although there can be no doubt that some markets are at least partially segmented.

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7 Some common variations of the DCF model include the constant growth dividend discount model (sometimes referred to as Gordon Growth model), and various multi-stage models.

8 The online Cost of Capital Navigator's International Cost of Capital Module focuses on (i) providing useable risk premia for estimating cost of capital on a global scale, and (ii) providing guidance for properly using such data. For more information, visit kroll.com/costofcapitalnavigator.

The most common adjustments made by practitioners aimed at this segmentation problem are addressed by adding ad hoc country-specific risk premia to cost of capital estimates.

However, that does not answer the question of whether there should be an additional risk premium incorporated into the discount rate applied when valuing investments in those segmented markets in the first place. In theory, the only risks that are relevant for purposes of estimating the cost of equity are those that cannot be “diversified away”. In a nutshell, the argument is that if there is low correlation across markets, much of the country risk may be considered specific risk that can be diversified away by global investors investing across all markets.

In an increasingly globalized (i.e., integrated) world economy, some researchers argue that country-specific risks have been reduced, and may not be as important as they once might have been. Other researchers argue that policy makers have to consider the trade-off between this increase in the level of financial integration and global financial stability. In times of stress, locally funded (i.e. segmented) financial institutions appear less vulnerable to a global financial crisis, which means they can continue to lend to local businesses and consumers, ultimately benefitting the local economy. The authors argue that some degree of segmentation may contribute to a more resilient financial system.[9]

It is true that after the global financial crisis of 2008–2009, many emerging markets saw their stock markets collapse, in tandem with more developed markets. Global financial markets were under major liquidity constraints for a short period, until major central banks intervened to inject liquidity into the system. Similarly, the outbreak of COVID-19, a respiratory illness that was declared a pandemic by the World Health Organization on March 11, 2020, led to significant turbulence in global financial markets and caused concerns about system-wide liquidity.[10] To preserve the stability and the integrity of the global financial system during the current crisis, and learning from its experience in the aftermath of the 2008 global financial crisis, the U.S. central bank (“Federal Reserve” or the “Fed”) entered into new U.S. dollar liquidity arrangements with an additional nine central banks, including (for the first time) some located in emerging markets.[11]

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9 Claessens, Stijn. "Fragmentation in Global Financial Markets: Good or Bad for Financial Stability?" (October 1, 2019) BIS Working Paper No. 815. Available at SSRN: https://ssrn.com/abstract=3463898.

10 The virus that caused the coronavirus disease or COVID-19 was identified as the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). On December 31, 2019, the World Health Organization (WHO) was informed of an outbreak of “pneumonia of unknown cause” detected in Wuhan, a large city in the Hubei Province, China. The spread of the virus moved quickly from China to neighboring countries. On January 30, 2020 the WHO declared the current outbreak as a “public health emergency of international concern”'. On March 11, 2020 the WHO announced that it was changing its classification of COVID-19 to a “pandemic” which meant the disease was spreading rapidly to different parts of the world. For a more detailed timeline on COVID-19, visit: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#!.

11 The Fed uses its regional bank in New York to execute transactions in accordance with the Fed’s monetary policy. Following the COVID-19 crisis, the Federal Reserve Bank of New York entered into temporary U.S. dollar liquidity arrangements (i.e. swap lines) with the following central banks: Reserve Bank of Australia, Banco Central do Brasil, Danmarks Nationalbank (Denmark), Bank of Korea, Banco de Mexico, the Norges Bank (Norway), Reserve Bank of New Zealand, Monetary Authority of Singapore, and Sveriges Riksbank (Sweden). This is in addition to the existing liquidity agreements with the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, and the Swiss National Bank. For more details, visit: https://www.newyorkfed.org/markets/international-market-operations/central-bank-swap-arrangements.

We agree in part that the inherent differences in risk between, say, "developed" countries and "emerging" economies, have likely *diminished* in most recent decades due to the trend toward globalization. However, it would probably be far too ambitious (and possibly ill advised) to make decisions without considering the very real (albeit likely diminished) differences that continue to exist between countries. Or, as Bekaert and Harvey (2014) succinctly state:

"*Given the dramatic globalization over the past twenty years, does it make sense to segregate global equities into 'developed' and 'emerging' market buckets? We argue that the answer is still yes…emerging market assets still have higher risk than most developed markets – and as a result, continue to command higher expected returns*".[12]

There are, of course, a range of opinions on this point. For example, some argue that the cost of capital for emerging markets may be lower if investing *across* countries is taken into account. The argument is that the low correlation between the risks of individual countries may provide a degree of diversification benefit to an investor who holds a portfolio of assets across many different countries.[13] Correlation can be a measure of potential "diversification benefits" in financial markets.[14] Assets that are *highly* correlated offer *less* potential diversification benefit; assets that are *less* correlated offer *more* potential diversification benefits. Diversification in assets that are less correlated may provide a dampening of overall portfolio risk.

While it is true that the imperfect correlation between say, developed countries' and emerging countries' equity market returns implies a degree of risk mitigation due to potential diversification benefits, the correlation of world markets does appear to have significantly *increased* in the most recent decades.

To illustrate (see Exhibit 1.1), the MSCI "World" equity index (which includes 23 developed markets), and the MSCI "Emerging Market" index (which includes 24 emerging markets) had a

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12 Bekaert, Geert and Harvey, Campbell R., Emerging Equity Markets in a Globalizing World (May 20, 2014). Netspar Discussion Paper No. 05/2014-024, Available at SSRN: https://ssrn.com/abstract=2463053 or http://dx.doi.org/10.2139/ssrn.2463053.

13 Correlation can vary from –1 to +1, with a correlation of –1 implying a perfectly negative relationship, a correlation of +1 implying a perfectly positive relationship, and a correlation of 0 implying no relationship (i.e., "random"). If two variables generally move together (i.e., they both move up at the same time, or they both move down at the same time), they are positively correlated; if the two variables move opposite of each other (i.e., when one moves up, the other moves down), they are negatively correlated; if the two variables move randomly in relation to each other, they have no correlation, either positive or negative.

14 Theoretically, markets are perfectly integrated if financial assets with the same risk profile have identical expected returns irrespective of the market in which they are traded. In other words, the premise of financial market integration is the "law of one price". See for example, Chen, Z., and P. J. Knez, 1995, "Measurement of Market Integration and Arbitrage", *Review of Financial Studies 8*, pp. 287–325. However, academics have not come to an agreement on the best measure(s) to capture the degree of market integration in practice. Focusing specifically on equity markets, some researchers argue that the co-movement between markets does not necessarily mean that they are integrated. In other words, they argue that when there are multiple global sources of variability in returns, assets of individual countries do not necessarily have similar exposures to all these sources, and yet, these countries can still be perfectly integrated. For a survey of academic literature covering market integration and associated measures, review Akbari, Amir, and Lilian Ng. "International Market Integration: A Survey." *Asia-Pacific Journal of Financial Studies 49*, no. 2 (2020): 161-185.

correlation factor of 0.52 over the 120-month period ending December 1998.[15,16,17] This correlation increased to 0.80 over the 120-month period ending March 2020, lending support to the notion that the potential diversification benefit to an investor who holds a portfolio of assets across many different countries *decreased* over the December 1998–March 2020 period, due to an *increased* correlation of the asset classes across the globe. Researchers investigated the start of this pattern and concluded that the current levels of integration started as recently as 1970.[18]

This same pattern exists when the correlations of MSCI's Europe, U.S., and the Far East equity indices are computed against the MSCI Emerging markets equity index.[19,20]

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15 MSCI is a leading provider of investment decision support tools to clients worldwide. MSCI provides indices, portfolio risk and performance analytics, and ESG data and research. To learn more about MSCI, visit www.msci.com.

16 The MSCI World Index consists of the following 23 developed market indices: Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Hong Kong, a special administrative region of China; Ireland; Israel, Italy; Japan; Netherlands; New Zealand; Norway; Portugal; Singapore; Spain; Sweden; Switzerland; the United Kingdom; and the United States.

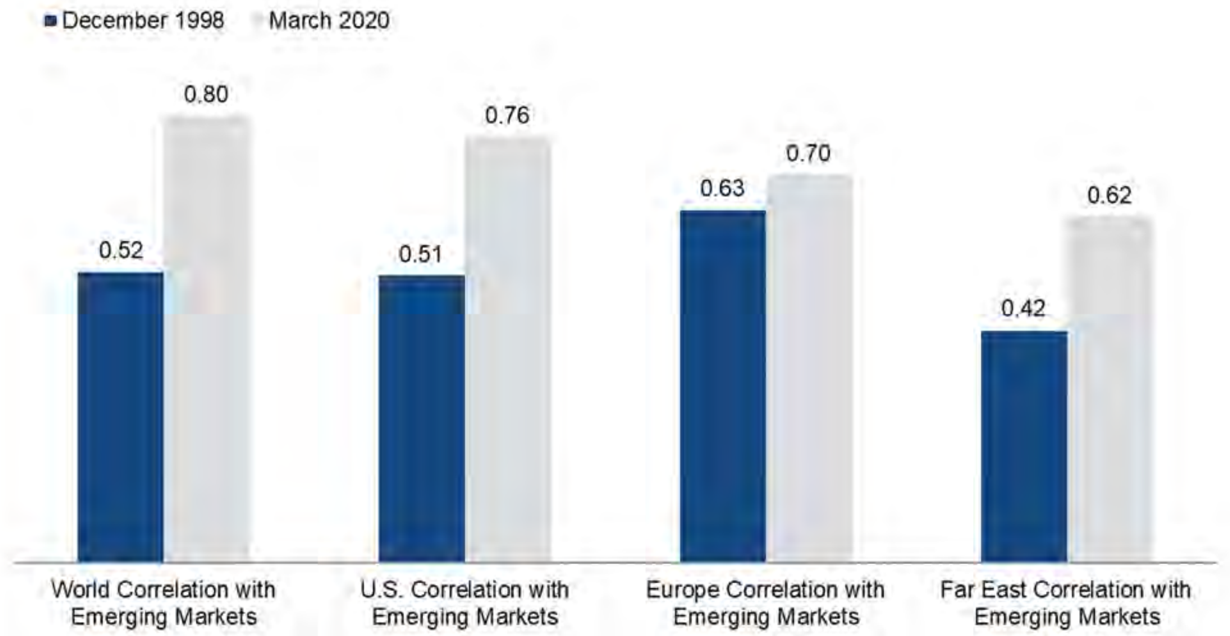
17 As of the data-through date of the analysis in Exhibit 1.1 (March 2020), the MSCI Emerging Market Index consisted of the following 24 emerging market indices: Brazil, Chile, China (note that in this report China refers to the market of mainland China), Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, South Africa, Taiwan, Thailand, Turkey, and United Arab Emirates. As of June 2021, the index has added the following three countries: Kuwait, Saudi Arabia, and Argentina.

18 In a comprehensive study that examine returns of different asset classes for a sample 83 countries over almost two centuries, the authors found that integration is not a gradual linear process and the highest level of integration in history is the post-2000 period which started in 1970's. Zaremba, Adam, George D. Kambouris, and Andreas Karathanasopoulos. "Two centuries of global financial market integration: Equities, government bonds, treasury bills, and currencies." *Economics Letters 182* (2019): 26-29.

19 The MSCI Europe Index consists of the following 15 developed market country indices: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

20 The MSCI Far East Index consists of the following 3 developed market indices: Hong Kong, Japan, and Singapore.

**Exhibit 1.1:** 120-month Correlation of the Total Returns of the MSCI World, U.S., Europe, and Far East Indices with the MSCI Emerging Markets Equity Index, as of December 1998 and March 2020




**Source of underlying data:** Morningstar, Inc. Used with permission. All rights reserved. **Series used:** MSCI World GR LCL and MSCI EM GR LCL series used for "World Correlation with Emerging Markets" correlation; MSCI USA GR USD and MSCI EM GR USD series used for "U.S. Correlation with Emerging Markets" correlation; MSCI Far East GR LCL and MSCI EM GR LCL series used for "Far East Correlation with Emerging Markets" correlation; MSCI Europe GR (in €EUR) and MSCI EM GR (in €EUR) used for "Europe Correlation with Emerging Markets" correlation. For more information about MSCI indices, visit www.msci.com.

While this analysis supports the notion that the potential diversification benefit of investors based in developed countries investing in emerging countries *decreased* in recent years, Bekaert and Harvey (2014) caution that "correlations between developed and emerging markets have increased, [but] the process of integration of these markets into world markets is incomplete".[21] Moreover, financial integration does not necessarily equate to economic integration of those countries into the global economy. In general, academics consider the measurement of economic integration a more challenging task.[22] Akbari, Ng, and Solnik document that economies became more interconnected during the 2008–2009 global crisis period and the ensuing recession. However, they found that while the gap in economic integration between developed and emerging markets is closing, there is still a significant gap in financial integration between these two groups of countries.[23]

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21 Bekaert, Geert and Harvey, Campbell R., Emerging Equity Markets in a Globalizing World (May 20, 2014). Netspar Discussion Paper No. 05/2014-024, Available at SSRN: https://ssrn.com/abstract=2463053 or http://dx.doi.org/10.2139/ssrn.2463053.

22 Several researchers differentiate between levels of financial and economic integration. For alternative perspectives and measures of economic and financial integration, see Akbari, Amir, and Lilian Ng. "International Market Integration: A Survey." *Asia-Pacific Journal of Financial Studies 49*, no. 2 (2020): 161-185.

23 Akbari, Amir, Lilian K. Ng, and Bruno Solnik. "Emerging markets are catching up: economic or financial integration?", *Journal of Financial and Quantitative Analysis* (2019). Using a global capital asset pricing model (CAPM) framework, these researchers define economic integration as a common cash flow dynamic, and financial integration as a common risk-pricing dynamic. In other words, they decompose stock returns into revisions in cash-flow expectations (economic integration) and revisions in risk

We conclude that in today's increasingly integrated economy there may be less theoretical justification for country risk premia than may have been warranted even a few decades ago. However, these risks *still* exist in the real world, and it would likely be unwise to make investment decisions without considering these risks. Furthermore, the ex-ante theoretical expectations that increased global financial market integration would diminish the risk (and therefore, required returns) associated with investing in emerging markets has not fully come to fruition. From a practical perspective, emerging markets are still clearly characterized by substantially more financial, economic, and political turmoil than are mature markets such as the U.S. or Germany. Increased correlation in recent years between developed and emerging markets means that those country-specific risks cannot be completely diversified away and, therefore country risk premia may be priced by investors.

If understood, differences between global economies can be planned for and considered in the structure of an investment well in advance. If not understood, these differences can result in unwise investments being pursued – or turn an otherwise sensible investment into a bad one.

### Risks Typically Associated with International Investment

The risks associated with international investing can largely be characterized as *financial, economic,* or *political.* Many of these are the types of risks associated with investing in general – the possibility of loan default, the possibility of delayed payments of suppliers' credits, the possibility of inefficiencies brought about by the work of complying with unfamiliar (or burdensome) regulation, unexpected increases in taxes and transaction fees, differences in information availability, and liquidity issues, to name just a few. Some risks, however, are typically associated more with global investing – currency risk, lack of good accounting information, poorly developed legal systems, and even expropriation, government instability, or war.

### Financial Risks

Financial risks typically entail an issue that is specifically money-centric (e.g., loan default, inability to easily repatriate profits to the home country, etc.). Among these types of risks, currency risk is probably the most familiar. Currency risk is the *financial* risk that exchange rates (the value of one currency versus another) will change unexpectedly.

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pricing (financial integration). Accordingly, a country's real economic integration is determined by the proportion of its cash-flow news influenced by world related cash-flow news. Similarly, a country's degree of financial integration with the global market is measured by the proportion of the country's risk-pricing revision that is influenced by world risk-pricing revisions. Based on these measures, the authors found that the financial integration gap between developed and emerging markets still remains high, whereas the economic integration gap is closing between the two country groups.

For example, when a French investor invests in Brazil, he or she must first convert Euros into the local currency, in this case the Brazilian Real (BRL). The returns that the French investor experiences in local currency terms are identical to the returns that a Brazilian investor would experience, but the French investor faces an additional risk in the form of currency risk when the returns are "brought home" and must be converted back to Euros.[24]

Expected changes in exchange rates can often be hedged. However, even when currency hedging is used, exchange rate risk often remains. To the extent the Euro unexpectedly *increases* in value versus the Real (i.e., the Euro appreciates against the Real), the French investor is able to purchase fewer Euros for each Real he realized in the Brazilian investment when returns from the investment are repatriated, and his return is thus *diminished*.[25,26]

Conversely, to the extent the Euro unexpectedly *decreases* in value versus the Real (i.e., the Euro depreciates against the Real), the French investor is able to purchase more Euros for each Real he realized in the Brazilian investment when returns from the investment are repatriated, and his return is thus *enhanced*.

For example, U.S.-based investors investing in U.S. equities realized an approximate return of just 1.0% in 2015, but French investors making a similar investment in the U.S. realized an approximate 13% return when they repatriated their returns and converted them to Euros (see Exhibit 1.2). The reason for this is that the Euro *depreciated* against the U.S. Dollar in 2015, so the French investors could purchase *more* euros with their dollars when they repatriated their returns. In a more recent example, Brazil-based investors investing in Brazilian equities realized an approximate return of 15% in 2019, but French investors making a similar investment in Brazil realized an approximate 29% return when they repatriated their returns and converted them to euros (the Euro *depreciated* against the Brazilian Real in 2019, so the French investors could purchase *more* euros with their reals when they repatriated their returns).

It is important to note that currency conversion effects can also work to *diminish* realized returns. For example, in 2015 Argentina equities returned an astonishing 52% return in local terms. Because the Euro *appreciated* against the Argentine Peso in 2015, French-based investors in Argentina stocks experienced a *lower* return (11%) when they repatriated their returns and converted them to euros (they could buy *fewer* euros with their pesos when they repatriated their returns).

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24 For this example, we assume that the French and local investor are both subject to the same regulations, taxes, and local risks when investing in the same local asset.

25 We say "unexpectedly" for a reason. If the investor had been able to predict (at the time of investing) the precise exchange rate at which he/she would be repatriating his/her returns, these "expected" changes to the exchange rate would have been reflected in the expected cash flows of the investment at inception.

26 For example, say the French investor had achieved a 10% return in local (Brazilian) terms on his investment in a given year, but the Euro had unexpectedly appreciated by 3% in value relative to the Real over the same period. When the returns are repatriated, the French investor's overall return is diminished to approximately 6.7% [(1+10%)*(1–3%)–1] in Euro terms. Conversely, had the Euro depreciated in value versus the Real by 3%, the repatriated returns would be enhanced to approximately 13.3% [(1+10%)*(1+3%)–1] in Euro terms.

**Exhibit 1.2:** Currency Conversion Effects

| France-based Investor Investing In: | | Return in Local Terms | Return to French Investors (EUR) | Currency Conversion Effect |
|---|---|---|---|---|
| 2009 | South Africa (ZAR) | 26% | 53% | 27% |
| 2015 | Japan (JPY) | 10% | 22% | 12% |
| 2015 | Switzerland (CHF) | 2% | 13% | 11% |
| 2015 | Brazil (BRL) | -12% | -34% | -22% |
| 2015 | Argentina (ARS) | 52% | 11% | -41% |
| 2015 | United States (USD) | 1% | 13% | 12% |
| 2016 | United Kingdom (GBP) | 19% | 3% | -16% |
| 2019 | Brazil (BRL) | 15% | 29% | 14% |

**Source of underlying data:** Morgan Stanley Capital International (MSCI) Brazil, South Africa, Japan, Switzerland, and Argentina, gross return (GR) equity indices. For more information about MSCI, visit www.msci.com. The S&P 500 Index was used as the proxy for the United States equity market. For more information about S&P indices, visit http://us.spindices.com/indices/equity/sp-500. Underlying data from Morningstar, Inc. Used with permission. All rights reserved. For more information about Morningstar, visit http://corporate.morningstar.com/.

A common misstep we often encounter is companies constructing forward-looking budgets or projection analyses in local currencies, and then converting these projections to the currency of the parent company using the spot rate.

This mistakenly assumes that the exchange rate will not change in the future. Projections, which are inherently forward-looking, need to embody expected currency conversion rates. We are interested in currency risks over the period of the projected net cash flows, not just in the spot market. Even then, these are merely estimates of future currency exchange rates and the actual exchange rate can vary from these estimates.

Does currency risk affect the cost of capital? One team of researchers found that emerging market exchange risks have a significant impact on risk premia and are time varying (for countries in the sample). They found that exchange risks affect risk premia as a separate risk factor and represent more than 50% of total risk premia for investments in emerging market equities. The exchange risk from investments in emerging markets was found to even affect the risk premia for investments in developed market equities.[27]

While exchange rate volatility appears to be partly systematic, researchers have found that despite not being constant, the currency risk premium is small and seems to fluctuate around zero.[28] A relatively recent academic paper set out to study whether corporate managers should include foreign exchange risk premia in cost of equity estimations. The authors empirically estimated the differences between the cost of equity estimates of several risk-return models,

[27] Francesca Carrieri, Vihang Errunza, and Basma Majerbi, ''Does Emerging Market Exchange Risk Affect Global Equity Prices?'' *Journal of Financial Quantitative Analysis* (September 2006): 511–540.

[28] Piet Sercu, International Finance: Theory into Practice, (Princeton, NJ: Princeton University Press, 2009), Chapter 19.

including some models that have an explicit currency risk premia and others that do not. They found that adjusting for currency risk makes little difference, on average, in the cost of equity estimates, even for small firms and for firms with extreme currency exposure estimates. The authors concluded that, at a minimum, these results applied to U.S. companies, but future research would still have to be conducted for other countries.[29]

Rather than attempting to quantify and add a currency risk premium to the discount rate, using expected or forward exchange rates to translate projected cash flows into the home currency will inherently capture the currency risk, if any, priced by market participants.[30]

**Economic Risks**

Global investors may also be exposed to *economic* risks associated with international investing. These risks may include the volatility of a country's economy as reflected in the current (and expected) inflation rate, the current account balance as a percentage of goods and services, burdensome regulation, and labor rules, among others.

The impact of these economic risks appears to be more important during periods of crises, when global investors are more risk averse. For instance, let us take an important source of economic risk in the aftermath on the 2008–2009 global financial crisis: government debt as a proportion of gross domestic product (GDP) of a country. A group of researchers found that the impact of a 1.0% change in government debt-to-GDP level on country risk premium estimates for emerging countries is very different depending on whether global risk appetite is accommodative (i.e. investors are less risk averse). According to these authors, issues related to (i) the deterioration in macroeconomic indicators such as current account balance, international reserves, and fiscal budget balance, or (ii) an increase in foreign-currency denominated debt issued by non-financial corporations are estimated to increase the country risk premium more strongly when global risk appetite slides.[31] We have seen the example of Greece during the Euro sovereign debt crisis of 2010–2012: the country needed several rounds of bailouts due to investors' views that the Greek government had accumulated unsustainable levels of debt. During that period, Greece defaulted on its debt obligations, the country's economy contracted severally, while measures of country

[29] A. Krapl and T. J. O'Brien, (2016), "Estimating Cost of Equity: Do You Need to Adjust for Foreign Exchange Risk?", *Journal of International Financial Management & Accounting*, 27: 5–25.

[30] This assumes that the valuation is being conducted in the home currency, by discounting projected cash flows denominated in the home currency, with a discount rate also denominated in home currency. Alternatively, the analyst can conduct the entire valuation in foreign currency terms (projected cash flows and discount rate are both in foreign currency terms), in which case the estimated value would be translated into the home currency using a spot exchange rate.

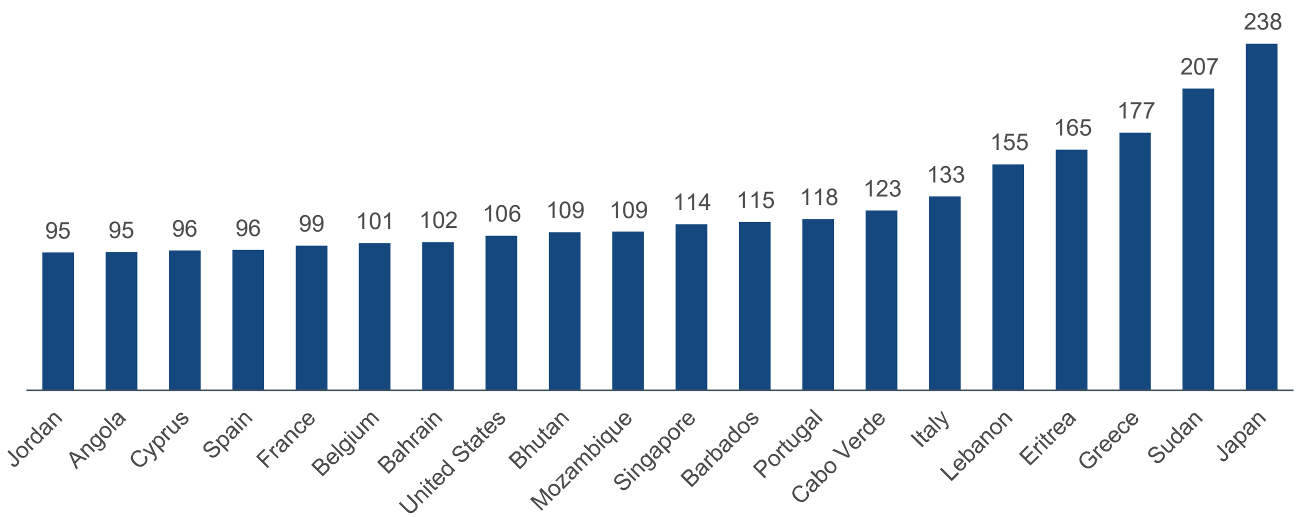
[31] Akçelik, Fatih, and Salih Fendoğlu, (2019). "Country Risk Premium and Domestic Macroeconomic Fundamentals When Global Risk Appetite Slides." CBT Research Notes in Economics No. 19/04. Research and Monetary Policy Department, Central Bank of the Republic of Turkey.

risk increasing dramatically.[32] A study has found that even rating agencies reconsidered how they assigned their ratings after the Eurozone debt crisis.[33]

In Exhibit 1.3a, the 20 countries with the *overall* highest estimated government debt-to-GDP ratios are shown (regardless of the size of their economies), as of calendar year 2020. For example, Italy has a debt-to-GDP ratio of 134% (i.e., the Italian government's debt is 34% *larger* than Italy's annual GDP), and France has a debt-to-GDP ratio of 99% (i.e., France's government debt is 1% *less* than France's annual GDP).

In Exhibit 1.3b, the estimated government debt-to-GDP ratios for the 20 countries with the *largest* economies (as measured by GDP) are shown, also as of calendar year 2020. The rank of GDP size is shown in parentheses after each country's name. Switzerland (with a ranking of "20") is the smallest GDP, and the United States (with a ranking of "1") is the largest GDP in the group.

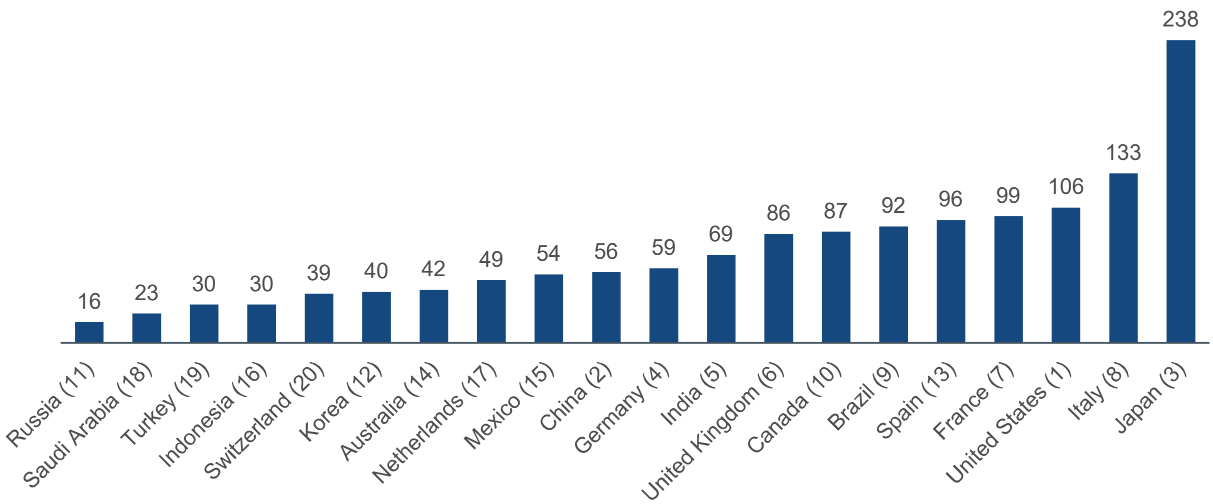
**Exhibit 1.3a:** 2020 Government Debt-to-GDP (in percent)




32 Greece saw a decline in real GDP in every single year from 2008 through 2016, with the exception of 2014 (at a modest growth of 0.7%). From the end of 2007 till the end of 2016, the Greek economy contracted 26% in real terms. The largest declines in real GDP growth were observed in 2011 and 2012. Growth in real GDP based on latest estimates at the time of writing. Source: Eurostat. Data retrieved on September 20, 2020 from https://ec.europa.eu/eurostat/data/database.

33 Reusens, Peter, and Christophe Croux. "Sovereign credit rating determinants: A comparison before and after the European debt crisis." *Journal of Banking & Finance 77* (2017): 108-121. The authors of this study investigated the procedures from the three major credit rating agencies procedure in allocating ratings before and after the European debt crisis for a sample of 90 countries for the years of 2002–2015. They found that the importance of fiscal balance, among other things, increased considerably in rating agencies' assessment after the European debt crisis. Importantly, GDP growth gained significant importance for highly indebted sovereigns and government debt became much more important for countries with a low GDP growth rate

**Exhibit 1.3b:** 2020 Government Debt-to-GDP (in percent), 20 countries with largest GDP




**Source of underlying data for Exhibit 1.3a and Exhibit 1.3b:** World Economic Outlook Database from the International Monetary Fund (IMF). For additional information, please visit: http://www.imf.org/external/pubs/ft/weo/2020/01/weodata/download.aspx.

There are costs that tend to go hand-in-hand with what might be considered unsustainable debt levels by governments. Lenders may demand a higher expected return to compensate them for additional default risk when investing not only in the country's sovereign debt, but also in businesses operating in those countries.

The outbreak of COVID-19 generated an unprecedented reaction by governments to a pandemic. In addition to massive interventions by major central banks, several governments enacted some of the largest fiscal stimulus packages ever seen in an attempt to mitigate the impact of mandatory lockdown policies implemented by numerous countries.[34] To finance those fiscal packages, governments across the globe had to issue large amounts of debt and, as a result, the ratio of debt-to-GDP is reaching unprecedented levels for several countries. The full impact of these fiscal packages and corresponding debt levels is still unknown and will be felt for years to come.[35]

Governments may decide to increase the money supply in an effort to inflate their way out of debt. Ultimately, some governments may decide on outright currency devaluation or even a repudiation of debt (i.e., defaulting on their debt obligations). These risks are not entirely limited to less developed countries, but less developed countries may be more willing to resort to these extreme measures than developed countries.

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[34] A country-by-country summary of monetary and fiscal policies implemented in response to COVID-19 can be found here: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

[35] The IMF publishes an interactive Fiscal Monitor showing historic, current and forecasted debt-to-GDP ratios on a country-by-country basis. The IMF estimates that as of September 11, 2020, the global fiscal response to COVID-19 amounted to $11.7 trillion, or 12% of global GDP. Fiscal Monitor data was retrieved on October 16, 2020 and is accessible here: https://data.imf.org/?sk=4BE0C9CB-272A-4667-8892-34B582B21BA6.

**Political Risks**

Political risks can include government instability, expropriation, bureaucratic inefficiency, corruption, and even war. A relatively recent example of the effects of political risk is Venezuela's expropriation of various foreign-owned oil, gas, and mining interests. These actions tend to reduce Venezuela's attractiveness to foreign investors, who will likely demand a significantly higher expected return in exchange for future investment in the country – in effect raising their cost of capital estimates for projects located in Venezuela. Exhibit 1.4 summarizes some of the risks that investors may view as unique or country-specific.

**Exhibit 1.4:** Reasons Typically Cited for Adding a Country Risk Premium Adjustment

**Political Risks**

- Expropriation of private investments in total or in part through change in taxation
- Repudiation of contracts by governments
- Economic planning failures
- Political leadership and frequency of change
- External conflict
- Corruption in government
- Military in politics
- Organized religion in politics
- Lack of law-and-order tradition
- Racial and national tensions
- Civil war
- Poor quality of the bureaucracy
- Poorly developed legal system
- Political terrorism

**Financial Risks**

- Currency volatility plus the inability to convert, hedge, or repatriate profits
- Loan default or unfavorable loan restructuring
- Delayed payment of suppliers' credits
- Losses from exchange controls
- Foreign trade collection experience

**Economic Risks**

- Volatility of the economy
- Unexpected changes in inflation
- Parallel foreign exchange rate market indicators
- Labor issues
- Debt service as a percentage of exports of goods and services
- Current account balance of the country in which the subject company operates as a percentage of goods and services

## Does the Currency Used to Project Cash Flows Impact the Discount Rate?

According to corporate finance theory, the currency of the projections should *always* be consistent with the currency of the discount rate. In practice, this means that the inputs used to derive a discount rate (the denominator) should be in the same currency used to project cash flows (the numerator). For example, if the projections are denominated in Australian Dollars, then the risk-free rate and equity risk premium inputs should also be denominated in (local) Australian Dollar terms.

There are two basic methods to address foreign currency cash flows in valuations, assuming the analysis is being conducted in *nominal* terms:

- Perform the valuation in the local (foreign) currency, discount the projected cash flows with a local (foreign) currency denominated discount rate (i.e., using foreign currency inputs), and convert the resulting value into the home currency (e.g., USD, EUR) at the spot exchange rate.

- Convert cash flows at a forecasted exchange rate into the home currency (e.g., USD, EUR) and discount the projected cash flows with a home country discount rate (using home currency inputs). In this case, the forecasted exchange rate already includes the risk associated with exchange rate fluctuations.

Notwithstanding the two general approaches outlined above, valuation and finance professionals may find themselves in a position where a local currency discount rate is needed and yet there are no reliable cost of capital inputs in the local (foreign) currency. What should you do in such a situation?

One can go back to one of the central ideas in international finance: the so-called “law of one price.” The basic idea is that international investors explore profit arbitrage opportunities across financial markets in different countries, therefore guaranteeing that identical financial assets have similar prices, once adjusted for different currencies. This presumes competitive markets, where market imperfections do not exist.

Five key theoretical economic relationships result from these arbitrage activities:[36]

- Purchasing Power Parity

- Fisher Effect

- International Fisher Effect

- Interest Rate Parity

- Forward Rates as Unbiased Predictors of Future Spot Rates

It is beyond this publication to discuss these concepts on a detailed level. Several international finance textbooks have been written and published which cover this topic extensively. These

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[36] Alan C. Shapiro, *Multinational Financial Management*, 10th ed. (Hoboken, NJ: John Wiley & Sons, 2013).

theoretical relationships are also central to understanding and forecasting foreign exchange rates, as well as prices of other financial assets denominated in foreign currencies.[37]
The International Fisher Effect is formalized in the following equation:

$$\mathit{Interest\ Rate}_{\mathit{Local\ Currency}} = (1 + \mathit{Interest\ Rate}_{\mathit{Home\ Currency}}) \times \frac{(1 + \mathit{Inflation}_{\mathit{Local\ Currency}})}{(1 + \mathit{Inflation}_{\mathit{Home\ Currency}})} - 1$$

The International Fisher Effect suggests that countries with high inflation rates should expect to see higher interest rates relative to countries with lower inflation rates.
This relationship can be extended from interest rates into discount rates, thereby allowing us to translate a home currency cost of capital estimate into a foreign currency indication.

However, it is crucial to understand that the International Fisher Effect relationship holds only in equilibrium. This presumes that (i) there is no government intervention in capital markets; and (ii) capital can flow freely in international financial markets from one currency to another, such that any potential arbitrage opportunity across countries will be quickly eliminated. In reality, market frictions (e.g., transaction costs, regulations, etc.) and government interventions do exist in practice, which means that using the International Fisher Effect to translate the home currency discount rate into a local currency will result in only an approximation.

Applying the International Fisher Effect to translate the rates of return on equity and debt would result in the following relationships:

$$\mathit{Cost\ of\ Equity}_{\mathit{Local\ Currency}} = (1 + \mathit{Cost\ of\ Equity}_{\mathit{Home\ Currency}}) \times \frac{(1 + \mathit{Expected\ Inflation}_{\mathit{Local\ Currency}})}{(1 + \mathit{Expected\ Inflation}_{\mathit{Home\ Currency}})} - 1$$

$$\mathit{Cost\ of\ Debt}_{\mathit{Local\ Currency}} = (1 + \mathit{Cost\ of\ Debt}_{\mathit{Home\ Currency}}) \times \frac{(1 + \mathit{Expected\ Inflation}_{\mathit{Local\ Currency}})}{(1 + \mathit{Expected\ Inflation}_{\mathit{Home\ Currency}})} - 1$$

In practice, these formulas tend to be applied in the context of using a single discount rate to compute the present value of the projected cash flows in both the discrete forecast period and in the terminal (or residual) year. Such application would therefore use long-term expected inflation rates as inputs for both the home and the local (foreign) country.

However, this practical application does not work well when dealing with a country with high inflation for the foreseeable future, but which is expected to decline over time. In such cases,

37 See for example: (i) Chapters 4 and 19 of Piet Sercu (2009), *International Finance: Theory into Practice*, (Princeton, NJ: Princeton University Press); and (ii) Chapter 4 of Alan C. Shapiro (2013), *Multinational Financial Management*, 10th ed. (Hoboken, NJ: John Wiley & Sons, 2013).

valuation analysts may have to calculate multiple discount rates (one for each year in the projections) to reflect the changing inflation differentials, until a long-term, more sustainable, inflation differential is expected to be reached.

Despite these limitations, the International Fisher Effect can be useful in ensuring that inflation assumptions embedded in the projected cash flows are consistent with those implied by the discount rates.[38]

### Summary

Cross-border investing creates additional challenges relative to making an investment in domestic (or home) financial markets. Those challenges are exacerbated when contemplating investing in emerging (i.e., less-developed) countries. The latter are often characterized by incremental volatility created by so-called country risk factors.[39]

Country risk is generally described as *financial*, *economic*, or *political* in nature. These rules may create incremental complexities when developing cost of capital estimates for a business, business ownership interest, security, or an intangible asset based outside of a mature market such as the United States.

While years ago academics expected that an increase in global integration of financial markets would diminish the reason for expecting a country risk premium for investing in emerging markets (i) there is still a certain degree of market segmentation; and (ii) correlation between developed (mature) and developing (i.e., "emerging") markets has increased significantly in recent years. This means that the anticipation that country risk could be completely diversified away has not come fully into fruition.

To the extent that country risk is systematic in nature, a related premium may need to be incorporated into discount rate estimates, if not already embedded in the projected cash flows.

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[38] For a discussion and examples of how to apply the methods outlined in this section, refer to the complementary CFA Institute webinar entitled "Quantifying Country Risk Premiums", presented on December 6, 2016 by James P. Harrington and Carla S. Nunes, CFA, by Kroll. This webcast can be accessed here: https://www.cfainstitute.org/en/research/multimedia/2016/quantifying-country-risk-premiums.

[39] For additional information on assessing country risk factors, please see Consensus Economics®. Visit: www.consensuseconomics.com.

# Chapter 2
# Strengths and Weaknesses of Commonly Used Models

The Cost of Capital Navigator's International Cost of Capital Module includes (i) equity risk premia (ERPs) for 16 countries in USD and local currencies, (ii) implied country risk premia (CRPs) calculated using the Country Yield Spread Model, (iii) implied relative volatility (RV) factors calculated using the Relative Volatility Model, and (iv) base country-level cost of equity capital and implied CRPs calculated using the Erb- Harvey-Viskanta Country Credit Rating Model.

For completeness, in Chapter 2 we briefly discuss additional international cost of capital models commonly mentioned by academics and/or valuation analysts.

## World (or Global) CAPM

The World CAPM model has intuitive appeal where markets are integrated and/or when the subject company is a diversified multi-national corporation operating in many countries. This method recognizes cross-border diversification opportunities and prices securities accordingly. The following equation is typically expressed in U.S. Dollars:

$$\boxed{k_e = R_{f,\text{U.S.}} + \left(\beta_w \times RP_w\right)}$$

Where:

$k_e$ = Cost of equity capital

$R_{f,U.S.}$ = U.S. risk-free rate

$\beta_w$ = Market risk measured with respect to a world portfolio of stocks (i.e., beta)

$RP_w$ = Equity risk premium (ERP) (rate of return expressed in terms of U.S. Dollar returns) on a world diversified portfolio

Because we are estimating expected returns in terms of U.S. Dollars, this discount rate can be used for discounting net cash flows expressed in U.S. Dollars with the currency risk (preferably) treated in either the net cash flows or the discount rate.

The World CAPM model has been shown to work reasonably well for developed markets.[1] However, this approach has several potential weaknesses, particularly when dealing with investments located in emerging markets. These potential weaknesses may include:

- Markets are not all fully integrated. In effect, the World CAPM approach assumes away meaningful differences across countries. If the subject company's operations are concentrated in one or two countries, the risks of that business will differ from the risks of nearly identical companies operating in multiple countries. The prior specification is an idealized approximation unless there is complete integration.

- While developed countries' betas may have some ability to discriminate between high and low expected return countries, realized emerging market returns suggest that there is little relation between expected returns and betas measured with respect to the world market portfolio.[2]

To illustrate the second point, that there is seemingly little relation between expected returns and betas regressed against the world market portfolio, we present in Exhibit 2.1 the 60-month ordinary least squares (OLS) betas of MSCI developed and frontier markets, sorted from smallest betas (on the left) to largest betas (on the right), as of December 2021.[3]

Countries and regions classified by MSCI as "developed" markets, as the name implies, include the most developed economies (e.g., U.S., Germany, Singapore, etc.), while the MSCI "frontier" markets include the least developed economies or whose equity markets have poor depth and liquidity (e.g., Bangladesh, Nigeria, Serbia, etc.).[4] The betas of the countries and regions classified as "frontier" markets (the solid green line) are systematically *lower* than the betas of "developed" markets (the solid blue line). This would imply that the risk associated with frontier markets is *less* than the risk associated with developed markets (all other things held the same), which investors would reasonably assume to be *incorrect*.

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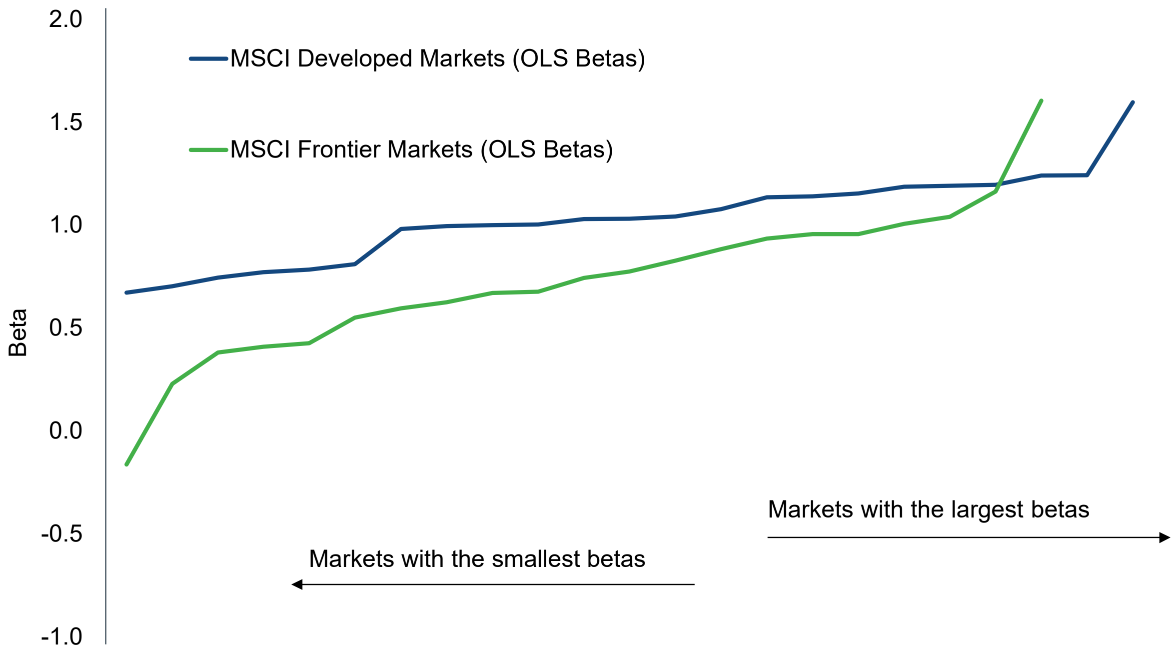
1 See for example, Claude Erb, Campbell Harvey, and Tadas Viskanta, "Expected Returns and Volatility in 135 Countries", *Journal of Portfolio Management* (Spring 1996): 46–58.

2 Campbell R. Harvey, "12 Ways to Calculate the International Cost of Capital", Duke University, Durham, North Carolina, USA 27708, National Bureau of Economic Research, Cambridge, Massachusetts, USA 02138.

3 Source of MSCI classifications: www.msci.com.

4 Countries classified by MSCI as "emerging" market countries are not shown. Emerging market countries have economies more developed than frontier market countries, but less developed than developed market countries. Emerging market countries were not used in this analysis because to illustrate the point, the most striking differences are observed between the developed and frontier market classifications.

**Exhibit 2.1:** MSCI Developed and Frontier Markets' OLS Betas as Measured Over the 60-month Period Ending December 31, 2021




**Source of underlying data:** MSCI: All returns are based on MSCI indices, in U.S. Dollars, and accounting for capital gains/losses and dividends. The classification of developed and frontier markets corresponds to the countries/regions in the MSCI indices of developed, and frontier markets as of December 2021. MSCI Developed Markets represented in this analysis by: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong SAR, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United States, and the United Kingdom. MSCI Frontier Markets represented in this analysis by: Argentina, Bahrain, Bangladesh, Croatia, Estonia, Jordan, Kazakhstan, Kenya, Kuwait, Lebanon, Lithuania, Mauritius, Morocco, Nigeria, Oman, Romania, Serbia, Slovenia, Sri Lanka, Tunisia, and Vietnam. The market benchmark used in the calculation of all betas is the MSCI World Index. All rights reserved; used with permission. All calculations by Kroll.

## Single-country Version of the CAPM

The single-country version of the CAPM can be expressed as:

$$\boxed{k_{e,local} = R_{f,local} + \left(\beta_{local} \times RP_{local}\right)}$$

Where:

$k_{e,local}$ = Cost of equity capital in local country

$R_{f,local}$ = Return on the local country government's (default-risk-free) debt

$\beta_{local}$ = Market risk of the subject company measured with respect to the local securities market (i.e., beta)

$RP_{local}$ = Equity risk premium in local country's stock market

If one estimates all inputs in local currency (e.g., Brazilian Real), then the resulting cost of equity capital estimate can be used to discount expected net cash flows expressed in local currency terms.

If one estimates all expected return in terms of rates of return in U.S. Dollars (or another home currency), then the resulting cost of equity capital is used to discount expected cash flows expressed in U.S. Dollars (or another home currency), with the currency risk treated (preferably) in the expected cash flows or as an adjustment to the discount rate.

This single-country version of the CAPM approach has appeal because local investors provide capital to local firms in the local market. This approach allows more local factors to be incorporated in the measure of local market risks. This type of model works best in developed economies. For example, the analyst could determine betas for U.S. firms relative to the Standard & Poor's (S&P) 500, U.K. firms relative to the FTSE 100, and Japanese firms relative to the Nikkei 225.

Potential weaknesses of the single-country version of the CAPM include:

- The model does not work well in less developed markets.

- The model generally requires the "local" country to have a history of bond and stock market returns in local currency terms. Data may be poor or non-existent in segmented, developing country settings, especially the type of data required to develop the local beta and ERP. Even if some historical information is available, if the "local" country underwent a significant change in its economy, level of development, or political regime (to name a few), it would be unlikely that the historical data would represent a good proxy for what would be expected in the future (e.g., calculated historical ERPs would not be reliable indicators of forward-looking ERPs).

- Beta estimates using historical returns may be low because the local stock market may be dominated by just a few firms (or industries).

- The local country government's debt is possibly not free of default risk.

### Damodaran's Local Country Risk Exposure Model

The Damodaran model compares the volatility of the local country's stock market returns and bond returns (i.e., a proxy for the relative risk between debt and equity for investors in that country to estimate a country risk premium, or CRP). Damodaran also calls this the Lambda ($\lambda$) approach.[5] The Damodaran model can be applied in U.S. Dollars, Euros, or another currency that has a

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[5] Aswath Damodaran, *Investment Valuation*, 2nd ed. (Hoboken, NJ: John Wiley & Sons, 2002): 204–206; Aswath Damodaran, *Damodaran on Valuation*, 2nd ed. (Hoboken, NJ: John Wiley & Sons, 2006): 59–61; and Damodaran, Aswath, *Country Risk: Determinants, Measures and Implications – The 2016 Edition* (July 14, 2016). Available at SSRN: https://ssrn.com/abstract=2812261 or http://dx.doi.org/10.2139/ssrn.2812261.

(default free) risk-free rate and is easily accessible. The following equation depicts Damodaran's model expressed in U.S. Dollar terms:

$$\boxed{k_{e,local} = R_{f,U.S.} + \left(\beta_{U.S.} \times RP_{U.S.}\right) + \lambda \times \left(CRP\right)}$$

Where:

| | | |
|---|---|---|
| $k_{e,local}$ | = | Discount rate for equity capital in local country |
| $R_{f,U.S.}$ | = | U.S. risk-free rate |
| $\beta_{U.S.} \times RP_{U.S.}$ | = | Risk premium (in U.S. Dollars terms) appropriate for a U.S. company in a similar industry as the subject company in the local country, where $\beta_{U.S.}$ is the beta of the subject company expressed in U.S. Dollars and $RP_{U.S.}$ is the U.S. equity risk premium also expressed in U.S. Dollars |
| $\lambda$ | = | Company's exposure to the local country risk |
| $CRP$ | = | $\left[\left(R_{local\ euro\ \$\ issue} - R_{f,U.S.}\right) \times \left(\frac{\sigma_{stock}}{\sigma_{bond}}\right)\right]$ |
| $R_{local\ euro\ \$\ issue} - R_{f,U.S.}$ | = | Yield spread between government bonds issued by the local country in U.S. Dollars versus U.S. government bonds |
| $\sigma_{stock}$ | = | Volatility of returns in local country's stock market |
| $\sigma_{bond}$ | = | Volatility of returns in local country's bond market |

This model is premised on two basic ideas:[6]

- A company's exposure to country risk ($\lambda$) comes from where it operates, and not where it is incorporated.

- If the country default spread is estimated through the premium demanded for buying a government bond issued by the subject country relative to a risk-free government bond issued by a developed (mature) market, then the country risk premium used to estimate a cost of equity for that country should be greater, because equities are riskier than bonds. This is accomplished by scaling the equity risk premium by the relative standard deviation of stocks vs. bonds ($\sigma_{stocks} / \sigma_{bonds}$) in the local market, which will generally yield a greater country risk (CRP) than merely using the spread between the respective countries' bonds (sovereigns or corporates).

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[6] Letter to the Editor, Professor Aswath Damodaran, *Business Valuation Review* 31(2/3) (Summer/Fall 2012): 85 86.

If we are estimating expected returns in terms of U.S. Dollars, this discount rate can be used for discounting expected net cash flows expressed in U.S. Dollars (with the exchange risk treated preferably in the expected cash flows, or potentially as an adjustment to the discount rate).

For countries without rated debt, you can use country risk ratings to estimate the credit rating and the default spread, which is then used to estimate the country risk premium (CRP).

The company's exposure to the local country risk is measured relative to the average company in the local country. Damodaran indicates that the determinants of such exposure would be influenced by at least three factors (if not more): (i) revenue source from the country in question; (ii) location of production facilities; and (iii) level of usage of risk management products. Using the simplest measure of lambda based entirely on revenues, if the average of local country companies has 80% revenue from operations in that local country, then you want to measure the subject company's percent of total revenues generated in that country relative to the average company in the local country of 80%.

The country exposure measure in the Damodaran model is consistent with a study that measured global, country, and industry effects in firm-level returns between emerging and developed markets.[7] The authors found that country effects dominate global and industry effects in emerging markets in contrast to developed markets. The implication of their results is that in applying country risk factors, you should consider the firm level amount of international business in determining the impact of country risk versus global and industry risk. One can incorporate the data published in this book to measure country level risks into the framework of the Damodaran model.

Some analysts are critical of this model, claiming that it does not have a strong theoretical foundation and is not consistent with a CAPM framework.[8]

### Alternative Risk Measures (Downside Risk)

Is beta a flawed measure of risk in emerging markets? We have already noted that in many local markets, beta measurements may be flawed because "market" returns in some markets are dominated by a few large companies (or industries) and the returns on other "local market" companies may not be correlated with those large companies. Returns of the local market companies may even be highly correlated to one another and experience high variance (risk), but they look like low-risk companies because their betas are low relative to the overall market index.

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7 Kate Phylaktis and Xia Lichuan, "Sources of Firms' Industry and Country Effects in Emerging Markets", *Journal of International Money and Finance* (April 2006): 459–475.

8 Lutz Kruschwitz, Andreas Löffler, and Gerwald Mandl, "Damodaran's Country Risk Premium: A Serious Critique", *Business Valuation Review* 31(2/3) (Summer/Fall 2012): 75–84.

Mishra and O'Brien studied implied cost of capital estimates for individual stocks from 16 developing (i.e., emerging) economies. They found that total risk (volatility of returns) is the most significant risk factor in explaining implied cost of capital estimates for these stocks.[9]

For companies based in those markets, but with global market presence, the global beta does explain, but to a lesser degree, differences in implied cost of capital estimates.

Other researchers have suggested that downside risk measures may result in more accurate risk measures in developing markets. Gendreau and Heckman found returns in emerging markets systematically related to downside risk, measured as the semi-standard deviation of returns compared with a benchmark return.[10]

A model that incorporates downside risk as the measure of risk is expressed in the following equation in U.S. Dollars:

$$k_{e,local} = R_{f,U.S.} + \left(\frac{DR_i}{DR_w}\right) \times RP_w$$

Where:

| | | |
|---|---|---|
| $k_{e,local}$ | = | Discount rate for equity capital in local country |
| $R_{f,U.S.}$ | = | U.S. risk-free rate |
| $DR_i$ | = | Downside risk (i.e., semi-deviation with respect to the mean) of returns in the local stock market *i* (measured in terms of U.S. Dollar returns) |
| $DR_w$ | = | Downside risk (i.e., semi-deviation with respect to the mean) of returns in the global ("world") stock market index (measured in terms of U.S. Dollar returns) |
| $RP_w$ | = | General market risk premium in global ("world") stock market index |

If we are estimating expected returns in terms of U.S. Dollars, this discount rate can be used for discounting expected net cash flows expressed in U.S. Dollars (with the exchange risk treated preferably in the expected cash flows or, alternatively, as an adjustment to the discount rate).

The semi-deviation of returns in the local stock market index (average of squared deviation of downside returns realized in the local market minus the average returns of the local market) is $DR_i$, while $DR_w$ is the semi-deviation of returns in a global stock market index (average of squared deviation of downside returns realized in the global index minus the average returns of the global index).[11]

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9 Dev R. Mishra and Thomas J. O'Brien, "Risk and Ex Ante Cost of Equity Estimates of Emerging Market Firms", *Emerging Market Review* 6 (2005): 107–120.

10 Brian Gendreau and Leila Heckman, "Estimating the Equity Premium across Countries", Salomon Smith Barney (2002).

11 See for example Javier Estrada, "The Cost of Equity in Emerging Markets: A Downside Risk Approach", *Emerging Markets Quarterly*, Fall 2000.

A possible alternative downside risk measure to the preceding formula is using downside betas. This would entail replacing the downside risk ratio ($DR_i/DR_w$) shown in the preceding formula with a downside beta calculated for the subject country relative to the world market portfolio. The downside beta can be calculated in a few different ways, including using the following formula:

$$\beta_i^D = \frac{Cosemivariance(R_i, R_w)}{Semivariance(R_w)}$$

Where:

| | | |
|---|---|---|
| $\beta_i^D$ | = | Downside beta for local country *i* |
| $Cosemivariance(R_i, R_w)$ | = | Cosemivariance of returns (a.k.a. downside covariance) between the local country *i* and the global ("world") stock market index (all measured in terms of U.S. Dollar returns) |
| $Semivariance(R_w)$ | = | Semivariance of returns (i.e., square of the semi-deviation with respect to the mean) on the global ("world") stock market index (measured in terms of U.S. Dollar returns) |

The advantages of the model are its theoretical foundations and empirical support.[12] The downside beta has received some support in the literature. That is, portfolios of company stocks with high downside betas realize greater returns than portfolios of company stocks with low downside betas, consistent with the theory of CAPM.[13]

However, more recent research has cast doubt on some of these findings, at least when applied to developed markets. Using six distinct measures of downside risk, including downside beta, the authors analyzed the relationship between downside risk and the cross-section of equity returns for 26 developed markets. They found that there is no significantly positive relation between systematic downside risk and the cross-section of equity returns, and in fact, this relation is mostly negative.[14]

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12 Estrada, Javier, and Ana Paula Serra. "Risk and return in emerging markets: family matters." *Journal of Multinational Financial Management* 15, no. 3 (2005): 257-272; Javier Estrada, *Finance in a Nutshell* (New York: Financial Times Prentice-Hall, 2005): 96–108.

13 See, for example, Estrada, Javier, and Ana Paula Serra. "Risk and return in emerging markets: family matters." *Journal of Multinational Financial Management* 15, no. 3 (2005): 257-272; Galagedera, Don (Tissa) U. A. and Jaapar, Asmah M. Mohd, Modelling Time-Varying Downside Risk (December 1, 2008). The *Icfai University Journal of Financial Economics*, Vol. 7, No. 1, March 2009, 21st Australian Finance and Banking Conference 2008, Available at SSRN: https://ssrn.com/abstract=1209507. Downside risk measures have been criticized. See Sergei Vasilievich Cheremushkin, “Internal Inconsistency of Downside CAPM Models”,January 14, 2012. Available at http://ssrn.com/abstract=1985372.

14 Atilgan, Yigit, Turan G. Bali, K. Ozgur Demirtas, and A. Doruk Gunaydin. "Global downside risk and equity returns." *Journal of International Money and Finance* 98 (2019): 102065.

From a practical standpoint, this model has gained limited acceptance in part due to limited published data on downside risk measures. In addition, the use of a country downside beta may or may not fully capture the incremental risk of investing in a given emerging market. To test this assertion, we have updated Professor Estrada's calculations of downside betas by country (through December 2021) as fully explained in his 2007 academic paper.[15]

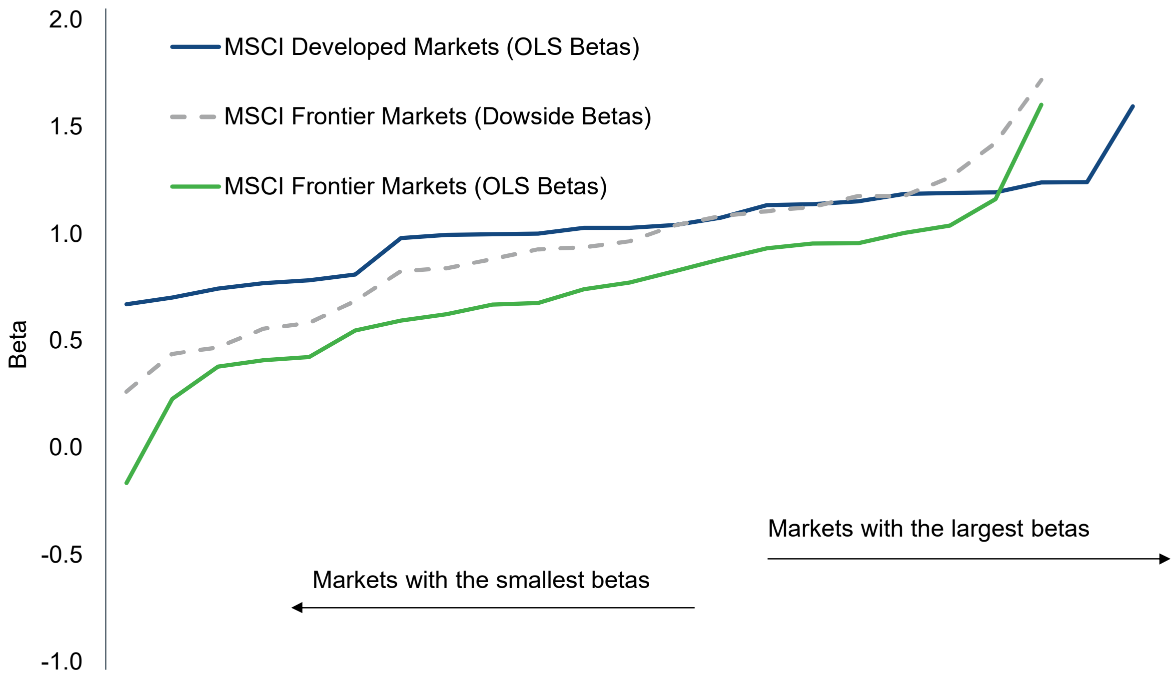
As background, Professor Estrada (2007) showed empirical evidence for developed and emerging markets, which supported downside beta as a superior measure of risk relative to CAPM's beta when estimating required returns for emerging markets. Countries were categorized as "developed" or "emerging" based on MSCI's market classification. Professor Estrada found that on average, downside beta generated a higher required return for emerging markets (as a group) than for developed markets (as a group). In contrast, average required returns on equity based on textbook CAPM were approximately the same for both groups of countries (i.e., the average OLS beta for developed markets was virtually the same as that for emerging markets).

We have updated the same type of analysis as in Estrada (2007) through December 2021, expanding it to include frontier markets. Again, the categorization of developed, emerging, and frontier markets was based on MSCI classification as of December 2021. Monthly return data from the MSCI database were used for developed markets and frontier markets. All returns were measured in U.S. Dollars and accounted for both capital gains and dividends (i.e., total returns).

Exhibit 2.2 depicts the same 60-month OLS CAPM betas as of December 2021 for developed countries/regions (the solid blue line) and frontier markets (the solid green line) shown in Exhibit 2.1, again sorted from smallest betas (on the left) to largest betas (on the right). In Exhibit 2.2 we have added an additional line: the 60-month downside betas for frontier markets (the dashed gray line) are sorted and presented in a similar fashion. The result of this analysis is shown in Exhibit 2.2.

[15] Javier Estrada, "Mean-Semivariance Behavior: Downside Risk and Capital Asset Pricing". *International Review of Economics and Finance* 16 (2007), 169–185.

**Exhibit 2.2:** MSCI Developed Markets' OLS Betas and Frontier Markets' OLS and Downside Betas as Measured over the 60-month Period Ending December 31, 2021




**Source of underlying data:** MSCI: All returns are based on MSCI indices, in U.S. Dollars, and accounting for capital gains/losses and dividends. The classification of developed and frontier markets corresponds to the countries/regions in the MSCI indices of developed and frontier markets as of December 2021. MSCI Developed Markets represented in this analysis by: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United States, and the United Kingdom. MSCI Frontier Markets represented in this analysis by: Argentina, Bahrain, Bangladesh, Croatia, Estonia, Jordan, Kazakhstan, Kenya, Kuwait, Lebanon, Lithuania, Mauritius, Morocco, Nigeria, Oman, Romania, Serbia, Slovenia, Sri Lanka, Tunisia, and Vietnam. The market benchmark used in the calculation of all betas is the MSCI World Index.  All calculations by Kroll.

As discussed previously, the OLS betas of the countries classified as "frontier" markets (the solid green line) are nearly always *lower* than the OLS betas of "developed" markets (the solid blue line in Exhibit 2.2), which we previously concluded runs counter to investors' relative risk perceptions between these two groups of countries/regions. The downside betas of frontier markets (the dashed light gray line), while doing a better job of estimating risk than the OLS betas of frontier markets, are still *lower* than the OLS betas of developed markets in nearly all cases shown in Exhibit 2.2.

Exhibit 2.3 provides a summary statistics about the graph in Exhibit 2.2. Observations about the information in Exhibit 2.3 include:

- The downside betas of both developed markets and frontier markets are *larger* than their OLS beta counterparts.

- Downside betas for frontier markets increased significantly *more* compared to their OLS counterparts than did downside betas for developed markets compared to their OLS counterparts. For example, the average downside beta for developed markets is approximately 5% larger than its OLS counterpart (1.08 versus 1.03), but the average downside beta for frontier markets is approximately 28% larger than its OLS counterpart (0.93 versus 0.73)

- Frontier market OLS and downside betas are systematically smaller than their developed market counterparts, which runs counter to investors' relative risk perceptions between these two groups of countries.

**Exhibit 2.3:** Average OLS and Downside Betas for MSCI Developed, Emerging, and Frontier Markets Measured over the 60-Month Period Ending December 31, 2021

| | **OLS Beta** | | **Downside Beta** | |
|---|---|---|---|---|
| | Average | Median | Average | Median |
| Developed Markets | 1.03 | 1.03 | 1.08 | 1.10 |
| Frontier Markets | 0.73 | 0.74 | 0.93 | 0.94 |

Either because stock markets located in frontier markets tend to exhibit very low liquidity or due to their low degree of integration with global markets (or both), it appears that expected returns of frontier markets have little relation to expected returns in a world market portfolio, even when risk is measured by downside beta.[16] In fact, researchers have concluded that there is a low level of integration of frontier equity markets into the global market, even after the 2008−2009 global financial crisis.[17] Nonetheless, these analyses suggest that downside betas may do a better job at capturing the risk of emerging and frontier markets, when compared to textbook CAPM (OLS) betas.

### What Model Should I Use?

There is no consensus among academics and practitioners as to the best model to use in estimating the cost of equity capital in a global environment, particularly with regards to companies operating in emerging economies.

In choosing a model, the goal is to balance several objectives:

- **Acceptance and use:** The model has a degree of acceptance, and the model is actually used by valuation analysts.

[16] There could be other reasons why frontier markets' OLS and downside betas are systematically lower than those of developed markets over the period analyzed, which we do not explore in this publication.

[17] Zaremba, Adam, and Alina Maydybura. "The cross-section of returns in frontier equity markets: Integrated or segmented pricing?" *Emerging Markets Review* 38 (2019): 219-238. The authors studied data for 22 frontier markets classified according to MSCI.

- **Data Availability:** Quality data are available for consistent and objective application of the model.

- **Simplicity:** The model's underlying concepts are understandable and can be explained in plain language.

There are several common approaches to incorporating country factors into a cost of equity capital estimate. None are perfect.

## Economic Integration

A key issue in choosing an international cost of capital estimation model is the degree to which the subject country is integrated into the global economy. An integrated economy has a significant portion of inputs and outputs of its economy that are sourced and sold internationally rather than locally. If all economies were fully integrated, it might be reasonable to expect that *similar* companies or projects located in different countries would have *similar* costs of capital.

However, the economies of developed countries are generally integrated into the global economy to a *greater* degree than are less-developed countries. Choosing the appropriate model(s) for estimating the cost of equity capital for a company or project in a less developed country (i.e., "emerging" and "frontier" countries), where local market volatility may become more important, is indeed an ongoing challenge.

We present a brief overview of models more commonly used for estimating the cost of equity capital in international settings. None of these models are perfect, so it is important to understand the strengths and potential weaknesses of each model in order to make well-informed choices when developing cost of capital estimates for global investments.

Exhibit 2.4 presents a summary of the general strengths and weaknesses of various international cost of equity capital models. In cases where countries lack stock and/or bond market return data, or yields on government debt denominated in "home" (or mature market) currencies, it may be appropriate to correlate the subject country's credit (or risk) rating with ratings of other countries that do have these metrics.[18]

[18] Country risk ratings are available from Euromoney's Country Risk Ratings or Political Risk Services' *International Country Risk Guide*.

**Exhibit 2.4:** A Comparison of International Cost of Capital Models

| International Cost of Capital Model | Strengths | Weaknesses |
|---|---|---|
| World (Global) CAPM Model | Can work well if country is integrated and/or the subject company operates in many countries. | Assumes away meaningful differences across countries.<br><br>Generally requires the "local" country to have a history of bond market and stock market returns.<br><br>Does not work well in emerging markets: generally results in lower betas for companies located in emerging markets, counter to expectations. |
| Single Country CAPM Model | Allows more local factors to be introduced. | Does not work well in emerging markets.<br><br>Generally requires the "local" country to have a history of bond market and stock market returns. |
| Damodaran Model | Introduces a measure of economic integration at the company level. | Complexity.<br><br>Generally requires the "local" country to have a history of bond market and stock market returns. |
| Country (Sovereign) Yield Spread Model | Intuitive / easily implemented. | Requires that the "local" government issues debt denominated in the "home" government's currency. However, this can be overcome by using a regression of observed yield spreads against country risk ratings.<br><br>May double count (or underestimate) *business* cash flow risks, particularly if the default risk of a given country is not a good proxy for the risks faced by the subject company operating locally. |
| Relative Volatility Model | Intuitive / easily implemented. | Does not work well in countries that do not have well-diversified stock markets.<br><br>Requires the "local" country to have a history of stock market returns.<br><br>Results are sensitive to the period selected to compute standards deviation of returns.<br><br>At times does not work well for even the most developed countries resulting in implied adjustments far in excess of what would be expected. |
| Country Credit Rating Model | Intuitive / can be applied to a significant number of countries. | Complexity<br><br>Requires access to quality stock market return data from a large number of countries.<br><br>Stock market data and country credit rating data is more frequently available for countries that are more developed, which may bias the results.<br><br>Results are sensitive to the period chosen over which the regression is performed.<br><br>The country credit ratings used as inputs in the CCR Model are (at least in part) based on qualitative factors that are subject to judgement. |

# Chapter 3
# International Equity Risk Premia

### Description of Data

The Cost of Capital Navigator's International Cost of Capital Module at kroll.costofcapital.com includes historical equity risk premia (ERPs) estimates for 16 world economies, through December 2021.[1, 2]

Long-horizon historical ERPs are calculated (i) in terms of the U.S. Dollar, and (ii) in terms of each country's "local" currency. In the case of the United States, the "local" currency is the U.S. Dollar, and so the long-horizon ERP is calculated only once, and labeled "in U.S. Dollars", which is also the "local" currency.

The time horizon over which each country's ERPs are calculated is dependent on data availability, and for most countries analyzed the time horizon is 1970–2021. However, Canada, the United Kingdom, and the United States' historical ERPs are calculated over the time horizons 1919–2021, 1900–2021, and 1926–2021, respectively. Note that if the analyst wishes to select a long-term ERP measured over the same time horizon as the majority of the other subject countries' long-term historical ERPs are measured in Exhibit 1 (1970–2021 in most cases), that information is *still* provided in the Canada, U.K., and U.S. long-term ERP tables.

The ERPs in the International Cost of Capital Module:

- Were calculated using the same general *data sources* that were used to calculate the ERPs previously published in the Ibbotson Associates/Morningstar *International Equity Risk Premia Report*.[3]

- Were calculated using the same general *methodologies* that were used to calculate the ERPs previously published in the Ibbotson Associates/Morningstar *International Equity Risk Premia Report*.

In estimating historical equity risk premia in the fashion previously reported in the Ibbotson Associates/Morningstar *International Equity Risk Premium Report* and now reported in the Cost of Capital Navigator's International Cost of Capital Module, changes in methodology and data were made to improve the analysis, and to strengthen internal consistency. This was primarily accomplished by:

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1 The ERPs for the 16 countries are calculated annually as of December 31. The most recent update was December 31, 2021.
2 "Premia" is the plural of premium. A single equity risk premium is denoted "ERP"; the plural equity risk premia is denoted "ERPs".
3 The Ibbotson Associates/Morningstar *International Equity Risk Premia Report* was discontinued in 2013.

- Minimizing the number of index “families” used (e.g., MSCI, IMF, DMS) to standardize the analysis and to increase internal consistency.

- Using the same (or similar) time horizons over which ERP estimates were estimated.

- Eliminating analysis for countries that had data histories which were likely not long enough to provide meaningful historical ERP estimates.[4]

A summary of the 16 countries for which historical ERPs are calculated, the currencies in which they are calculated, and the time periods over which they are calculated is presented in Exhibit 3.1.

**Exhibit 3.1:** Countries Covered, Currencies, and Time Periods

| | | | USD | Local Currency |
|---|---|---|---|---|
| Country | Local Currency | Currency Code | Long-Horizon Start Date | Long-Horizon Start Date |
| Australia | Australian Dollar | AUD | 1970 | 1970 |
| Austria | Euro | EUR | 1972 | 1971 |
| Belgium | Euro | EUR | 1970 | 1970 |
| Canada | Canadian Dollar | CAD | 1919 | 1919 |
| France | Euro | EUR | 1970 | 1970 |
| Germany | Euro | EUR | 1970 | 1970 |
| Ireland | Euro | EUR | 1970 | 1970 |
| Italy | Euro | EUR | 1970 | 1970 |
| Japan | Yen | JPY | 1970 | 1970 |
| Netherlands | Euro | EUR | 1970 | 1970 |
| New Zealand | New Zealand Dollar | NZD | 1970 | 1970 |
| South Africa | Rand | ZAR | 1971 | 1970 |
| Spain | Euro | EUR | 1972 | 1971 |
| Switzerland | Swiss Franc | CHF | 1970 | 1970 |
| United Kingdom | Pound Sterling | GBP | 1900 | 1900 |
| United States | U.S. Dollar | USD | 1926 | 1926 |

[4] A total of 10 countries’ ERP estimates that were previously reported in the Morningstar/Ibbotson *2013 International Equity Risk Report* were eliminated from the analyses presented herein due to insufficient data. The countries eliminated were Czech Republic, Finland, Greece, Hungary, Malaysia, Norway, Poland, Portugal, Singapore, and Thailand.

## U.S. SBBI® Long-term Government Bond Series Data Revision (immaterial)

Morningstar reported data revisions in January 2016 and spring 2021 to the "SBBI® Long-term Government Bond" total return and income series, which are inputs in the calculation of U.S. long-term ERP estimates herein. These data revisions were small and did not materially affect U.S. ERP calculations. For more information, see the of Capital Navigator's International Cost of Capital Module's "Resources Library" section.

## Methodology

### The Equity Risk Premium (ERP)

The ERP (often interchangeably referred to as the *market risk premium*) is defined as the extra return (over the expected yield on risk-free securities) that investors expect to receive from an investment in the market portfolio of common stocks, represented by a broad-based market index (e.g., the S&P 500 Index in the United States). A risk-free rate is the return available, as of the valuation date, on a security that the market generally regards as free of the risk of default (e.g., a U.S. Treasury security in the United States). The risk-free rate and the ERP are interrelated concepts. All ERP estimates are, by definition, developed in relation to the risk-free rate.

### Calculating Historical ERP

There is no single universally accepted methodology for estimating the ERP. A wide variety of premia are used in practice and recommended by academics and financial professionals. These differences are often due to differences in how ERP is estimated.[5] Generally, we can categorize approaches for estimating the ERP as either an *ex post* approach (based on actual results) or an *ex ante* approach (based on forecasts).

For example, some valuation analysts define expected returns on common stocks in terms of averages of *realized* (historical) single-period returns while others define expected returns on common stocks in terms of realized (i.e., historical) multi-year compound returns. These are *ex post* approaches. Some valuation analysts estimate the ERP using the returns on the diversified portfolio implied by expected (future) stock prices or expected dividends. These are *ex ante* approaches.

The ERPs herein are all calculated using an *ex post* approach: the examination of the historical relationship between equities (i.e., stocks) and a "risk-free" security.[6] For example, the long-term historical average annual return of stocks in Belgium as represented by the MSCI Belgium equities total return index (in terms of Euros) over the time period 1970–2020 is 12.59%, and the

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5 For a detailed discussion of the equity risk premium, see *Cost of Capital: Applications and Examples* 5th edition, by Shannon P. Pratt and Roger J. Grabowski (John Wiley & Sons, Inc., 2014), Chapter 8 ("Equity Risk Premium"), Appendix 8A ("Deriving ERP Estimates"), and Appendix 8B ("Other Sources of ERP Estimates").

6 No security is truly "risk-free". A risk-free rate is the return available on a security that the market generally regards as free of the risk of default, and thus useable as a proxy for a risk-free security. For example, for a valuation denominated in U.S. Dollars (USD), analysts typically use the valuation date yield-to-maturity on a U.S. government security as a proxy for the risk-free rate.

historical average annual return of a long-horizon risk-free security in Belgium (also in terms of Euros) as represented by a long-horizon risk-free return index for Belgium over the same period is 6.34%, implying a long-term ERP of 6.25%:

*“Historical” ERP = Average Annual Return of Stocks – Average Annual Return of Risk-free Security*

*6.25% = 12.59% - 6.34%*

**Equity Returns**

The same “family” of equity indices is used in the analyses presented herein in order to maximize internal consistency. The primary source of equity total returns used in this analysis is MSCI Global Equity Indexes.[7,8,9]

The MSCI Total Return Indexes “*measure the price performance of markets with the income from constituent dividend payments. The MSCI Daily Total Return (DTR) Methodology reinvests an index constituent’s dividends at the close of trading on the day the security is quoted ex-dividend (the ex-date)*”. In all cases for which an MSCI equity index is available, the MSCI Total Return Indexes (with gross dividends) is used.[10]

There are five countries for which MSCI equity data was used, but only in part: Canada, Ireland, New Zealand, South Africa, and the U.K. In these five cases, Dimson, Marsh, Staunton (DMS) equity returns data was used in earlier years (1919–1969 in the case of Canada, 1970–1987 in the case of Ireland and New Zealand; 1970–1992 in the case of South Africa, and 1900–1969 in the case of the U.K.)[11] MSCI equity returns data was then used for the respective remainder of the years through 2021, for each of these five countries.

There is one country for which MSCI equity data was *not* used: the United States. For the U.S., equity returns are represented herein by the S&P 500 Index. The reason for this is straightforward: in the Cost of Capital Navigator (and in the former *Valuation Handbook – U.S. Guide to Cost of Capital* as well as the former *SBBI® Yearbook*), the series used to represent U.S. equities is (and

7 MSCI market-cap-weighted indexes are among the most respected and widely used benchmarks in the financial industry. Collectively, they provide detailed equity market coverage for more than 80 countries across developed, emerging and frontier markets, representing 99% of these investable opportunity sets. For more information, see: https://www.msci.com/market-cap-weighted-indexes.

8 MSCI equity series were also the primary series used in the former Morningstar/Ibbotson “International Equity Risk Premium Report”.

9 Source of MSCI Equity Indexes used: Morningstar, Inc. Used with permission. All rights reserved. To learn more about Morningstar, visit www.corporate.morningstar.com.

10 Gross total return indices reinvest as much as possible of a company’s dividend distributions. The reinvested amount is equal to the total dividend amount distributed to persons residing in the country of the dividend-paying company. Gross total return indices do not, however, include any tax credits. See http://www.msci.com/indexes.

11 The Dimson, Marsh, Staunton data are summarized in the Credit Suisse Global Investment Returns Yearbook 2021 (Credit Suisse Research Institute, 2021) by Elroy Dimson, Paul Marsh, and Mike Staunton. Copyright © Elroy Dimson, Paul Marsh, and Mike Staunton. All rights reserved. Used with Permission. Duff & Phelps has a data license to the full DMS dataset through Morningstar Inc.

was) the S&P 500 Index (unless otherwise stated). While it would be internally *consistent* to use the MSCI U.S. equity series within the historical equity risk premium analysis presented herein (since all the other countries' equity returns are represented primarily by MSCI indices), doing so would be *inconsistent* with (i) Duff & Phelps' other published valuation data resources, and (ii) what most analysts use to represent U.S. equities (the S&P 500).[12,13]

Currency translation is used only in cases for which MSCI does not supply a raw series in the appropriate currency. Specifically, the *raw* index data from MSCI is used, if available in the required currency. For example, MSCI creates a total return series for Belgium equities in USD, and so that series is used in the calculations and no additional currency translations are required for this series. When translation does become necessary (i.e., MSCI provides a total return series for the equity data needed, but the series is not denominated in the currency needed), the currencies are translated using the same currency conversion data and methodology that was utilized in the former Ibbotson Associates/Morningstar *International Equity Risk Premium Report*.[14,15]

### Risk-free Returns (long-horizon)

The primary data source used in the construction of long-horizon risk-free returns is from the International Monetary Fund (IMF).[16,17,18] Long-horizon government income return series constructed in this fashion are available for all 16 of the countries shown in Exhibit 3.1.

There is one country for which long-horizon risk free series based on IMF data were *not* used: the United States. For the U.S., long-horizon risk free returns are represented by the "SBBI® U.S. Long-Term Government Income Return" series.[19] The reason for this is straightforward: in the

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12 The S&P 500 total return index was also used to represent U.S. equities in the former Morningstar/Ibbotson "International Equity Risk Premium Report". In the Cost of Capital Navigator, the United States long-horizon equity risk premia is also calculated from 1926 to 2021 using the S&P 500 total return index.

13 In any case, a side-by-side analysis of the equity risk premium data over the full time-horizon presented here is calculated using (i) the S&P 500 index and the SBBI® U.S. LT Gov't income return index and (ii) MSCI U.S. equity index and IMF U.S. LT Gov't income return index produces very similar results.

14 Source of currency conversion data: Morningstar Direct database.

15 MSCI provides a total return equity series in USD for each of the 16 countries presented herein, and so for these series no currency translation was required.

16 The "IMF Long-Term World Government Bonds" are computed by Duff & Phelps using yields from the IMF. These IMF government bond yields have long-term maturities and vary from country to country. Returns are calculated assuming a single bond is bought at par (i.e., the coupon equals the market yield) at the beginning of each period. The bond is "held" over the period, and "sold" at the end of the period at the then-prevailing market yield. The end-of-period price is calculated as a function of the coupon, yield, and maturity remaining at period-end. The return in excess of yield (capital appreciation) is then derived as the change in price over the period, divided by the beginning-of-period price (i.e., divided by par). The yield is converted to an income return by (dividing it by 12) lagging it one period. Total return is equal to the income return plus the return in excess of yield.

17 Beginning in 2018, the "IMF-Long-term World Government Bonds" are now computed in house (i.e., by the Duff & Phelps Valuation Digital Services team) using yields from the IMF, Reserve Bank of Australia, European Central Bank, Bank of Canada, Federal Reserve of St. Louis, Reserve Bank of New Zealand, Swiss National Bank, and the Bank of England. NOTE: this is (i) the exact same historical data, and (ii) methodology that Morningstar used in the past. Duff & Phelps cross-checked the data, methodology, and results with Morningstar.

18 These same series were the primary series used for long-horizon risk-free rates in the former Morningstar/Ibbotson *International Equity Risk Premium Report*.

19 Source: Morningstar, Inc. Used with permission. All rights reserved.

Cost of Navigator (and in the former *Valuation Handbook – U.S. Guide to Cost of Capital* as well as former *SBBI® Yearbook*), the series used to represent U.S. long-horizon risk-free returns is (and was) the SBBI® U.S. Long Term Government Income Return series (unless otherwise stated). While it would be internally *consistent* to use the long-horizon risk-free series based on IMF data within the historical equity risk premium analyses presented herein (since all the other countries' long-horizon risk-free returns are represented primarily by these series), doing so would be *inconsistent* with Duff & Phelps' other published valuation data resources.[20]

## Description of Data Series Used[21]

### Australia

**Equity Series:** The equity series used is the MSCI Australia Index.[22] The MSCI Australia Index is designed to measure the performance of the large and mid-cap segments of the Australia market. With 63 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Australia.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Australia Long-term Government Income Return series. The IMF Australia Long-term Government Income Return series assesses secondary market yields on non-rebate bonds with maturity of 10 years. Yields are calculated before brokerage and on the last business day of the month. The average maturity for the IMF Australia Long-term Government Income Return series is 10 years.

### Austria

**Equity Series:** The equity series used is the MSCI Austria Index. The MSCI Austria Index is designed to measure the performance of the large and mid-cap segments of the Austrian market. With 5 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Austria.

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20 The SBBI® U.S. Long-Term Government Income Return series was also used to represent the U.S. long-horizon risk-free rate in the former Ibbotson Associates/Morningstar *International Equity Risk Premium Report*.

21 The descriptions of the equity series and risk-free series are from the following sources: (i) Morningstar Direct database; (ii) MSCI database; (iii) Credit Suisse Global Investment Returns Yearbook 2021 (Credit Suisse Research Institute, 2021) by Elroy Dimson, Paul Marsh, Staunton; (iv) International Monetary Fund (IMF) database. All series data was accessed using the Morningstar Direct database, except for the long-term IMF government bond series yield data that is used to construct the IMF long-term government income series. Beginning in 2018, the "IMF Long-term World Government Bonds" are now computed in house (i.e., by the Duff & Phelps Business Publications team) using yields from the IMF, Reserve Bank of Australia, European Central Bank, Bank of Canada, Federal Reserve of St. Louis, Reserve Bank of New Zealand, Swiss National Bank, and the Bank of England. NOTE: this is (i) the exact same historical data, and (ii) methodology that Morningstar used in the past. Duff & Phelps cross-checked the data, methodology, and results with Morningstar. To learn more about Morningstar, visit www.corporate.morningstar.com.

22 In all cases in this section, the MSCI indices used are "GR" (i.e., gross return) MSCI indices. MSCI "GR" equity indices account for both capital gains and dividends (i.e., "total" returns).

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used the IMF Austria Long-term Government Income Return series. This series refers to all government bonds issued and not yet redeemed. They are weighted with the share of each bond in the total value of the government bonds in circulation. The data include bonds benefiting from tax privileges under the tax reduction scheme. The average maturity for the IMF Austria Long-term Government Income Return series is 10 years.

### Belgium

**Equity Series:** The equity series used is the MSCI Belgium Index. The MSCI Belgium Index is designed to measure the performance of the large-, mid-, and small-cap segments of the Belgian market. With 12 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Belgium.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Belgium Long-term Government Income Return series. Prior to 1990, this series was represented by a weighted average yield to maturity of all 5–8 percent bonds issued after December 1962 with more than 5 years to maturity. From 1990 onward, this series was represented by the yield on 10-year government bonds. The average maturity for the IMF Belgium Long-term Government Income Return series is 10 years.

### Canada

**Equity Series:** From 1919 to 1969, the equity series used is Dimson, Marsh, Staunton (DMS) equity returns for Canada. The main data source for DMS equity returns for Canada from 1926 forward is Panjer and Tan (2002).[23] Prior to 1926, the primary source for DMS equity returns for Canada was the equity returns series produced by Moore (2012).[24] From 1970 to present, the equity series used is the MSCI Canada GR Index (total return) series. The MSCI Canada Index is designed to measure the performance of the large and mid-cap segments of the Canada market. With 89 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Canada.

[23] Harry Panjer, and Ken Seng Tan, 2002. Report on Canadian Economic Statistics 1924–2001, Canadian Institute of Actuaries. [Updated in: Report on Canadian Economic Statistics 1924–2008].

[24] Lyndon Moore, 2012, "World Financial Markets, 1900–1925", unpublished manuscript.

**Long-Horizon Risk-free Rate:** From 1919 to 1957, long-term government securities data from the Bank of Canada Data and Statistics Office were used.[25] From 1958 to present, the long horizon risk -free series used is the IMF Canada Long-term Government Income Return series, calculated from government bond yield issues with original maturity of 10 years or more. It is calculated based on average yield to maturity.

### France

**Equity Series:** The equity series used is the MSCI France Index. The MSCI France Index is designed to measure the performance of the large and mid-cap segments of the French market. With 69 constituents, the index covers approximately 85% of the equity universe in France.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF France Long-term Government Income Return series. The series uses average yield to maturity on public sector bonds with original maturities of more than 5 years. Monthly yields are based on weighted averages on weekly data. Prior to April 1991, the data are average yields to maturity on bonds with original maturities of 15 to 20 years, issued on behalf of the Treasury by the Consortium of Credit for Public Works. Between April 1991 and December 1998, the data are average yields to maturity on bonds with residual maturities between 9 and 10 years. From January 1999 onward, monthly data are arithmetic averages of daily gross yields to maturity of the fixed coupon 10- year Treasury benchmark bond (last issued bond beginning from the date when it becomes the most-traded issue among government securities with residual maturities between 9 and 10 years), based on prices in the official wholesale market. The average maturity for the IMF France Long-term Government Income Return series is 10 years.

### Germany

**Equity Series:** The equity series used is the MSCI Germany GR Index (total return) series. The MSCI Germany Index is designed to measure the performance of the large and mid-cap segments of the German market. With 61 constituents, the index covers approximately 85% of the equity universe in Germany.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Germany Long-term Government Income Return series. From 1970 to 1979, the bonds issued by the federal government, the railways, the portal system, the Lander government, municipalities, specific-purpose public associations, and other public associations established under special legislation are used to compose this series. This series is calculated based upon the average yields on all bonds with remaining maturity of more than 3 years, weighted by the amount of individual bonds

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25 Source: Bank of Canada website at: https://www.bankofcanada.ca/rates/interest-rates/. Source document for 1919–1935, 1936–1948, and 1949–1957 long-term government securities data: Government of Canada Marketable Bonds, Average Yield, Over 10 years V122487 Jan. 1919; “selected_historical_v122487.pdf”, Bank of Canada, Data and Statistics Office. Rates for 1919 to 1935 are “monthly averages for selected long-term bond issues”. Rates from 1936–1948 are “theoretical 15- year bond yields based on middle of the market quotations”. Rates from 1949–1957 “refer to direct debt payable in Canadian Dollars, excluding extendible issues and Canada Savings Bonds. Prior to 1975 some extendible issues are included but their inclusion does not materially affect the average yields. The rates shown from 1949 to 1958 are arithmetic averages of yields at month-end”.

in circulation. On January 1980, the series was changed to comprise of yields on listed federal securities that can be traded on the German Financial Futures and Options Exchange (DTB) with a remaining maturity of 9 and 10 years. The average maturity for the IMF Germany Long-term Government Income Return series is 10 years.

### Ireland

**Equity Series:** From 1970 to 1987, the equity series used is the DMS Ireland Index. The DMS equity return data for Ireland is comprised of the Irish CSO Price Index of Ordinary Stocks and Shares and Irish Stock Exchange Equity (ISEQ) total return index. From 1988 to present, the equity series used is MSCI Ireland GR Index (total return) series. The MSCI Ireland Index is designed to measure the performance of the large-, mid- and small-cap segments of the Irish market. With 5 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Ireland.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Ireland Long-term Government Income Return series. This series uses secondary market yields of government bonds with a 10-year maturity.

### Italy

**Equity Series:** The equity series used is the MSCI Index. The MSCI Italy Index is designed to measure the performance of the large and mid-cap segments of the Italian market. With 25 constituents, the index covers approximately 85% of the equity universe in Italy.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Italy Long-term Government Income Return series. Prior to 1980, the data is derived from average yields to maturity on bonds with original maturities of 15 to 20 years, issued on behalf of the Treasury by the Consortium of Credit for Public Works. Beginning January 1980, average yield to maturity on bonds with residual maturities between 9 and 10 years is used. From January 1999 to present, monthly data are arithmetic averages of daily gross yields to maturity of the fixed coupon 10 year Treasury benchmark bond (last issued bond beginning from the date when it becomes the most traded issue among government securities with residual maturities between 9 and 10 years), based on prices in the official wholesale market. The average maturity for the IMF Italy Long-term Government Income Return is 17.5 years.

### Japan

**Equity Series:** The equity series used is the MSCI Japan Index. The MSCI Japan Index is designed to measure the performance of the large and mid-cap segments of the Japanese market. With 259 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Japan.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Japan Long-term Government Income Return series. This series is based on the arithmetic yield on newly issued government bonds with 10-year maturity. The monthly series are compiled from closing (end-of-month) prices quoted on the Tokyo Stock Exchange. The average maturity for the IMF Japan Long-term Government Income Return series is 7 years.

### Netherlands

**Equity Series:** The equity series used is the MSCI Netherlands Index. The MSCI Netherlands Index is designed to measure the performance of the large-cap and mid-cap segments of the Netherlands market. With 23 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Netherlands.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used the IMF Netherlands Long-term Government Income Return series. This series is based on the yield of the most recent 10-year government bond. The average maturity for the IMF Netherlands Long-term Government Income Return series is 10 years.

### New Zealand

**Equity Series:** From 1970 to 1987, the equity series used is the DMS New Zealand Index. The DMS equity return data for New Zealand comprises the Reserve Bank of New Zealand index, the Datex Index, and the New Zealand Stock Exchange gross index. From 1988 to present, the equity series used is the MSCI New Zealand Index. The MSCI New Zealand Index is designed to measure the performance of the large and mid-cap segments of the New Zealand market. With 6 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in New Zealand.

**Long-Horizon Risk-free Rate:** The long horizon risk-free series used the IMF New Zealand Long-term Government Income Return series. The average maturity for the IMF New Zealand Long-term Government Income Return series is 10 years.

### South Africa

**Equity Series:** From 1970 to 1992, the equity series used is DMS South Africa Index. The DMS equity return data for South Africa is comprised of the Rand Daily Mail Industrial Index and the Johannesburg Stock Exchange (JSE) Actuaries Equity Index. From 1993 to present, the equity series used is the MSCI South Africa Index. The MSCI South Africa Index is designed to measure the performance of the large and mid-cap segments of the South African market. With 38 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in South Africa.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF South Africa Long-term Government Income Return series. The average maturity for the IMF South Africa Long-term Government Income Return series is 10 years.

### Spain

**Equity Series:** The equity series used is the MSCI Spain Index series. The MSCI Spain Index is designed to measure the performance of the large and mid-cap segments of the Spanish market. With 18 constituents, the index covers about 85% of the equity universe in Spain.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Euro Area Long-term Government Income Return series. This series is based on the Euro Area yield for 10 year government bonds calculated on the basis of harmonized national government bond yields weighted by GDP. The average maturity for the IMF Euro Area Long-term Government Income Return series is 10 years.

### Switzerland

**Equity Series:** The equity series used is the MSCI Switzerland GR Index (total return) series. The MSCI Switzerland Index is designed to measure the performance of the large and mid-cap segments of the Swiss market. With 41 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Switzerland.

**Long Horizon Risk-free Rate:** The long-horizon risk-free series used is the IMF Switzerland Long-term Government Income Return series. Prior to 1987, the data is derived from yields on 15-year government bonds. Beginning January 1987, the series uses secondary market yields on 10-year bonds. The average maturity for the IMF Switzerland Long-term Government Income Return series is 10 years.

### United Kingdom

**Equity Series:** From 1900–1969, the equity series used is DMS United Kingdom Equity Total Return. The main data source for DMS equity returns for the U.K. over the period 1955–1969 is the fully representative record of equity prices maintained by London Business School.[26] For earlier periods (specifically, 1900–1954), an index comprised of the largest 100 firms by market capitalization was constructed using share price data collected from the *Financial Times*.[27]

From 1970 to present, the equity series used is the MSCI United Kingdom Index. The MSCI United Kingdom Index is designed to measure the performance of the large-cap and mid cap segments

[26] As described in Elroy Dimson, and Paul Marsh, 1983, "The stability of UK risk measures and the problem of thin trading", Journal of Finance, 38: 753–783.

[27] For detailed index construction methodology, see Elroy Dimson, Paul Marsh, and Mike Staunton, Credit Suisse Global Investment Returns Yearbook 2021 (Credit Suisse, 2021), pages 209–210.

of the U.K. market. With 84 constituents, the index covers approximately 85% of the free float adjusted market capitalization in the U.K.

**Long-Horizon Risk-free Rate:** From 1900–1969, the long-horizon risk-free series is based upon "gilt" redemption yields available from the Bank of England as a proxy for income returns.[28,29] From 1970 to present, the long horizon risk-free series used is the IMF U.K. Long-term Government Income Return series. The average maturity for the IMF U.K. Long-term Government Income Return series is 20 years. These are theoretical gross redemption bond yields.

## United States

**Equity Series:** U.S. equities are represented by the Standard & Poor's S&P 500® Index (total return) series. The S&P 500 Index is a readily available, carefully constructed, market-value-weighted benchmark of common stock performance. Market-value-weighted means that the weight of each stock in the index, for a given month, is proportionate to its market capitalization (price times the number of shares outstanding) at the beginning of that month. Currently, this composite index includes 500 of the largest stocks (in terms of stock market value) in the United States; prior to March 1957 it consisted of 90 of the largest stocks.

**Long-Horizon Risk-free Rate:** The long-horizon risk-free series used is the SBBI® U.S. Long term Government Income Return series. The total returns on long-term government bonds from 1977 to present are constructed with data from the *Wall Street Journal*. The data from 1926 1976 are obtained from the Government Bond File at the Center for Research in Security Prices (CRSP) at the University of Chicago Graduate School of Business. To the greatest extent possible, a one-bond portfolio with a term of approximately 20 years and a reasonably current coupon whose returns did not reflect potential tax benefits, impaired negotiability, or special redemption or call privileges was used each year. Where "flower" bonds (tenderable to the Treasury at par in payment of estate taxes) had to be used, the bond with the smallest potential tax benefit was chosen. Where callable bonds had to be used, the term of the bond was assumed to be a simple average of the maturity and first call dates minus the current date. The bond was "held" for the calendar year and returns were computed. From 1977 to present, the income return is calculated as the change in flat price plus any coupon actually paid from one period to the next, holding the yield constant over the period. As in the total return series, the exact number of days comprising the period is used. From 1926–1976, the income return for a given month is calculated as the total return minus the capital appreciation return.

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28 "Redemption" yield of a gilt is a measure of the return implicit in its prevailing market price, assuming that the gilt is held to maturity and that all cash flows are reinvested back into the gilt.

29 Historical average conventional gilt yields are provided, these being calculated as the average daily close of business yields for the prevailing short, medium, long and ultra-long dated benchmark gilts for each month since April 1998. Average daily yields for 2½% Consolidated Stock are available on an annual basis from 1727 to 2015. To learn more, visit: https://www.dmo.gov.uk/data/ExportReport?reportCode=D4H.

## Currency Translation

Currency translation is used only in cases in which a series *not* in the needed currency (specifically, USD or "local") is available.

**Equities:** MSCI provides a total return equity series in USD for each of the 16 countries presented here, and so for these series no currency translation was required. MSCI provides a total return equity series in local for each of the 16 countries presented here, and so for these series no currency translation was required. Dimson, Marsh, Staunton (DMS) total return equity series were available in USD and local, and so for these series no currency translation was required.

**Risk-free Rates:** Long-term IMF risk free series in local currency were available, and so for these series no currency translation was required. These series were then translated into USD currency.[30] Short-term Dimson, Marsh, Staunton (DMS) risk-free series were available in USD and local, and so for these series no currency translation was required. Exhibit 3.2 provides a summary of the data series used to calculate the historical ERPs presented in the International Cost of Capital Module, "2020 International Equity Risk Premia" (next page).

30 Source of currency conversion data: Morningstar, Inc. Used with permission. All rights reserved. Exchange rate sources (as reported by Morningstar): 1960–1987 Main Economic Indicators Historical Statistics (Organisation for Economic Co-operation and Development); 1988–present the Wall Street Journal.

**Exhibit 3.2:** Data Series Used to Calculate the Equity Risk Premia (ERPs) Presented in Cost of Capital Navigator – International Cost of Capital Module

| Country | Long-Horizon ERP Start Date | Short-Horizon ERP Start Date | Equity Series | Long-Horizon Risk-Free Series | Short-Horizon Risk-Free Series |
|---|---|---|---|---|---|
| Australia | 1970 | 1970 | MSCI Australia GR | IMF Australia LT Gvt Inc Ret | DMS Australia Bill TR |
| Austria | 1972 USD<br>1971 Local | 1970 | MSCI Austria GR | IMF Austria LT Gvt Inc Ret | DMS Austria Bill TR |
| Belgium | 1970 | 1970 | MSCI Belgium GR | IMF Belgium LT Gvt Inc Ret | DMS Belgium Bill TR |
| Canada | 1919 | 1919 | 1919–1969 DMS Canada Equity TR<br>1970–2019 MSCI Canada GR | 1919–1957 Bank of Canada Yield Data<br>1958–2019 IMF Canada LT Gvt Inc Ret | DMS Canada Bill TR |
| France | 1970 | 1970 | MSCI France GR | IMF France LT Gvt Inc Ret | DMS France Bill TR |
| Germany | 1970 | 1970 | MSCI Germany GR | IMF Germany LT Gvt Inc Ret | DMS Germany Bill TR |
| Ireland | 1970 | 1970 | 1970–1987 DMS Ireland Equity<br>1988–2019 MSCI Ireland GR | IMF Ireland LT Gvt Inc Ret | DMS Ireland Bill TR |
| Italy | 1970 | 1970 | MSCI Italy GR | IMF Italy LT Gvt Inc Ret | DMS Italy Bill TR |
| Japan | 1970 | 1970 | MSCI Japan GR | IMF Japan LT Gvt Inc Ret | DMS Japan Bill TR |
| Netherlands | 1970 | 1970 | MSCI Netherlands GR | IMF Netherlands LT Gvt Inc Ret | DMS Netherlands Bill TR |
| New Zealand | 1970 | 1970 | 1970–1987 DMS New Zealand Equity<br>1988–2019 MSCI New Zealand GR | IMF New Zealand LT Gvt Inc Ret | DMS New Zealand Bill TR |
| South Africa | 1971 USD<br>1970 Local | 1970 | 1970–1992 DMS South Africa Equity<br>1993–2019 MSCI South Africa GR | IMF South Africa LT Gvt Inc Ret | DMS South Africa Bill TR |
| Spain | 1972 USD<br>1971 Local | 1970 | MSCI Spain GR | IMF Euro Area LT Gvt Inc Ret | DMS Spain Bill TR |
| Switzerland | 1970 | 1970 | MSCI Switzerland GR | IMF Switzerland LT Gvt Inc Ret | DMS Switzerland Bill TR |
| United Kingdom | 1900 | 1900 | 1900–1969 DMS United Kingdom Equity<br>1970–2019 MSCI United Kingdom GR | 1900–1969 Bank of England "Gilt" Redemption<br>Yields 1970–2019 IMF U.K. LT Gvt Inc Ret | DMS UK Bill TR |
| United States | 1926 | 1926 | S&P 500 TR (IA Extended) | IA SBBI U.S. LT Gvt IR | IA SBBI U.S. 30 Day Tbill |

## How to Use the International ERP Tables

The previous Morningstar/Ibbotson *International Equity Risk Premium Report* included large "wedge" tables in which historical ERP estimates were calculated over all possible start-year and end-year combinations (e.g., ERPs calculated over the time horizon 1970–2020, 1984 1995, or 1976–1977). While this presentation was complete, one could argue that ERPs calculated over many of these possible time horizons are extraneous, and not very informative.

For this reason, the historical ERP estimates presented include all possible estimates calculated over the (i) longest period available, and then (ii) beginning in years divisible by 5, and finally (iii) the most recent completed calendar year.

For example, Germany has equity return and risk-free rate data available starting in 1970, and so 1970–2020 is the longest period available (see Exhibit 3.3 on the next page). Then, the "starting years divisible by 5" are 1975, 1980, etc. Finally, 2020 is the "most recent completed calendar year".

Like the previous Morningstar/Ibbotson *International Equity Risk Premium Report*, historical ERPs are calculated in USD and "local" currencies.

Using "Germany Long-Horizon Equity Risk Premia In Local Currency" (see Exhibit 3.3 on the next page), in example "A" the long-horizon historical ERP as measured over the period 1970 (the "start date") and 2020 (the "end date") is 5.1%. Alternatively, in example "B" the long-horizon historical ERP as measured over the period 1980 (the "start date") and 1987 (the "end date") is 8.0%.[31]

Note that the example shown in Exhibit 3.3 is Germany long-horizon ERP, as calculated in local currency. In the case of Germany, the "local" currency is the Euro, as reported in Exhibit 3.1.

[31] All values are presented in percent format, rounded to one decimal place.

**Exhibit 3.3:** Using the Tables (examples using an abbreviated version)

## Germany Long-Horizon Equity Risk Premia

in Local Currency (Euro, "EUR")
in Percent

| | A | | | | B | | |
|---|---|---|---|---|---|---|---|
| | Start Date | | | | | | |
| End Date | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| 1970 | -31.7 | | | | | | |
| 1971 | -14.2 | 3.4 | | | | | |
| 1972 | -6.7 | 5.8 | 8.2 | | | | |
| 1973 | -12.1 | -5.5 | -10.0 | -28.2 | | | |
| 1974 | -10.8 | -5.5 | -8.5 | -16.8 | -5.4 | | |
| 1975 | -3.6 | 2.1 | 1.7 | -0.4 | 13.5 | 32.4 | |
| 1976 | -4.8 | -0.3 | -1.0 | -3.3 | 5.0 | 10.2 | -12.0 |
| 1977 | -3.5 | 0.5 | 0.1 | -1.5 | 5.1 | 8.6 | -3.3 |
| 1978 | -2.8 | 0.8 | 0.4 | -0.9 | 4.6 | 7.1 | -1.3 |
| 1979 | -4.1 | -1.1 | -1.6 | -3.0 | 1.2 | 2.5 | -5.0 |
| 1980 | -4.3 | -1.6 | -2.1 | -3.4 | 0.1 | 1.0 | -5.3 |
| 1981 | -4.5 | -2.0 | -2.6 | -3.8 | -0.7 | -0.1 | -5.5 |
| 1982 | -3.6 | -1.3 | -1.7 | -2.7 | 0.2 | 0.9 | -3.6 |
| 1983 | -0.9 | 1.5 | 1.3 | 0.7 | 3.6 | 4.6 | 1.1 |
| 1984 | -0.8 | 1.5 | 1.3 | 0.7 | 3.4 | 4.2 | 1.1 |
| 1985 | 4.2 | 6.5 | 6.8 | 6.7 | 9.6 | 10.9 | 8.8 |
| 1986 | 4.0 | 6.2 | 6.4 | 6.3 | 8.9 | 10.1 | 8.1 |
| 1987 | 1.3 | 3.2 | 3.2 | 2.9 | 5.1 | 5.9 | 3.7 |
| 1988 | 2.8 | 4.7 | 4.8 | 4.6 | 6.8 | 7.6 | 5.7 |
| // | | | | | | | |
| 2014 | 5.0 | 5.8 | 5.9 | 5.8 | 6.6 | 6.9 | 6.3 |
| 2015 | 5.1 | 5.9 | 5.9 | 5.9 | 6.7 | 7.0 | 6.4 |
| 2016 | 5.1 | 5.9 | 6.0 | 5.9 | 6.7 | 7.0 | 6.4 |
| 2017 | 5.3 | 6.0 | 6.1 | 6.0 | 6.8 | 7.1 | 6.5 |
| 2018 | 4.8 | 5.5 | 5.6 | 5.5 | 6.3 | 6.5 | 5.9 |
| 2019 | 5.2 | 5.9 | 6.0 | 5.9 | 6.7 | 6.9 | 6.4 |
| 2020 | 5.1 | 5.9 | 5.9 | 5.9 | 6.6 | 6.9 | 6.3 |

# Appendix 3A
# Additional Sources of International Equity Risk Premium Data

The Cost of Capital Navigator's International Cost of Capital Module at costofcapital.kroll.com includes historical equity risk premia (ERPs) estimates for 16 economies around the world, through December 2021.[1,2] The ERP values are calculated using the same general data sources and methodologies that were used to calculate the ERPs previously published in the Ibbotson Associates/Morningstar *International Equity Risk Premia Report*.[3]

For completeness, in Appendix 3A we briefly discuss additional sources of international ERP information.

### Dimson, Marsh, and Staunton Equity Risk Premia Data

Dimson, Marsh, and Staunton (DMS) studied the realized equity returns and equity premia relative to bonds for 21 countries (including the United States) from 1900 to the end of 2021.[4,5] In the 2022 edition of their annual study, DMS have expanded the equity risk premia coverage to an additional 14 markets, but for which data is only available starting in 1950s or later.[6] These authors report the following realized equity risk premia relative to the total return on long-term government bonds for a selection of countries and regions (returns for the three geographic regions are expressed in U.S. Dollars, from a global investor perspective), as illustrated in Exhibit 3A.1.

1 The ERPs for the 16 countries are calculated annually as of December 31 of each year. As of the date of publication, the most recent update was December 31, 2021.

2 "Premia" is the plural of premium. A single equity risk premium is denoted "ERP"; the plural equity risk premia is denoted "ERPs".

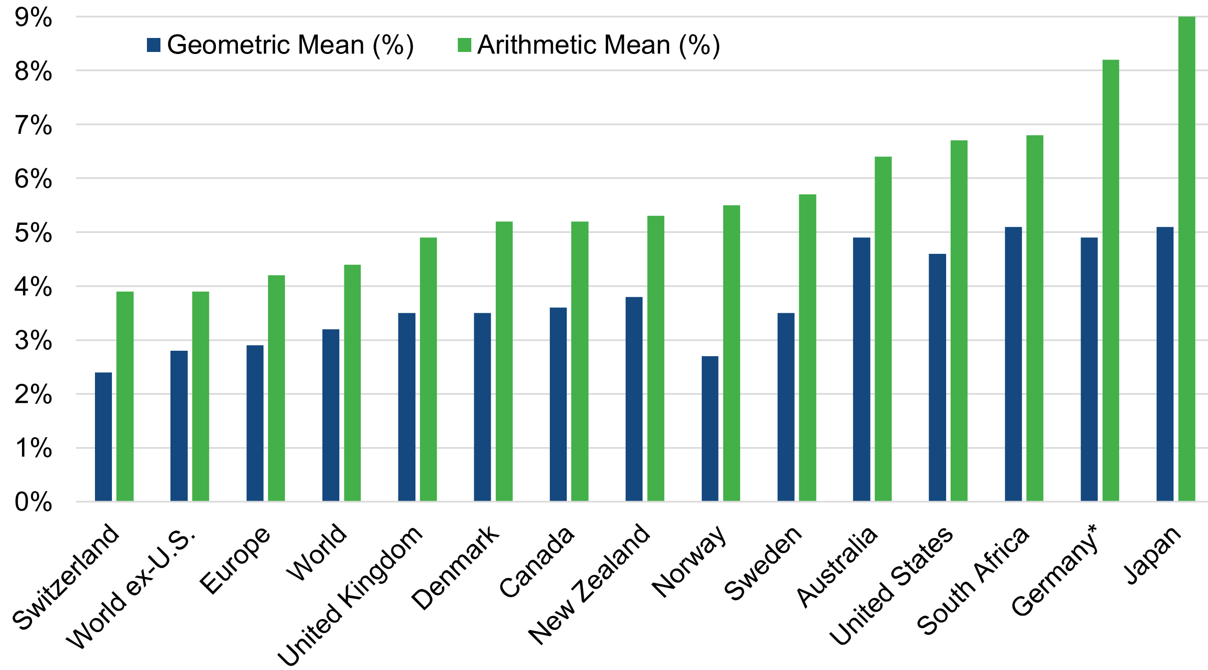
3 The Ibbotson Associates/Morningstar International *Equity Risk Premia Report* was discontinued in 2013.

4 The Dimson, Marsh, Staunton data are summarized in the *Credit Suisse Global Investment Returns Yearbook 2022* (Credit Suisse Research Institute, 2022) by Elroy Dimson, Paul Marsh, and Mike Staunton. Copyright © Elroy Dimson, Paul Marsh, and Mike Staunton. All rights reserved. Used with Permission. Elroy Dimson is Chairman of the Centre for Endowment Asset Management at Cambridge Judge Business School, Emeritus Professor of Finance at London Business School, and Chairman of the Academic Advisory Board and Policy Board of FTSE Russell. Paul Marsh is Emeritus Professor of Finance at London Business School. Mike Staunton is Director of the London Share Price Database, a research resource of London Business School, where he produces the London Business School Risk Measurement Service.

5 The *Credit Suisse Global Investment Returns Yearbook 2022* reports 122-year historical equity risk premia relative to (i) bills and (ii) bonds in Table 10 and Table 11 therein, respectively, for 21 countries and composite indexes for the World, the World ex-USA, Europe, Developed markets, and Emerging markets. The 21 countries for which ERPs are reported are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, United Kingdom, and the United States.

6 The additional markets include Argentina, Brazil, Chile, Mainland China, Hong Kong SAR, Taiwan, Greece, India, Malaysia, Mexico, Russia, Singapore, South Korea, and Thailand. The annual data coverage ranges from 45 to 71 years, depending on the market.

**Exhibit 3A.1:** Dimson, Marsh, and Staunton Equity Risk Premia Relative to Bonds 1900–2021




*Germany based on 120 years, excluding 1922–1923.

Source of underlying data: *Credit Suisse Global Investment Returns Yearbook 2022* (Credit Suisse Research Institute, 2022) by Elroy Dimson, Paul Marsh, and Mike Staunton. Copyright © Elroy Dimson, Paul Marsh, and Mike Staunton.

Dimson, Marsh, and Staunton observe larger equity returns earned in the second half of the twentieth century than in the first half due to (i) major / global wars being averted, (ii) corporate cash flows growing faster than investors anticipated (fueled by rapid technological change and unprecedented growth in productivity and efficiency), (iii) transaction and monitoring costs falling (i.e., improved governance) over the course of the century, and (iv) required rates of return on equity declining because of diminished business and investment risks.

The authors conclude that:

- The nearly 9% annualized real return on the world equity index from 1950 to 1999 (or the approximately 7% from 1950–2021) almost certainly exceeded expectations and more than compensated for the poor first half of the 20th century when the annualized real return was just short of 3%;

- Prior to 1950, dividend growth was only positive for three countries (Australia, New Zealand, and the U.S.), in real terms. In contrast, from 1950 to 2021 real dividend growth was positive for 19 of the 21 countries reported (the exceptions were Italy and New Zealand). However, the healthy real dividend growth on the world index post-1950 relied heavily on the contribution of the U.S. market. The authors argue that the positive 1900–2021 average real dividend growth was partly due to "good luck" observed in the post-

1950 years, which far outweighed the “bad luck” seen in the first half of the century, and this trend should not be expected to continue in the future. Alternatively, they argue that the expected dividend yield should be lower than in the past, if one assumes the same (or a higher) real growth rate in dividends. The authors conclude that a dividend yield similar to the 1900–2021 historical average, combined with a real dividend growth rate in excess of 2.1% per year (similar to the post-1950 level) is unlikely.

- The observed increase in the overall price-to-dividend ratio during the past century is attributable to the long-term decrease in the required risk premium. Equity risk became more diversifiable as diversified funds and new industries came into existence, while liquidity (accompanied by a decline in transaction costs) and risk management improved. These developments have likely reduced the required equity premium, but the resulting increase in realized equity returns does not signal an increase in the required ERP going forward. In addition, a further increase in stock prices due to declining barriers to diversification is not a repeatable phenomenon and the price-to-dividend ratio re-rating (i.e., an expansion in this valuation multiple) is not likely to continue into the future.

Dimson, Marsh, and Staunton conclude that downward adjustment to real growth in dividends in the future compared to history is likely and the realized risk premia due to the increase in price-to-dividend ratio are warranted.[7] One can estimate a range of likely forward-looking ERP estimates by adjusting the historical data via (i) a reduction in the expected real growth rate in dividends or (ii) by removing the increase in the price-to-dividend ratio, while keeping the same expected real growth rate in dividends.

### Pablo Fernandez Equity Risk Premia and Risk-free Rate Surveys

Professor Pablo Fernandez and his co-authors survey “finance and economics professors, analysts and managers,” asking them what risk-free rate and ERP they are using to “calculate the required return to equity in different countries” (the “Fernandez survey”).[8,9]

In May 2022, Professor Fernandez and his co-authors sent an email to more than 15,000 finance and economics professors, analysts, and managers of companies. By May 23rd he had received 1,624 email responses for ERPs and/or risk-free rates used in 2022.[10] This year’s study by Professor Fernandez and his colleagues focused on ERP *and* risk-free rates for 95 countries.

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7 See discussion in Elroy Dimson, Paul Marsh, and Mike Staunton, *Credit Suisse Global Investment Returns Yearbook* 2022: Chapter 5, “Projected Returns”; pages 61-62.

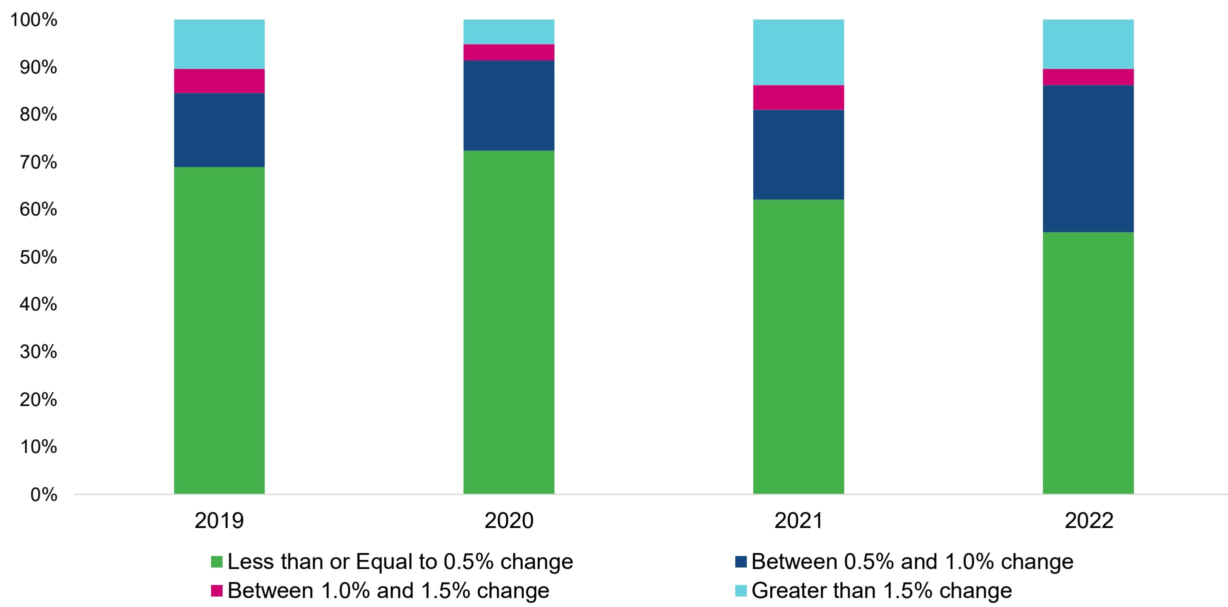
8 Pablo Fernandez is professor in the Department of Financial Management at IESE, the graduate business school of the University of Navarra, Spain, and holder of IESE’s Corporate Finance Chair. He is also visiting professor at the Piura (Peru), INALDE (Colombia), IAE (Argentina), IEEM (Uruguay) and IPADE (Mexico) Business Schools.

9 Fernandez, Pablo and de Apellániz, Eduardo and F. Acín, Javier, Survey: “Market Risk Premium and Risk-Free Rate used for 95 countries in 2022” (June 1, 2022). Available at SSRN: https://ssrn.com/abstract=3803990 or at https://dx.doi.org/10.2139/ssrn.3861152.”

10 In the 2022 survey there were 1,624 respondent emails received, with 167 of those coming from respondents who said they do not use ERP for one reason or another, leaving 1,457 (1,624 – 167) total respondent emails that included ERP and/or risk-free rate figures. Of the remaining emails, the survey authors excluded the following answers for the reasons listed: 96 because they were considered outliers (i.e., ERP estimate was below 2%), 47 because they were considered confidential, and 11 because the

Exhibit 3A.2 presents the year-to-year changes in the median ERP of each individual country/region, grouped by magnitude of annual changes in survey responses. As can be observed herein, ERP estimates from survey responses are generally stable from one year to the next. Over the last four years, on average 65% of countries and regions saw ERP changes of less than 0.5% in magnitude (the green bars), while 86% saw changes of less than 1.0% (green and dark blue bars combined). Eight countries and regions have seen a change exceeding 1.5% in the last four years. Notably, the change in the median Argentina ERP has changed by more than 1.5% three times in the last four years, while the Pakistan ERP and Venezuela ERP estimate have changed by more than 1.5% in each of the last four years.

**Exhibit 3A.2:** Annual Change in the Median Equity Risk Premium (ERP) by Magnitude for the 58 Countries and Regions that Had Results Published in All of the Published Surveys for the Last Four Years (2019–2022)



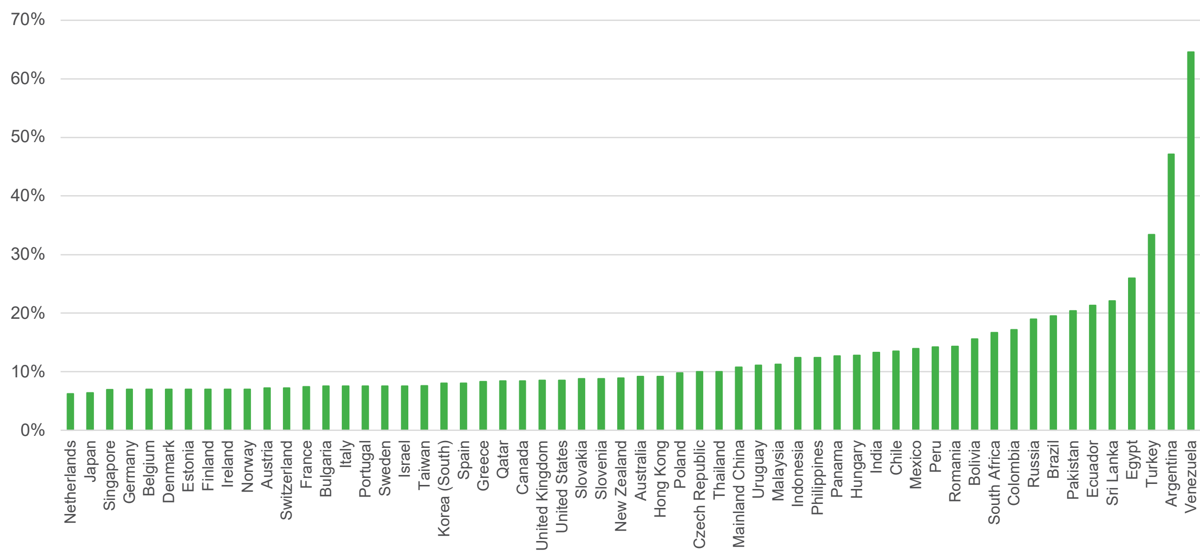

**Note:** The Fernandez survey publishes the "average" and "median" responses of survey participants, by country/region. The magnitude of ERP changes illustrated in Exhibit 3A.2 are calculated using the "median" survey responses for each country/region. The 58 countries and regions that had average and median ERP information reported in *each* of the last four years' surveys (2019–2022) and therefore could be used to calculate the annual changes in ERP estimates, as illustrated in Exhibit 3A.2, include: Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, Mainland China, Hong Kong SAR, Taiwan, Colombia, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, South Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom, Uruguay, United States, and Venezuela.

answer only provided either a risk-free rate or an ERP estimate (but not both). This left a universe of 4,337 answers that were used to calculate the survey statistics (i.e., some respondents provided risk-free rate and ERP estimates for multiple countries).

Of note, the 2020 Survey was conducted between February and mid-March and did not reflect the full impact of the COVID-19 crisis. COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020.[11] The 2020 survey incorporated responses captured through March 23, 2020 but only a little over 50 out of 1,946 survey respondents (or approximately 3%) considered the effect of COVID-19. Therefore, it is not surprising that at that time no major changes were reported in ERPs by survey participants. In 2022, as result of inflationary pressures and Russia's war on Ukraine, we can actually observe a relatively larger change on ERPs. Russia saw the largest increased in median ERP, after Argentina.

A takeaway from Exhibit 3A.2 is that, generally, the ERP estimates reported by participants of the Fernandez survey do not vary greatly from year to year (at least in the four years of aggregate survey data for the 58 countries and regions shown here).

**Exhibit 3A.3:** Comparison of the Median "Country/Region-Level Base Cost of Equity Capital" in Local Currency in the 2022 Survey for the 58 Countries and Regions that Had Results in the Surveys Published in *Each* of the Last Four Years (2019–2022).




**Note:** For each country/region, the Fernandez survey publishes the "average" and "median" responses of survey participants for the risk-free rate ($R_f$), ERP and required return to equity (calculated as the sum of Rf and ERP) being used in each year. The median of each country/region's required return to equity as reported in the 2022 survey was used as the base cost of equity capital for each of the countries/regions shown. The 58 countries and regions shown in Exhibit 3A.3 are the same 58 included in Exhibit 3A.2.

[11] "WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020", World Health Organization, March 11, 2020. Available here: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

In Exhibit 3A.3, the country/region-level base cost of equity capital is shown for the same 58 countries and regions analyzed in Exhibit 3A.2. The "country/region-level base cost of equity capital" is based on the median cost of equity reported for each country/region in the 2022 survey. The survey defines cost of equity as the required return to equity, which was calculated as the sum of the risk-free rate and ERP submitted by each survey respondent (i.e., it assumes a market beta of 1.0) and then aggregated for each respective country/region in the survey.

There is a significant variance in country/region-level base cost of equity capital as reported in the 2022 survey for the countries and regions included in Exhibit 3A.3. The country/region with the *lowest* median cost of equity capital is the Netherlands (6.2%), and the country/region with the *highest* median cost of equity capital is Venezuela (64.6%). These large variations between countries and regions can be partly explained by expected inflation differentials and different country/region risk perceptions.

A caveat to the results of this survey is that it is not completely clear (i) in which currency the risk-free rate and ERP estimates are being provided, and (ii) whether estimates are provided in real or nominal terms. A case in point is Venezuela, which has suffered of hyperinflation for several years. According to some estimates, annual inflation in Venezuela has exceeded 2,000%, and is now exceeding 300%, which is inconsistent with a local currency estimate for cost of equity capital of 66.7%.[12,13] Given the discrepancy in these indications and the fact that a local currency estimate would generally reflect inflation expectations, it is possible that some of these survey estimates are being provided in U.S. dollars instead (or some other currency).

12 See for example Reuters calculations of an annual inflation rate of 2,719% for Venezuela, as of May 2021. Source: "Venezuela monthly inflation hits 28.5% in May, central bank says", Reuters, June 16, 2021. Accessible here: https://www.reuters.com/article/venezuela-inflation/venezuela-monthly-inflation-hits-28-5-in-may-central-bank-says-idUSL2N2NY2I5.

13 A more recent estimate points to inflation exceeding 300%, much lower than in recent years, but still in hyperinflation territory. Source "Inflation Soars Over 300% in Venezuela in Blow to Maduro Rebound", Bloomberg, November 1, 2022. Accessible here: https://www.bloomberg.com/news/articles/2022-11-01/inflation-soars-over-300-in-venezuela-in-blow-to-maduro-rebound?sref=SfSK7hYQ.

# Appendix 3B
# Guidelines for Selecting Risk-Free Rate and Equity Risk Premium – Australia

In Appendix 3B thoughts and guidelines are provided for selecting an Australian risk-free rate and equity risk premium (ERP) assumption when estimating the cost of equity using the capital asset pricing model (CAPM).[1,2] The content and analysis in Appendix 3B was developed in collaboration with Dr. Steven Bishop, who is renowned in Australia for his ERP research.[3]

Throughout this appendix, International Organization for Standardization (ISO) currency codes are used as a convention: AUD stands for Australian Dollars, while USD stands for U.S. Dollars.

### The Consistency Principle

An essential principle to adhere to when performing valuations using a discounted cash flow (DCF) method is the Consistency Principle. This principle provides guidance to ensure the discount rate and cash flow forecasts are in harmony. It assists in selecting a risk-free rate that is internally consistent with the ERP guidance provided.

Applying the Consistency Principle assists in ensuring consistency in matters such as:

- The definitions of cash flow used in forecasting and the discount rate. Examples of this include using a cost of equity to discount free cash flows to *equity* and using *a* weighted average cost of capital (WACC) to discount cash flows to the *firm*.

- Treating the tax advantage of debt only *once* (in either the projected cash flows or in the discount rate).[4]

- Matching the risk of the projected cash flows to the risk used in the discount rate.

- Matching the currency of the projections with the local discount rate.

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1 The term "equity risk premium" (ERP) is often interchangeably referred to as the "market risk premium" (MRP) or "equity market risk premium" (EMRP).

2 Some of the concepts in this section are generic in nature and applicable to the selection of a risk-free rate and ERP in other countries (in addition to Australia).

3 Dr. Steven Bishop is a Director of Education & Management Consulting Services Pty Ltd. His consulting specialties include cost of capital estimation, expert business valuations, implementation of value-based management and strategy consulting. He is an expert witness for regulatory hearings on the cost of capital for valuation compliance.

4 This concept applies similarly for dividend imputation tax benefits accruing to shareholders, thereby avoiding double taxation. This benefit should be captured either directly in the projected cash flows or in the discount rate.

- Matching nominal (real) cash flow forecasts with nominal (real) discount rates.[5] A related consideration is the interaction of the growth rate used in cash flow forecasts – particularly for continuing (or terminal) value estimation – and the growth rate implied in the risk-free assumption used in the discount rate.

This chapter draws on application of the last item when thinking about inflation and growth and selection of a risk-free rate. It then provides commentary about selecting an ERP in Australia.

As a reminder, any cost of capital estimate (cost of equity capital, cost of debt capital, and weighted average cost of capital) should be:

- The current expected cost of raising capital over the duration of an investment's expected life.

- An opportunity cost (i.e., the minimum return investors require from an alternative investment with equivalent risk).

- Forward-looking: the cost of capital (like valuation itself) is based on investors' expectations of what will happen in the *future*.[6]

Of the three key inputs to the CAPM equation (the risk-free rate, the beta, and the ERP), only the risk-free rate is observable as a current, forward-looking opportunity cost.[7] However, there are some concerns about using current spot risk-free rates without further adjustments, given their recent abnormally low levels. The beta and the ERP have to be estimated, typically by using historical data as an input or a starting point. [8]

The estimation of a forward-looking ERP is subject to debate since there is no universally accepted view as to how to derive such a forward-looking ERP. This may well explain the reliance of many valuation professionals on historical averages instead. However, there is no reason to expect the ERP to be stable – it will change with the level of risk and investors' attitudes toward risk.[9]

---

5 This concept applies similarly to considerations of the growth rate used in cash flow forecasts and in the discount rate – particularly for continuing (or terminal) value estimation.

6 Just as the cost of capital itself is forward-looking, it follows that all inputs (e.g., the risk-free rate, the beta, the ERP, etc.) used in the development of cost of capital estimates must *also* be forward-looking.

7 It is not unusual for additional adjustments to be made to the CAPM. For example, a size premium is often used to adjust for the differences in the risks (and expected returns) of small versus large companies (i.e., as size *decreases*, risks and returns tend to *increase*, and vice versa). The application of a size premium is not universal (e.g., in the United States it is common; in Germany it is not).

8 Because there is a range of views on the subject, it is important to note that these guidelines reflect the view of Dr. Steve Bishop. Others may have a different view.

9 See for example, Antti Ilmanen, "Time Variation in the Equity Risk Premium," in Rethinking the Equity Risk Premium, ed. P. Brett Hammond, Jr., Martin L. Leibowitz, and Lawrence B. Siegel (The Research Foundation of CFA Institute, 2011).

## Important Caveat

While these suggested guidelines relate primarily to selecting a risk-free rate and an ERP, which are both important inputs to business valuations, it is even more critical to carefully link cash flow forecasts to the strategic position of the business (i.e., how the current industry and the competitive position of the business is expected to evolve over time). This includes careful examination of the evolution of economic profit and its drivers. A business will create value (i.e., earn economic profit above its cost of capital), if it has a competitive advantage and/or is operating in an attractive market. So, linking this strategic analysis with the valuation of the business provides an essential reasonability test of forecasts and the valuation outcome.

## Risk-Free Rate

The risk-free rate is a key input in the CAPM model. In Australia, the yield on 10-year Commonwealth Government Bonds (CGBs) issued by the Australian government is generally used as a proxy for the risk-free rate in the CAPM equation and to calculate historical ERPs. However, in line with the Consistency Principle, when alternative ERP estimates are used, it is imperative to use a risk-free that would match these alternative measures. This includes, for example, using a maturity for the risk-free security that is similar to the one used to calculate historical ERPs.

Sovereign yields in many developed countries, including Australia, have reached (or have been near) historical lows in recent times. However, yields have been increasing since mid-2021 and during the first half of 2022 due to significant inflationary pressures and a reversal in major central bank policies in an attempt to bring inflation under control. Prior to this recent interest rate reversal, the academic and investment communities have been trying to explain the secular decline in global interest rates, but diverge on the exact reason. One of the several explanations put forward is the scarcity of safe assets (i.e., government bonds of developed countries considered “safe” or “risk-free” by investors) leading to a misalignment in demand and supply.[10]

Exhibit 3B.1 shows the yield of both nominal and inflation-indexed 10-year CGBs since July 1986. This exhibit also shows the “breakeven inflation”, (i.e., the expected inflation implicit in the difference between nominal and inflation-indexed (i.e., real) yields).[11]

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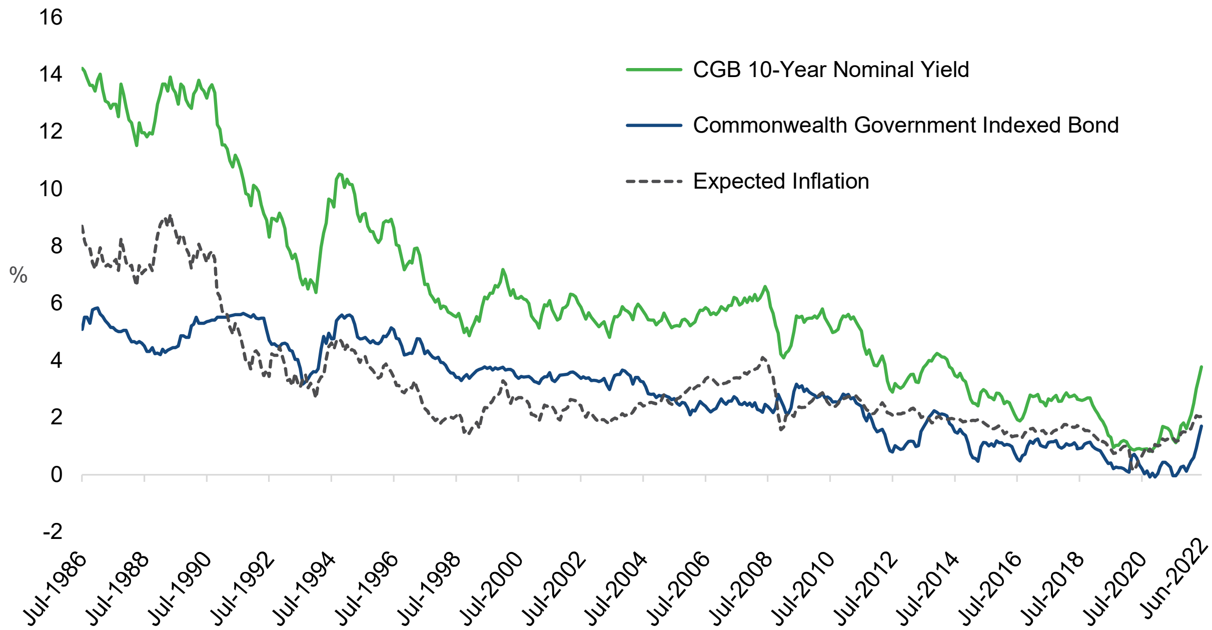
[10] Caballero, R.J., Farhi, E. and Gourinchas, P.O., 2017. The safe assets shortage conundrum. *Journal of Economic Perspectives*, *31*(3), pp.29-46.

[11] Breakeven inflation is a measure of market expected inflation calculated as the difference between nominal and inflation-indexed government securities. It is sometimes referred to as market implied inflation or market expected inflation. For more details, please refer to: Moore, Angus “Measures of Inflation Expectations in Australia.”, Reserve Bank of Australia, Bulletin – December Quarter 2016. A copy can be found here: https://www.rba.gov.au/publications/bulletin/2016/dec/3.html.

**Exhibit 3B.1:** Nominal Yields and Inflation-Indexed (i.e., Real) Yields on 10-year Commonwealth Government Bonds (CGBs), and the Breakeven Inflation Rate (July 1986–June 2022)




**Source of underlying data:** Reserve Bank of Australia

Until December 2020, all three series in Exhibit 3B.1 show a clear downward trend. For instance, during the last six months of 2020, the yield on 10-year CGB and inflation-indexed 10-year CGB reached their lowest levels in over three decades, to end the year at 0.98% and –0.08% respectively. Using a breakeven inflation measure at year-end 2020 implied an annualized average expected inflation of approximately 1.06% over the next 10 years. The combination of investors' flight to quality and central bank interventions, particularly during the height of the COVID-19 crisis, contributed to the record low yields observed during 2020.

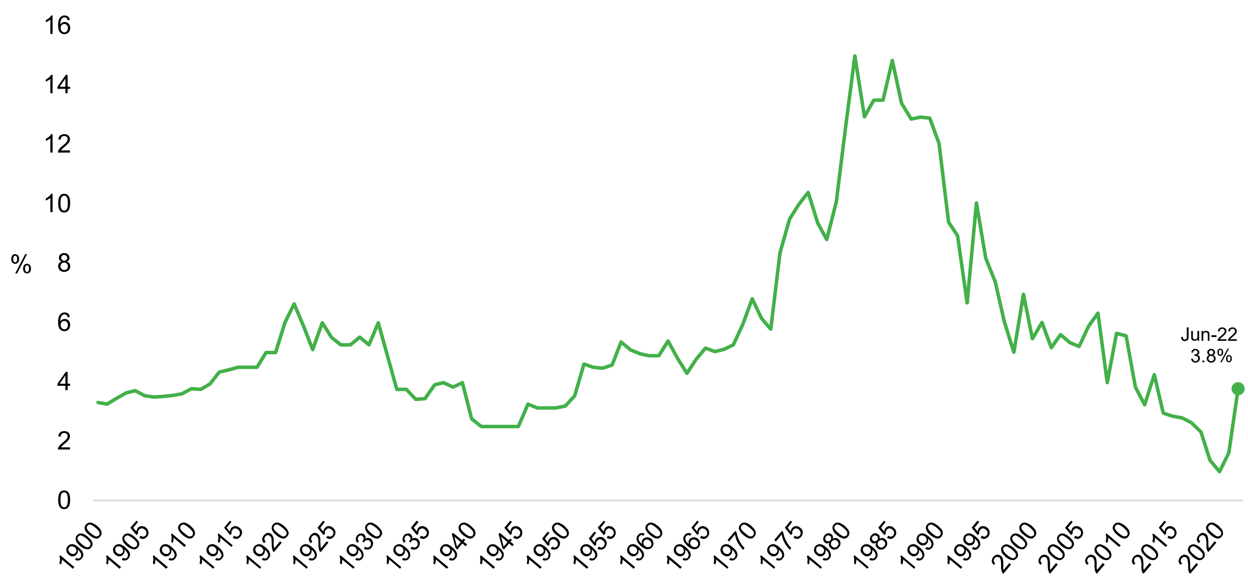
As mentioned earlier, yields reversed their downward trend starting in 2021 and throughout the first half of 2022 driven by a surge in inflation globally, which has led to a change in Australia's central bank's monetary policy, a move that mirrored that of other major central banks. Yields on CGBs have risen, reflecting increases in both expected inflation and real yields. As noted by the Reserve Bank of Australia's in May 2022, energy and food-based prices have increased sharply following Russia's invasion of Ukraine, but prices were already rising due to higher global demand and persistent supply chain disruptions following the lifting of COVID-19 lockdowns.[12] China's policy of zero COVID-19 cases continued to add pressure to global supply chains. Labor shortages, primarily due to absenteeism related to COVID-19 illness, exacerbated by a reduction in immigration and short-term overseas worker-travelers, have created shortages across supply chains, particularly in agriculture and the services industry.

[12] The Reserve Bank of Australia (RBA) is Australia's central bank. For more details, see RBA's "Statement on Monetary Policy – May 2022". Available here: www.rba.gov.au/publications/smp/2022/may/

Long-term market-based inflation expectations, as measured by the 10-year breakeven inflation, began rising in 2022. By April 2022 breakeven inflation had risen to 2.06%, which was above the RBA inflation target range of 2.0% to 3.0%, the first time this happened since 2014. Annualized inflation for the quarter ending March 2022 reached 5.1%, climbing further to 6.1% for the quarter ended June 2020. According to RBA governor, Philip Lowe, inflation could peak at around 7.0% by the end of the year.[13] Australia's Treasurer, Jim Chalmers, expected the inflation peak to be even higher at 7.75%, which if reached would the highest level since 1990.[14] The concept of breakeven inflation and its value as a predictor of expected inflation is further discussed below.

In Exhibit 3B.2 nominal 10-year CGB yields are shown over a longer time horizon (1900–2022). Yields on Australian 10-year CGBs reached record lows in 2020 during the COVID-19 pandemic. By June 2022 yields had increased to 3.8% but were still below the long-term (1900−2022) average (5.6%).

**Exhibit 3B.2:** Yields on 10-year Commonwealth Government Bonds (CGBs) (1900–2022)




**Source of underlying data:** Reserve Bank of Australia

Yields on other maturities have also decreased over the last four decades. The relationship between long- and short-term yields can provide valuable information about the economy. It has been argued that the shape of the yield curve, which depicts the level of yields at different maturities at the same point in time, can indicate the market's future expectations about economic growth. As Campbell Harvey, Finance professor at Duke University explains when talking about the United States:[15]

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13 Interview with Philip Lowe, Governor – ABC, 7.30. Transcript available here: https://www.rba.gov.au/publications/podcast/gov-2022-06-14-abc-730-interview-transcript.html

14 "Ministerial Statement on the Economy", speech to Australia parliament by Treasurer Jim Chalmers, 28 July 2022. Available here: https://ministers.treasury.gov.au/ministers/jim-chalmers-2022/speeches/ministerial-statement-economy

15 Harvey C.H., "Forecasts of Economic Growth from the Bond and Stock Markets", *Financial Analysts Journal*, Vol 45, No. 5, Sept–Oct 1989.

> *"The intuition is straightforward. If a recession is expected next year, there is an incentive to sacrifice today to buy a one-year bond that pays off in the bad times. The demand for the bond will bid up its price and lower its yield. The theory implies that current real interest rates contain information about expected economic growth."*

Since the 1960's, all recessions in the U.S. were preceded by an inversion of the yield curve, but there is a debate about the ability of the yield curve to predict recessions in countries other than the U.S. Nevertheless, there are indications that the shape of the yield curve predicts, to some extent, future economic performance in other countries.[16]

In the case of Australia specifically, Piyadasa Edirisuriya, lecturer of Banking and Finance at Monash University in Australia, explores the predictive power of financial variables on economic growth and he states:[17]

> *"On the basis of our results, we conclude that most financial variables are suitable for predicting real economic activity. Among these variables are 10-year Treasury bonds and 90-day bank bills . . ."*

The level of steepness of the yield curve is typically measured by the difference between the 10-year and 2-year yields (although other measures are preferred by some). A positive number would indicate that the yield curve is upward sloping, and a negative number would indicate the inverse. Exhibit 3B.3 reports the difference between these two maturities from January 1996 to June 2022.

The yield curve inverted twice over the period shown in Exhibit 3B.3: (i) between August and September 2000, and (ii) between June 2006 and August 2008. However, until COVID-19 was declared a pandemic in March 2020, Australia had not experienced a technical recession since 1991.[18] Both of these yield curve inversions did, however, precede a decrease in economic activity. Professor Scott Sumner called these "mini" recessions because they only caused a moderate increase in the unemployment rate.[19]

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16 "Yield curves help predict economic growth across the rich world", July 27, 2019, www.economist.com.

17 Edirisuriya P., "The Predictive Power of Financial Variables: New Evidence in Australia', Australasian Accounting, *Business and Finance Journal*, Vol 9, Issue 1, 2015.

18 For a detailed discussion about one of the longest economic growth cycles among developed countries please visit: https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook46p/LastRecession.

19 The technical definition of a recession is two consecutive quarter with negative economic real growth. According to this definition, Australia did not experience a recession since 1991. Prof. Scott Sumner defines a "mini" recession as an increase of unemployment rate by 1%-2%. According to this definition, Australia experienced two mini recessions since 1991, one in 2001 and the second in 2008. For more details about the Australian "mini" recessions please visit: https://www.econlib.org/why-does-australia-have-mini-recessions/

**Exhibit 3B.3:** Yield Difference Between 10-Year and 2-Year Commonwealth Government Bonds (CGBs) (January 1996 to June 2022)


**Source of underlying data:** Reserve Bank of Australia

During the COVID-19 crisis the RBA lowered interest rates aggressively, introduced a quantitative easing (QE) program to support the economy for the first time in its history, and started targeting the 3-year CGB yield.[20] See additional details on pandemic related measures in the section below titled "Impact of COVID-19 on Risk-Free Rates". These central bank interventions had an impact on all maturities in the yield curve. Both the short and long end of the curve plunged, but at different paces leading to a widening of the difference between the 10- and 2-year maturities.[21]

20 For more details on the RBA intervention to support the economy, please visit: https://www.rba.gov.au/covid-19/

21 In March 2021, the 10-year CGB yield reached 1.69% whereas the 2-year yield was at 0.1%, indicating a difference of 159 basis points (b.p.), the highest spread since June 2009.

Despite these measures, Australian real gross domestic product (GDP) contracted during the first two quarters of 2020 by 0.3% and 6.8%, respectively.[22, 23] In the third and fourth quarters, real GDP recovered, expanding by 3.5% and 3.3%, respectively. Overall, the Australian economy contracted in real terms by 2.1% in 2020.[24]

As the economy began to recover, the widening spread between the 10- and 2-year maturities reversed and the difference in yields began to narrow. Global factors like supply chain disruptions, China's zero COVID-19 policy, the war on Ukraine and the resurgence in domestic demand led to a spike in inflation and inflation expectations, which in turn lead to higher yields. Inflation expectations have differed between the short and long term; yields at the short end of the curve have seen a much larger increase compared to the long end.[25] One possible reason for this diversion in yields might be that market participants and forecasters believe that the heightened levels of inflation are short-lived and will revert to pre-pandemic levels in the near to medium term. Another reason might be that the RBA abandoned its targeting of the 3-year yield in November of 2021, while raising its (short-term) policy rate at a rapid pace in its attempt to curb inflation. Short-term yields are more sensitive to changes in policy rates than long term yields. [26]

While the yield curve failed to predict Australia's 2020 recession (its first in 29 years), the contraction was of a very different nature and not driven by economic reasons. Rather, it was caused by external shocks to the economy: (i) the damages inflicted by lockdowns associated with the COVID-19 pandemic, and (ii) bushfires.[27]

The Australian economy continued to recover in 2021. By the end of the second quarter, real GDP was larger than what it had been at the end of 2019.[28] Delta variant outbreaks of COVID-19 and related lockdowns led to another real GDP contraction in September 2021, but the economy has been on a steady path to recovery since then. According to the RBA's monetary policy statement of May 2022, the Australian economy is expected to grow at 4.2% by the end of 2022.[29]

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22 Growth figures are subject to subsequent revisions. Source: "Australian National Accounts: National Income, Expenditure and Product – March 2022", Australia Bureau of Statistics, June, 1, 2022. See "Gross domestic product, chain volume measures, seasonally adjusted" table. Available here: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/mar-2022

23 Growth rates are expressed on a quarterly basis. In some countries (e.g., United States, Japan) real GDP quarterly growth statistics are annualized.

24 International Monetary Fund, "World Economic Outlook Update – Gloomy and More Uncertain", July 2022. Available here: https://www.imf.org/-/media/Files/Publications/WEO/2022/Update/July/English/text-en.ashx

25 Yields on 2-year CGBs increased from 0.14% at the end of June of 2021 to 3.29% the end of June 2022. Yields on 10-year CGBs increased from 1.52% at the end of June 2021 to 3.77% at the end of June 2022.

26 Reserve Bank of Australia, "Review of the Yield Target", June 21, 2022. Available here: https://www.rba.gov.au/monetary-policy/reviews/yield-target/index.html .

27 "Australia in first recession for nearly 30 years", BBC, September 2, 2020, accessed here: https://www.bbc.com/news/business-53994318.[28] At the end of the first quarter of 2021, the quarterly real GDP was AUD 511 billion compared to AUD 505 billion at the end of the last quarter of 2019. Figures subject to subsequent revisions. Source: "Australian National Accounts: National Income, Expenditure and Product – March 2022", Australian Bureau of Statistics, June, 1, 2022.

28 At the end of the first quarter of 2021, the quarterly real GDP was AUD 511 billion compared to AUD 505 billion at the end of the last quarter of 2019. Figures subject to subsequent revisions. Source: "Australian National Accounts: National Income, Expenditure and Product – March 2022", Australian Bureau of Statistics, June, 1, 2022.

29 Reserve Bank of Australia, "Statement on Monetary Policy – May 2022". Available here: www.rba.gov.au/publications/smp/2022/may/

The Consistency Principle would suggest that the market view of both expected inflation and economic growth implicit in current CGB yields should be taken into account when building cash flow forecasts for DCF valuations, especially when estimating the continuing (terminal) value – otherwise there can be a mismatch resulting in flawed valuations. For instance, if the spot 10-year CGB at end of June 2022, 3.7% is used as the risk-free rate input in the CAPM equation, then the real yield of 1.7% as of the same date would imply an expected inflation over the next 10 years of 2.0%.[30] These yields can influence the view of expected inflation and economic growth for the "average" company.

A valuation professional may use different growth rates in the discrete forecast period to reflect the particular circumstances of the entity being valued and the industry in which it operates, but such rates are less appropriate to use in the terminal (or continuing) value estimate. In fact, there are arguments that the projected growth rate used in the terminal year should be *less* than the rate for the overall economy since few companies last forever in their current form – the attrition rate is high, with an average lifespan of listed companies being around 20 years, according to some estimates.[31] Of course, these estimates capture not just companies that have truly failed (i.e., filed for bankruptcy), but also those that have merged, were acquired by other companies, or went private.

In addition, some will argue (e.g., William Bernstein and Robert Arnott) that new enterprises are the key drivers of economic growth, but they do *not* contribute to the growth of existing companies (i.e., earnings growth of existing publicly traded companies). Under this argument, it follows that the long-term growth of projected cash flows should be less than the projected growth of the overall economy.[32] Ultimately, particular circumstances need to be carefully considered if the valuation professional moves away from the overall market view.

## Alternative Sources of Risk-Free Rates

Given the abnormally low but rising nominal yields shown in Exhibit 3B.1, some valuation professionals consider using alternative risk-free measures to reflect a different view of a forward-looking estimate of the risk-free rate. In this section two of these alternatives are discussed: long-term averaging, and the build-up method. The first alternative assumes that interest rates revert to a long-term average; hence, taking a historical average of government bond yields could be a proxy for future yields. The second alternative relies on the "Fisher equation" and uses a projected real rate based on economic conditions (e.g., neutral or natural rate of interest) and expected inflation.

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30 The choice of an expected inflation rate of around 2% stems from the Australia breakeven inflation analysis at the end of June 2022, as described earlier.

31 See, for example, Mauboussin, Michael J., Dan Callahan, Darius Majd, "Corporate Longevity Index Turnover and Corporate Performance", Credit Suisse, February 7,2017. Available here: https://plus.credit-suisse.com/rpc4/ravDocView?docid=V6y0SB2AF-WEr1ce.

32 Bernstein, W. J., & Arnott, R. D. (2003). Earnings growth: The two percent dilution. *Financial Analysts Journal*, 59(5), 47-55.

For a number of years, KPMG Australia conducted a survey of valuation professionals in Australia. As part of the survey views were gathered on cost of capital inputs, among other key valuation assumptions. The surveys were sent to valuation professionals from a variety of organizations across Australia, including Australia's Big 4 accounting firms, leading corporates, investment banks, investment funds, prominent boutique firms, second-tier accounting firms and smaller practitioners.

The KPMG survey has been replaced by a similar survey, but now conducted by the Chartered Accountants Australia and New Zealand (CA ANZ). The second edition of the "CA ANZ Business Valuation Survey" was conducted in September 2021 and includes results from 68 respondents working in valuation-related disciplines across the public and corporate sector.[33] In the 2021 survey, 62% of valuation professionals surveyed reported that they used a risk-free rate between 1.0% and 1.9% for valuations as of June 30, 2021. The mid-point of this range was in line with the 10-year CGB yield of 1.5% at that valuation date. In other words, those professionals were relying on a rate close to the spot yield. Nevertheless, a third of respondents used much higher rates than the prevailing CGB yields at the time. According to the survey results, 24% of respondents were using a risk-free rate between 2.0% and 2.9%, while 9% relied on a risk-free rate between 3.0% and 3.9%. In the prior year's survey, when the spot 10-year CGB yield was heavily influenced by flights to quality and unconventional monetary policies used to support the economy after the outbreak of COVID-19, the great majority of respondents were using  risk-free rate higher than the spot yield of 0.9% as of June 30, 2020.[34,35] Fast forward to 2022, with interest rates rising significantly, the practice regarding the use of a risk-free rate different from the spot yield may change yet again.

33 "2021 Business Valuation Survey", Chartered Accountants Australia and New Zealand, prepared in September 2021 and released on November 30, 2021. A copy of the survey results can be accessed here: https://www.charteredaccountantsanz.com/news-and-analysis/news/2021-valuation-practice-survey.

34 Only 28% of survey respondents were using a risk-free rate between 0% and 1%. All others were using higher rates. See "2020 Business Valuation Practice Survey", Chartered Accountants Australia and New Zealand, prepared in August 2020. A copy of the survey results can be accessed here: https://www.charteredaccountantsanz.com/-/media/0fae9b79124f4888ae6c69a1226f39a2.ashx.

35 If the valuation professional does not accept the spot yield on CGBs as being a market rate, then there may be a challenge in using a historical ERP which uses market rates for its estimation. Further, another challenging issue is defining the relationship between the risk-free rate and the expected return on the market or, put in another way, does the expected ERP change with changes in the risk-free rate? It may not. If the ERP is a function of the level of risk and attitudes to risk, then the risk-free rate may not impact the ERP. A different view on inflation and growth implicit in the risk-free rate should also impact the view of the expected market return – so both may change without affecting the difference (i.e., the ERP).

If a valuation professional was of the view that the current spot yield was not a reflection of a sustainable long-term risk-free rate, either long-term averaging and/or the build-up method could be used to develop an alternative estimate. The choice of an alternative measure of risk-free rates implies that it is a better view of the market, which may be inconsistent with some accounting standards (e.g., impairment) that call for the use of a market-based rate.[36] Specifically, a rate that differs from the current spot rate implies a different view of expected inflation and/or expected economic growth than in the spot rate. Consequently, these views should also be considered and reflected in the cash flow forecasts.

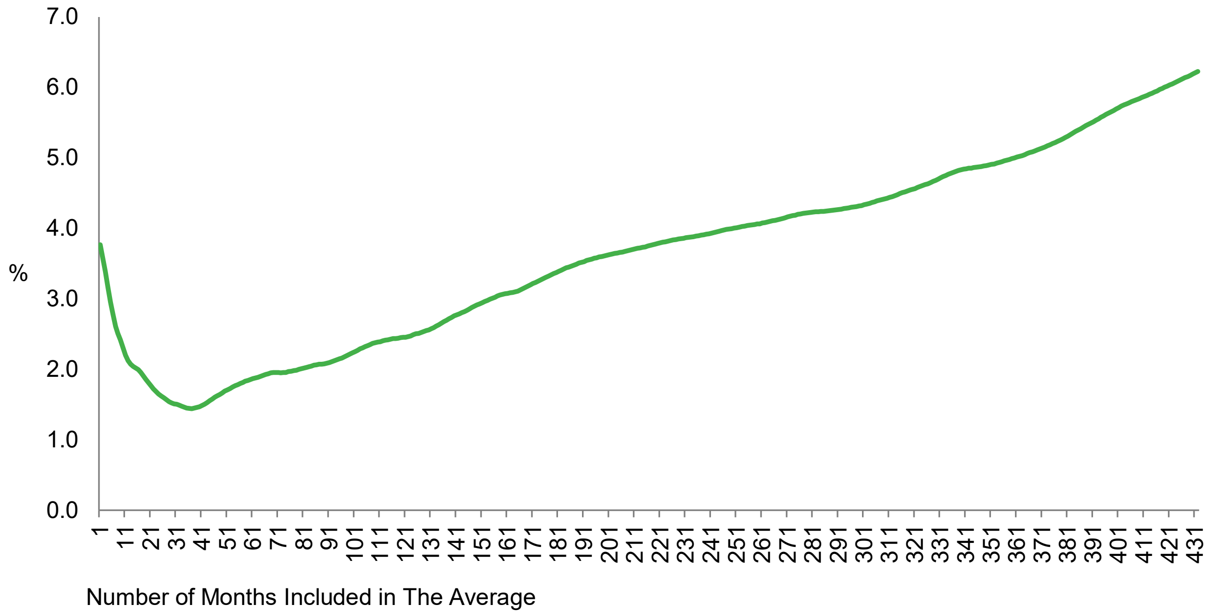
## Alternative 1: Averaging Spot Risk-Free Rates

A challenge when estimating an average risk-free rate is the selection of an averaging period for the computation. Exhibit 3B.4 and Exhibit 3B.5 illustrate two important issues on how the choice of the period can significantly alter the concluded average.

Exhibit 3B.4 illustrates how the average of monthly spot risk-free rates can change significantly depending on the length of the period over which the average is computed. The *leftmost* point in Exhibit 3B.4 is a single month's "average": the spot rate of 10-year CBGs at the end of June 2022. The *rightmost* point in Exhibit 3b.4 is the average monthly 10-year CBG yield over the whole sample, from July 1986 to December 2022 (432 months). Exhibit 3B.4 clearly demonstrates that the monthly average can vary significantly depending on the length of the averaging period.

[36] This is a function of how accounting standards are interpreted and typically applied in a given country and how different methodologies are accepted by auditors and other reviewers. For example, the use of a normalized risk-free rate in the context of goodwill impairment testing is accepted in the United States and various European countries. Conversely, local valuation practices in Germany do not generally accept the use of normalized risk-free rates.

**Exhibit 3B.4:** The Average 10-Year CBG Yield Can Vary Significantly Depending on the Length of the Averaging Period Selected



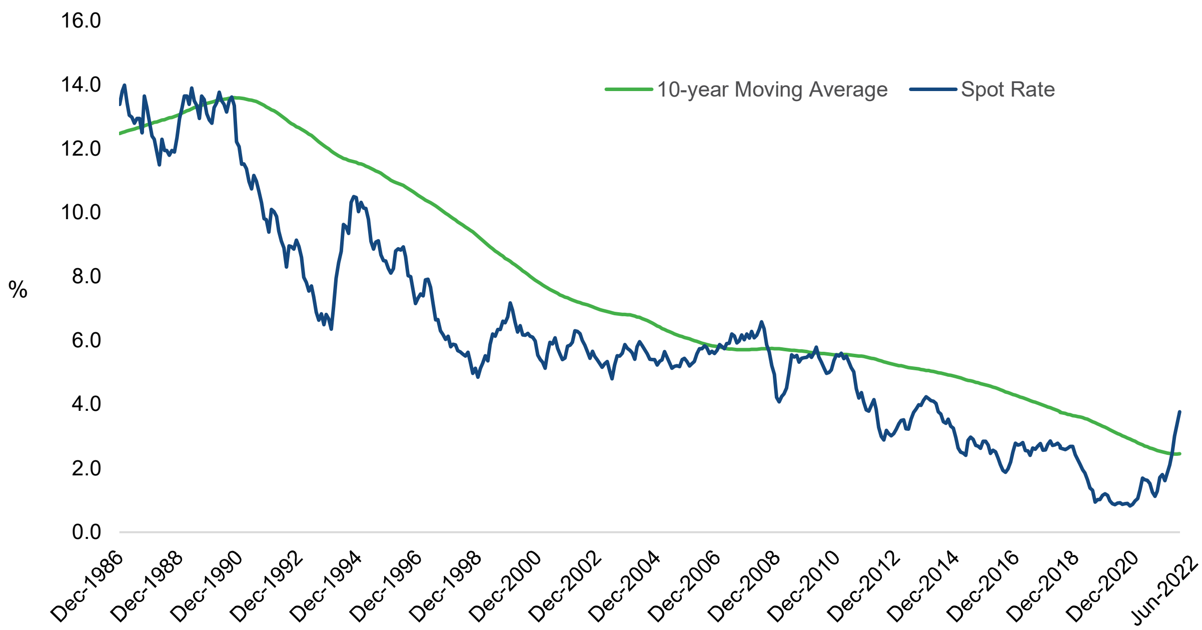

**Source of underlying data:** Reserve Bank of Australia

The whole premise behind averaging is to find a forecast to which future data is expected to converge. However, average 10-Year CBG Yields did not stabilize as the averaging period was extended in Exhibit 3B.4. This could lead to very different risk-free rate assumptions depending on the length of time over which an analyst decides to calculate an average. For example, as of June 2022 Analyst "A" could select a 10-year averaging period, and Analyst "B" could select a 20-year averaging period, implying a 2.5% risk-free rate and 3.9% risk-free rate, respectively. The concluded risk-free rate would have been even higher (6.2%) if the average is calculated over the entire sample period of 36 years.

Taking an average over the whole sample period can also be misleading, especially since interest rates in the 1980's and 1990's are quite dissimilar to the current inflation and interest rate environment (see Exhibit 3B.1). Analysts often use long-term averages of 10 years, although other averaging periods are also considered. Exhibit 3B.5 shows the trend over the last few decades in the 10-year moving average of 10-year CBG yields, juxtaposed with the corresponding spot yields.[37] The leftmost data point in Exhibit 3B.5 is the 120-month average CBG 10-year yield from January 1977 to December 1986; the rightmost data point is the 120-month average CBG 10-year yield from July 2012 to June 2022.

[37] Even the choice of a 10-year moving average is arbitrary, but it does provide a useful reference.

**Exhibit 3B.5:** The 10-Year CBG Spot Yield and its Corresponding 10-year Moving Average (December 1986–June 2022)




**Source of underlying data:** Reserve Bank of Australia

Over most of the December 1986−June 2022 period in Exhibit 3B.5, the 10-year moving average was generally higher than the spot rate. This relationship persisted over most of the last decade because spot rates generally *fell* over this period.[38] Both the spot yield and the 10-year moving average have been trending downward since the end of the 1980's, with the spot only reverting to its average briefly around the global financial crisis of 2008 and 2009 ("Global Financial Crisis") and the Euro Sovereign Debt Crisis in the early 2010's. A more recent exception has been the period since December 2021 in which spot rates have risen significantly, and quickly. At the end of June 2022, the 10-year moving average yield on 10-year CGBs was 2.5%, whereas the spot rate was 3.7%.

The picture that arises from Exhibit 3B.4 and Exhibit 3B.5 raises legitimate questions about the ability of long-term averages to improve the forecast of Australian risk-free rates to use in valuation projects.

There are two additional challenges with using an average risk-free rate. First, if the current spot market rate is viewed as being artificially low, then logically there should also be times when market rates that are viewed as too high. If a non-market rate (e.g., an average) is perceived to be a better forecast than the market rate, then logic suggests the average rate should be used consistently in both "too high" and "too low" interest rate environments. By putting a floor on rate levels (but not a ceiling), a bias toward using higher rates may be created.

38 This relationship would be the opposite if rates had generally *risen* over the period.

A second challenge related to using an average rate is identifying the expected inflation embedded in the average rate, so that it can be internally consistent with inflation assumptions used to project cash flows, and thereby adhering to the Consistency Principle. Note that if relying on breakeven inflation rates as the proxy for historical inflation expectations, these can only be inferred from data starting in 1985 when inflation-indexed CGBs were introduced.

It may seem odd at first to be *using* a long-term average as an input in estimating a forward-looking ERP but *not* doing so for the risk-free rate. The difference is that observable market rates are available for forward-looking risk-free bonds (by design), but *no* equivalent observable is available for ERP estimates. If a valuation professional does not regard the spot risk-free rate as a suitable forward rate, there is a need to carefully consider whether the numerator in the DCF relationship should (i) reflect the expected inflation embedded in that average rate, and (ii) the growth rate used in cash flow forecasts is largely consistent with the average rate, particularly in the continuing (terminal) value calculation.

### Alternative 2: Build-up model (Fisher Equation)

Another alternative to a spot risk-free rate is a build-up model based on the Fisher equation. The following is simplified version of the Fisher equation:[39, 40]

*Nominal Risk-Free Rate = Real Risk-Free Rate + Expected Inflation*

### Real Risk-Free Rate

Real risk-free rates are often proxied by inflation-indexed bonds. Australia started issuing these bonds in 1985. As Exhibit 3.B1 shows, the real rates on these bonds have been decreasing in tandem with nominal yields since their introduction. As of June 30, 2022, the yield on 10-year inflation-indexed bonds was 1.7%. If the valuation professional believes that the market nominal risk-free rate is artificially low (or high), the same might apply to the market real risk-free rate.

Another proxy for the forward real rate is the neutral (or natural) rate, which usually refers to the interest rate that would prevail when the economy is at full employment and stable inflation. The neutral rate is not observable, but there are numerous models that are used to capture this rate. Bear in mind that the neutral rate is a short-term rate concept. The RBA considers its own estimate

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[39] This is a simplified version of the "Fisher equation", named after Irving Fisher. Fisher's "The Theory of Interest" was first published by Macmillan (New York), in 1930. The Fisher equation is formally expressed as (1 + Nominal Rate) = (1 + Real Rate) x (1 + Expected Inflation). When rates are low, there is very little difference between the simple form and the Fisher equation.

[40] Various academic research papers show that the decomposition of the nominal rate into a real rate and expected inflation should include an additional component excluded from the Fisher equation: the inflation risk premium. This premium reflects the risk that inflation may vary significantly from expected inflation. The sign of the premium may be positive or negative, depending on the direction of the unexpected movements in inflation. Note that if both the inflation risk premium and the variance of inflation surprises are negligible, then the Fisher equation holds precisely, as indicated in the following article: Sarte, Pierre-Daniel G., "Fisher's Equation and the Inflation Risk Premium in a Simple Endowment Economy", Federal Reserve Bank of Richmond, *Economic Quarterly,* Volume 84/4 Fall 1998. Subsequent academic literature corroborates these findings and attempts to quantify the magnitude of the inflation risk premium over time.

of the neutral rate when setting its policy interest rate (i.e., the target cash rate). In contrast, the risk-free rate used in the CAPM is usually a longer-term *nominal* rate (e.g., 10 years) and will normally attract a term premium. However, that term premium can be captured in the nominal risk-free rate by using long-term (rather than short-term) inflation expectations.

Rachael McCririck and Daniel Rees, researchers at the RBA, have studied and provided estimates for the Australian neutral rate (also called a natural rate of interest or an equilibrium real rate).[41] They define the neutral rate as follows:[42]

> *"…the real policy rate required to bring about full employment and stable inflation over the medium term."*

They *further clarified that:*

> *"The term 'neutral interest rate' sometimes refers to the real short-term interest rate that will bring about full employment at any point in time, given the presence of these transitory business cycle influences. On average, over a normal business cycle, this interest rate will coincide with the medium-run concept . . . but will exhibit greater volatility because it will also adjust in response to transitory economic developments."*

The RBA paper notes that because the neutral rate is not directly observable "we must infer its value from the behavior of market interest rates and other economic variables". The authors use two economic models to estimate the rate over time, noting that the rate was fairly stable around 3.5% from the early 1990s until 2007. By 2017 the estimate has declined to around 1.0%. The authors also compared these estimates with market-based expected short-term real interest rates as implied by yields on inflation-indexed government bonds. Financial market estimates of the neutral interest rate ranged between 0.5% to 1.5%, which was consistent with the authors' model-based estimates.

The authors attributed the decrease in neutral rate estimates primarily to a *decline* in potential growth and an *increase* in risk aversion. A separate research paper suggests that the decrease in neutral rate of an open small economy, like Australia, is due to external factors, mainly foreign output shocks.[43]

In their paper, McCririck and Rees stated that the RBA intended to update and monitor their estimates of the neutral rate on a regular basis, but these updates do not appear to be made public. RBA's researchers Rochelle Guttmann, Dana Lawson and Peter Rickards suggest that

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41 Daniel Rees is now Senior Economist in the Monetary and Economic Department, Macroeconomic Analysis of the Bank of International Settlements, Basel, Switzerland.

42 McCririck, Rachael., Daniel Rees, "The Neutral Interest Rate", *RBA Bulletin*, September Quarter 2017.

43 Zhang, R., Martínez-García, E., Wynne, M.A. and Grossman, V., 2021. Ties that bind: Estimating the natural rate of interest for small open economies. *Journal of International Money and Finance*, 113, p.102315.

the RBA estimate of the natural rate for Australia as of December 2019 is still hovering around 1% and has stayed at the same level since 2017.[44]

More recently, the minutes to the RBA Board meeting on July 5, 2022 discussed neutral rate estimates, noting that:[45]

> *"…The [RBA] staff apply a range of methods for estimating the neutral rate, each with its own advantages and disadvantages, and each method produces a different estimate. The range of estimates is wide.…[T]he neutral rate framework provides only a general guide and any specific estimates need to be treated with caution."*

No estimates of the neutral rate were provided during the meeting. However, it was noted that the cash rate was currently well below the lower range of estimates for the *nominal* neutral rate, which suggested further interest rate hikes were needed to get inflation back to the RBA's target.
Independently, the National Australia Bank estimated the natural interest rate for Australia using the Holston, Laubach and Williams (2017) model as of June 2021 and found that the rate was around 0.8%, which is close to RBA's own estimates of 1.0%.[46,47] Research from The Commonwealth Bank of Australia released in March 2022 estimated the neutral rate to have declined to -0.3%.[48]

In summary, while the body of research estimating the neutral (real) rate for Australia is relatively small, the estimates range from -0.3% to 1.0%, with a median of 0.9%.

## Expected Inflation

The second component of the Fisher equation is expected inflation. One important aspect that stems from the Consistency Principle is to ensure that the expected inflation is consistent with the inflation assumptions used to develop the cash flow projections. In the current discussion, the focus is on long-term inflation expectations, since a long perspective is appropriate when valuing a business into perpetuity (i.e., assuming a going concern).

Expected inflation can be estimated using different techniques. A common methodology uses market-based estimates to infer breakeven inflation estimates. Another methodology is based on surveys of economists to gather their views on what inflation will be in the future.

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44 Guttmann, R., Lawson, D. and Rickards, P., 2020. The Economic Effects of Low Interest Rates and Unconventional Monetary Policy Bulletin–September Quarter 2020. *Bulletin*, (September).

45 Reserve Bank of Australia, "Minutes of the Monetary Policy Meeting of the Reserve Bank Board", July 5, 2022, pp. 5-6. Available here: https://www.rba.gov.au/monetary-policy/rba-board-minutes/2022/2022-07-05.html

46 Holston, K., Laubach, T. and Williams, J.C., 2017. Measuring the natural rate of interest: International trends and determinants. *Journal of International Economics*, *108*, pp.S59-S75.

47 Nugent, T., 2021. What does monetary policy neutrality look like today? *Australia Markets Weekly*, National Australia Bank.

48 Wu, Stephen, "Australia's lower neutral cash rate means a shallow tightening cycle ahead", Economic Insights - Global Economic & Markets Research, March 2022, Commonwealth Bank of Australia. Available here: https://www.commbankresearch.com.au/sfc/servlet.shepherd/version/renditionDownload?versionId=0684y00000GyUV8AAN&rendition=ORIGINAL_PDF

Anecdotally, many Australian valuation professionals use the mid-point of the RBA's target inflation range (2.0%−3.0%) as their long-term inflation estimate for projected cash flows.[49] However, the 2.5% mid-point of the target range has exceeded the nominal yield on 10-year CGB in recent years. For example, as shown in Exhibit 3B.1, the nominal 10-year AGB yield at the end of June 2022 was 3.7%, while the yield on indexed bonds was 1.7% which means that financial markets were expecting a 10-year inflation rate of around 2.0% – lower than the 2.5% mid-point of the RBA range.

If a valuation professional were to use 2.5% as the expected inflation in cash flow projections (particularly, as the long- term growth rate assumption), then it would be appropriate to adjust the risk-free rate to ensure consistency between the numerator and denominator of the DCF equation for an average growth company. Using the median (neutral) real rate estimates from the academic papers cited above of 0.9% as a proxy for the expected real rate, the proposed alternative risk-free using the Fisher equation would be 3.4% (2.5% + 0.9%) as of June 30, 2022 – in this case close to the spot 10-year yield.

Australia was one of the first countries to adopt an explicit inflation targeting policy.[50] The RBA inflation target range was established in the early 1990s when the 10-year trailing average inflation was 8.1%.[51] After the RBA introduced the inflation targeting policy, inflation started a downward trend toward the central bank's target range.

However, over the last decade and up to 2021, inflation has been consistently *below* the mid-point RBA range except for the year 2012, and yet the target range was never revised downward. This raises a major question about the ability of the RBA's mid-point range to indicate the true expected inflation in Australia. It also casts doubt on the use of RBA's mid-point target range as the basis for Australia's expected inflation in DCF-based analyses.

An alternative methodology to estimate inflation also applies the Fisher equation but attempts to infer future inflation expectations from financial markets. By rearranging the Fisher equation, and using market-based data on nominal and real government bond yields with a similar maturity, a (simplified) breakeven inflation for Australia can be computed as follows:[52]

*Breakeven Inflation = 10-year CGB Yield – 10-year Australia Inflation Indexed Yield*

Exhibit 3B.6 shows that the breakeven inflation rate at the end of June 2022 was at 2.0% compared to the static RBA mid-point target range of 2.5%. Furthermore, since 2014 the

49 The RBA introduced the inflation target range in the early 1990's to help anchor the private sector inflation expectations. For more details, visit: https://www.rba.gov.au/inflation/inflation-target.html.

50 Dotsey, M., 2006. "A Review of Inflation Targeting in Developed Countries." *Federal Reserve Bank of Philadelphia Business Review*, 3, pp.10-20.

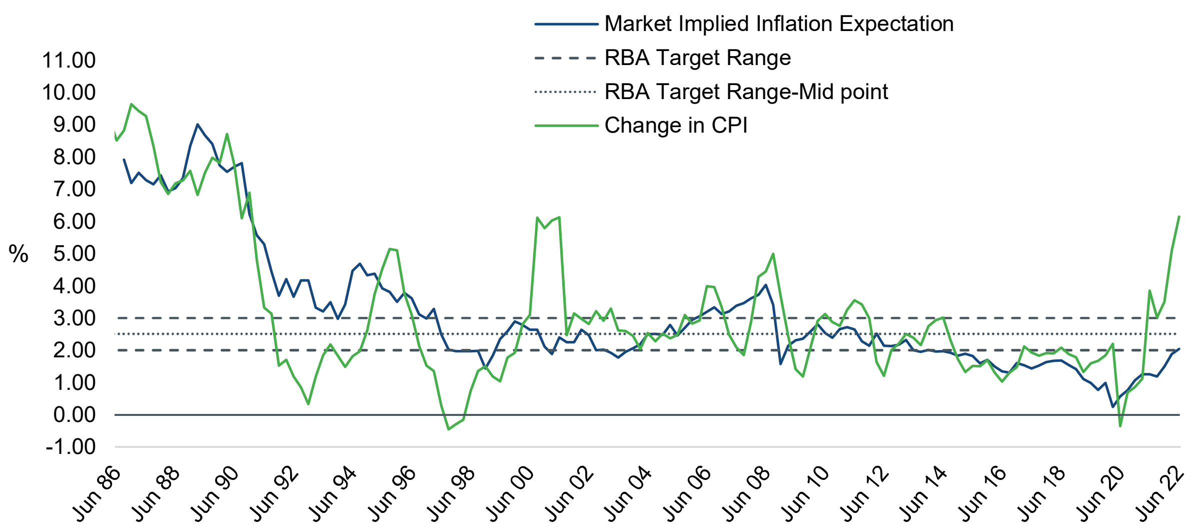
51 The average annual change in the Australia Consumer Price Index over the period 1981 and 1990 was 8.1%.

52 Also, refer to the following research highlighting the shortcomings of using breakeven inflation as an indication of long-term inflation: Bauer, Michael D., and Glenn D. Rudebusch (2015), "Optimal Policy and Market-Based Expectations", FRBSF Economic Letter 2015-12 (April 13); and Christensen, Jens H.E. and Jose A. Lopez (2016), "Differing Views on Long-Term Inflation Expectations", FRBSF Economic Letter 2016-11 (April 4).

breakeven inflation was consistently below 2.0%, the low end of the RBA target range, increasing only slightly above that level starting in April 2022.[53]

This large difference in estimates shows the impact that the choice of expected inflation would have on valuation analyses. For instance, using the median 0.9% real rate estimate (cited earlier) and the 2.0% breakeven inflation at the end of June 2022 would result in an adjusted risk-free rate for Australia of 2.9% (0.9% + 2.0%). A valuation professional should understand which method to estimate inflation expectations is a better predictor and more closely aligns with the true (realized) inflation.

**Exhibit 3B.6:** Inflation Breakeven Inflation and the RBA Inflation Target Range
(January 1986 – June 2022)




**Source of underlying data:** Reserve Bank of Australia (yields) and Australian Bureau of Statistics (Consumer Price Index)

Besides displaying the Australian breakeven inflation rates between March 1987 and June 2022 (quarterly), Exhibit 3B.6 also compares the annual change in Australia's Consumer Price Index (CPI) and the RBA's inflation target range over the time period from December 1993 to June 2022 (quarterly).[54]

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53 The breakeven inflation rate is calculated as the difference between nominal bond yields and the inflation indexed bond yields with the same maturity (in this case, 10 years). Using the formal (*geometric*) specification of the Fisher equation, the breakeven inflation is calculated as $i = \frac{1+3.77\%}{1-1.70\%} - 1 = 2.04\%$ at the end of June 2022. Note, the *simple* difference has been used in examples above.

54 While Exhibit 3B.6 displays the RBA "inflation target range" for the entire period since 1986 (for simplification), this approach commenced in the early 1990s. The earliest references to it were contained in speeches by the then Governor in August 1992 and March and August 1993. For more information visit: https://www.rba.gov.au/inflation/inflation-target.html.

There are three interesting observations from Exhibit 3B.6. First, the RBA inflation targeting policy has been very effective in anchoring inflation. Second, the breakeven inflation has tended to be a leading indicator of actual inflation. This shows some of the ability of financial markets to predict inflation. Third, both inflation and breakeven inflation started to trend downward after the Global Financial Crisis, and both have stayed below the RBA mid-range target until the quarter ended in June 2021. Given the surge in global energy and food prices, realized inflation in Australia spiked to 6.1% at the end of the second quarter of 2022, which is more than double the upper end of the target range. There is an ongoing debate about whether central banks will be able get the current levels of inflation under control in developed markets, but it seems that both financial markets (approximately 2.0%) and professional forecasters (approximately 2.8% – more details below) have long-term inflation estimates for Australia that are within the range of the 2.0% to 3.0% inflation target.[55]

The choice of a reliable method depends on the forecasting accuracy, which measures how close the forecast was to the actual inflation. Over the whole sample period, the RBA mid-range target rate had a lower forecasting error than breakeven inflation rates. However, during the post Global Financial Crisis period breakeven inflation forecasts provide a marginally better forecast over the short term.[56]

Nevertheless, several academic studies have noted that breakeven inflation is an imperfect measure of expected inflation because it ignores the presence of inflation risk premia in nominal yields (which can be negative or positive) and illiquidity premia common in inflation-indexed bonds. Inflation risks and illiquidity premia vary over time.[57, 58]

An alternative measure of expected inflation is to consider projections issued by economists and professional forecasters. Different private and public institutions provide their forecasts for different countries on a frequent basis. Some are publicly available, while others are only available through subscription services.

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55 Long-term inflation forecasts show that the long-term median inflation expectation is 2.8% as of June 2022. These estimates Source of inflation forecasts: Consensus Forecasts Asia Pacific, July 2022/April 2022; Economist Intelligent Unit, June 2022; IHS Markit-Comparative World Overview Tables June2022; IMF World Economic Outlook – April 2022; Oxford Economics Country Economic Forecast – Australia. June 2022; and PwC Global Economy Watch, June 2022.

56 The accuracy of both measures is evaluated using Root Mean Squared Error (RMSE). In simple terms, this technique measures the squared deviation between the forecasted parameter and the actual series. The *lower* the deviation, the *more* accurate the forecast. Over the whole period (1990–2020), the RMSE between the RBA mid-point range and the actual inflation was 1.25% compared to 1.50% between the 10-year breakeven inflation and the following year actual inflation. However, post Global Financial Crisis, the two RMSE numbers become 0.96% and 0.42% respectively, indicating that breakeven inflation forecasting error *decreased* compared to the RBA target mid-point. A caveat to this analysis is that technically the forecast errors should be computed by comparing a 10-year breakeven inflation to the actual average inflation rate realized over the ensuing ten years. Calculating the RMSEs by looking at next year's realized inflation is a simplification.

57 For an overview of this concept and a summary of academic literature addressing this issue in the United States, see for example Church, Jonathan, "Inflation expectations and inflation realities: a comparison of the Treasury Breakeven Inflation curve and the Consumer Price Index before, during, and after the Great Recession", *BLS Monthly Labor Review*, December 2019, available here: https://www.bls.gov/opub/mlr/2019/article/pdf/inflation-expectations-and-inflation-realities.pdf. Or review a more formal research paper by the same author: "Market-Based Inflation Expectations and Inflation Realities: A Comparison of the Treasury Breakeven Inflation (TBI) Rate Curve and the Consumer Price Index before, during, and after the Great Recession", BLS Working Paper 511, February 2019, available here: https://www.bls.gov/osmr/research-papers/2019/pdf/ec190010.pdf.

58 For a discussion in the context of Australia, see for example: (1) Mathysen, Hayden, "Best estimates of expected inflation: a comparative assessment of four methods", ACCC/AER Working Paper Series, Working Paper No. 11, October 2017 and (2) Australian Energy Regulator Discussion Paper, "Regulatory Treatment of Inflation", May 2020.

Economic forecasts depend on the institutions' forecasting models and their level of sophistication. There is a considerable level of uncertainty in long-term inflation and real GDP forecasts. Hence, it is advisable to use *multiple* sources to help minimize forecasting errors. Examples of reputable economic consulting firms include, but are not limited to, IHS Markit, Economist Intelligence Unit (EIU), Oxford Economics, and Consensus Economics. These firms provide regular forecasts of real GDP, inflation, and other annual growth rates that can be helpful in building cash flow projections. Other alternatives include projections issued by international organizations like the International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD).

In April 2022 the IMF released the semi-annual update to its World Economic Outlook. This report forecasted that Australia's consumer price inflation would reach 3.9% in 2022, 2.7% in 2023 and then 2.5% for 2024 to 2026, whereas real domestic product (GDP) was forecasted to be 4.2% in 2022 and decline to below 2.5% until 2026.[59] It is important to recognize that these forecasts did not reflect the full extent of the impact of the war in Ukraine and continued inflationary pressures on global markets.

The RBA does not provide long term forecasts of inflation, however the Governor's statement after the Monetary Policy Decision of July 5, 2022 forecasted inflation to peak at the end of 2022 then decline back to the 2% to 3% range in 2023.[60]

## Impact of COVID-19 on Risk-Free Rates

The outbreak of the novel coronavirus (COVID-19), a respiratory illness that was declared a pandemic by the World Health Organization on March 11, 2020, caused significant turmoil in global financial markets. Concerns about lack of liquidity in the financial system led to swift intervention by major central banks around the world, including in Australia. The RBA intervened to lower borrowing rates and to provide liquidity to financial markets.[61]

In an effort to support the Australian economy, the RBA lowered its target cash rate (the policy rate) twice in March 2020 to near 0.25% and once in November 2020 to 0.1%. In March 2020, the RBA also announced new unconventional monetary policy measures such as establishing a target of around 0.25% for the Australian 3-year CGB yield, which was further reduced to 0.1% in November 2020. In order to achieve this target yield, the RBA committed to purchase government bonds in the secondary market, thereby creating an artificial level for the 3-year CGB. In its November 2020 Statement the RBA issued a firm commitment to not increase the cash rate target until inflation reaches (sustainably) its target inflation range of 2.0%–3.0%, and suggested that this was unlikely to happen for at least three years (2024 at the earliest). The February and March 2021 RBA Statements reaffirmed the targets for both the cash rate and 3-year CGB yield.

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59 IMF "World Economic Outlook – War Sets Back the Global Recovery", April 2022. Available here: https://www.imf.org/en/Publications/WEO/Issues/2022/04/19/world-economic-outlook-april-2022

60 See https://www.rba.gov.au/media-releases/2022/mr-22-20.html

61 "Supporting the Economy and Financial System in Response to COVID-19". For more details on the Australian central bank intervention please refer to: https://www.rba.gov.au/covid-19/.

Other unconventional monetary policy measures introduced in March 2020 included the creation of a Term Funding Facility (TFF) with the objective of reducing funding costs of financial institutions, and in turn facilitate access to low-cost funding by businesses. An increase and extension of the TFF was announced in September 2020. In November 2020, the interest rate on the TFF was reduced from 0.25% to 0.1%.

After the Global Financial Crisis, major central banks around the world introduced several unconventional monetary policy programs. These policies included QE programs comprised of massive purchases of government securities, partly with the objective of driving down long-term interest rates. Some of those QE programs were later expanded to include corporate bonds and even equities. Australia was one of the few major developed economies that did not implement such programs in the aftermath if the Global Financial Crisis. However, the COVID-19 crisis changed that.

In addition to lowering its cash target rate to 0.1% and imposing a target of 0.1% on the Australian 3-year government bond yield, the RBA started buying government bonds with maturities up to 10 years in sizeable amounts. In November 2020, the RBA indicated it would purchase bonds issued by the Australian Government (and by the states and territories) in the secondary market under an AUD 100 billion bond purchase program. In February 2021, the RBA announced it would add an additional asset purchase program for another AUD 100 billion, following the completion of the initial program slotted for April 2021.[62]

On 6 July 2021, the RBA announced the extension of its second government bond purchase program of AUD 100 billion, which was scheduled to be completed in early September 2021. The new purchases amounted to AUD 4 billion per week, to be conducted until at least mid-November 2021 (or a combined AUD 40 billion approximately).[63] On September 7, 2021, the RBA announced that the AUD 4 billion weekly purchases would continue until at least mid-February 2022.[64] In November 2021, the RBA discontinued its targeting of the 3-year CGB yield, but the unwinding of this policy had a disruptive impact on markets.[65] Subsequently, the RBA conducted a review of its yield target policy and acknowledged that the ending of the program was disorderly and was associated with bond market volatility and some market dislocation. The RBA concluded that the experience had caused some damage to its reputation.[66]

62 "Statement by Philip Lowe, Governor: Monetary Policy Decision", February 2, 2021. For more details, visit: https://www.rba.gov.au/media-releases/2021/mr-21-01.html.

63 "Statement by Philip Lowe, Governor: Monetary Policy Decision", July 6, 2021. For more details, visit: https://www.rba.gov.au/media-releases/2021/mr-21-13.html.

64 Statement by Philip Lowe, Governor: Monetary Policy Decision", September 7, 2021. For more details, visit: https://www.rba.gov.au/media-releases/2021/mr-21-19.html.

65 Statement by Philip Lowe, Governor: Monetary Policy Decision", November 2, 2021. For more details, visit: https://www.rba.gov.au/media-releases/2021/mr-21-24.html.

66 RBA, "Review of the Yield Target", June 21, 2022. Available here: https://www.rba.gov.au/monetary-policy/reviews/yield-target/index.html.

On February 1, 2022, the RBA stated that its bond purchase program would cease after February 10th.[67] On March 2, 2022, the RBA balance sheet had grown by almost four-fold relative to its size on January 29, 2020.[68] According to the RBA, by February 2022, it owned approximately 35% of outstanding Australian government securities. This compares to only 9% in October 2020.[69]

QE policies, along with flights to quality, exacerbated volatility in the bond market, distorting observed CGB and real yields. In March 2020, the 10-year CGB yield decreased to 0.89%, versus 1.20% in December 2019. At the same time, the 10-year inflation-indexed (i.e., real) yield jumped from 0.21% to 0.65% in March 2020, implying a 10-year breakeven inflation rate of 0.24% (0.89% – 0.65%), at the height of COVID-19. This compares with the 10-year breakeven inflation of 0.99% (1.20% – 0.21%) in December 2019, as shown in Exhibit 3B.6. By the end of 2021, both nominal and real yields rebounded to pre-pandemic levels, while breakeven inflation rose to levels last seen in 2018. Specifically, in December 2021, the yields on 10-year CGB and inflation indexed bonds reached 1.61% and 0.12%, respectively, implying a 10-year breakeven inflation rate of 1.49%. However, actual inflation had jumped to 3.5% at the end of December (see Exhibit 3B.6).

In May 2022, as inflation pressures continued to build, the RBA decided to officially start quantitative tightening (QT) measures, by not reinvesting the proceeds of maturing government bonds held in its balance sheet.[70] This, together with a series of RBA interest rate hikes (see below), contributed to a significant increase in long-term yields and a considerable increase in 10-year breakeven inflation. At the end of June 2022, 10-year CGB nominal and real yields reached 3.77% and 1.70%, respectively, implying a 10-year breakeven inflation of 2.04% (3.77% – 1.7%).

Changes (sometimes significant) in breakeven inflation rates are not uncommon in times of crises. A similar trend was observed in the United States in the aftermath of the Global Financial Crisis and in the post COVID-19 environment.[71] However, it demonstrates that breakeven inflation measures can be misleading during times of significant market upheaval. Periods of high uncertainty are often accompanied by flights to quality, which means investors shift significant capital to liquid assets considered “safe”, such as government securities of major advanced economies.[72] This leads to a repricing of liquidity premia, while also driving nominal yields down. As a result, the yield spread between nominal and inflation-indexed bond yields narrows, but that does not necessarily translate into lower long-term inflation expectations. These bond market mechanisms should be considered when a measure of long-term expected inflation is considered for valuations performed during these periods.

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67 Statement by Philip Lowe, Governor: Monetary Policy Decision”, February 1, 2022. For more details, visit: https://www.rba.gov.au/media-releases/2022/mr-22-02.html.

68 The RBA total assets on January 29, 2022, and March 2, 2022 were AUD 170.4 billion and AUD 647.5 billion, respectively. For more details please visit: https://www.rba.gov.au/statistics/tables/

69 “From QE to QT – The next phase in the Reserve Bank's Bond Purchase Program”, statement on May 23, 2022 by Christopher Kent, Assistant Governor (Financial Markets) in the Reserve Bank of Australia. For more details, visit: https://www.rba.gov.au/speeches/2022/sp-ag-2022-05-23.html

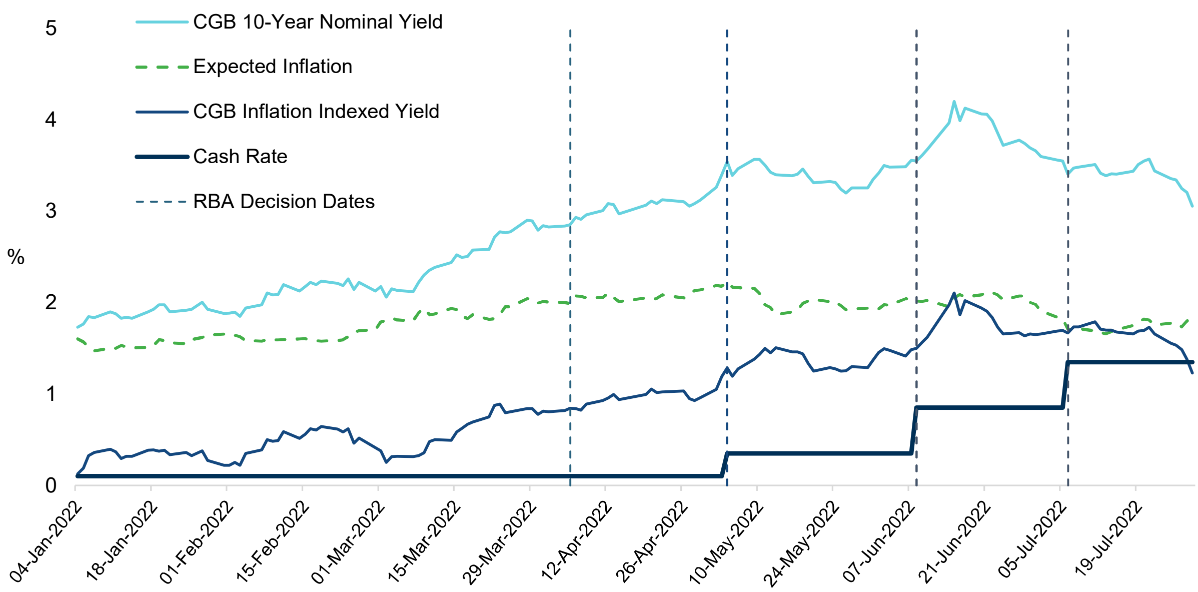
70 Statement by Philip Lowe, Governor: Monetary Policy Decision”, May 3, 2022. For more details, visit: https://www.rba.gov.au/media-releases/2022/mr-22-12.html.

71 Federal Reserve Bank of St. Louis, 10-Year Breakeven Inflation Rate [T10YIE], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/T10YIE.

72 According to Reuters, Australia is one of only nine countries with a AA rating from all three major rating agencies. Countries with AAA ratings are considered the safest sovereign investment. See: “Australia retains its Triple A status”, February 21, 2021, https://www.nasdaq.com/articles/australia-retains-its-triple-a-status-2021-02-21

The recent volatility in yields and, to some extent, in breakeven inflation measures clearly highlights how global and domestic economic and financial market indicators can be difficult to predict. The RBA decided to maintain its cash rate at 10 basis points on April 5, 2022. This was increased to 35 b.p. on May 3rd, then to 85 b.p. on June 7th and to 1.35% on July 5th, largely in an attempt to get inflationary pressures under control.

**Exhibit 3B.7:** Bond Market Reaction to RBA Cash Rate Increase Announcements (January 2022 – July 2022)




Each vertical line in Exhibit 3B.7 represents the date of each of the RBA announcements noted above. It is evident that the announcements were anticipated by investors, as there was little reaction in the 10-year bond yield (or the 3- and 5-year rates, not shown here) following the announcement. This exhibit also highlights the relative stability of the breakeven inflation at around 1.5% to 2.0% since the beginning of 2022, which shows some confidence by investors that the RBA will be able to get inflation under control and/or that an economic recession or slowdown may be in the horizon (which would require a lowering of the cash rate sometime within the next 10 years with a corresponding impact on long-term yields).

## Adjusting the Historical ERP

The ERP is the required return for bearing the incremental risk of investing in a diversified portfolio of equities rather than investing in a risk-free asset. It can be viewed as reflecting:

- A view of the level of risk in equity markets.
- Investors' appetite for risk (i.e., degree of risk aversion).

If either, or both, of these vary over time, then it is likely that the forward-looking view of the current ERP will also change over time. In contrast, the Australian historical average ERP, including the incremental return associated with the benefits from the imputation tax credits (i.e., franking credits, discussed at the end of this appendix), has been relatively stable. This stable trend can be observed since at least 1990, despite the fact that equity markets have seen some periods of significant volatility and risk-free rates have declined materially during that period. The range of historical ERPs has been between 6.5% and 7.0%, with the most recent update shown at the end of this discussion.[73]

## Level of Risk

This analysis starts by looking at the evolution of Australian's equity risk since the Global Financial Crisis. The forward-looking ERP is not observable directly in the market; however, volatility measures (historical or implied) are often used as proxies for market perceptions of equity risk.

Exhibit 3B.8 illustrates historical and implied volatilities for the Australian stock market since January 2008 (daily). The historical volatility is calculated as an annualized 90-day rolling standard deviation of returns for the Australian stock market benchmark index, the All Ordinaries Index (ASX). Forward volatility is represented by the S&P/ASX 200 VIX Index, which is calculated as the implied volatility of 30-day S&P/ASX 200 index options.[74] The two volatility measures appear to be highly correlated, with the VIX index leading in several instances, which is understandable given the forward-looking nature of the implied volatility calculations.

The S&P/ASX 200 VIX Index is primarily used as an indicator of investor sentiment and market expectations. Because a volatility index at relatively high levels implies a market expectation of very large changes in the underlying stock market index due to increased risk, while a relatively low value implies a market expectation of very little change (lower risk), the S&P/ASX 200 VIX will often move inversely to the equity market.[75]

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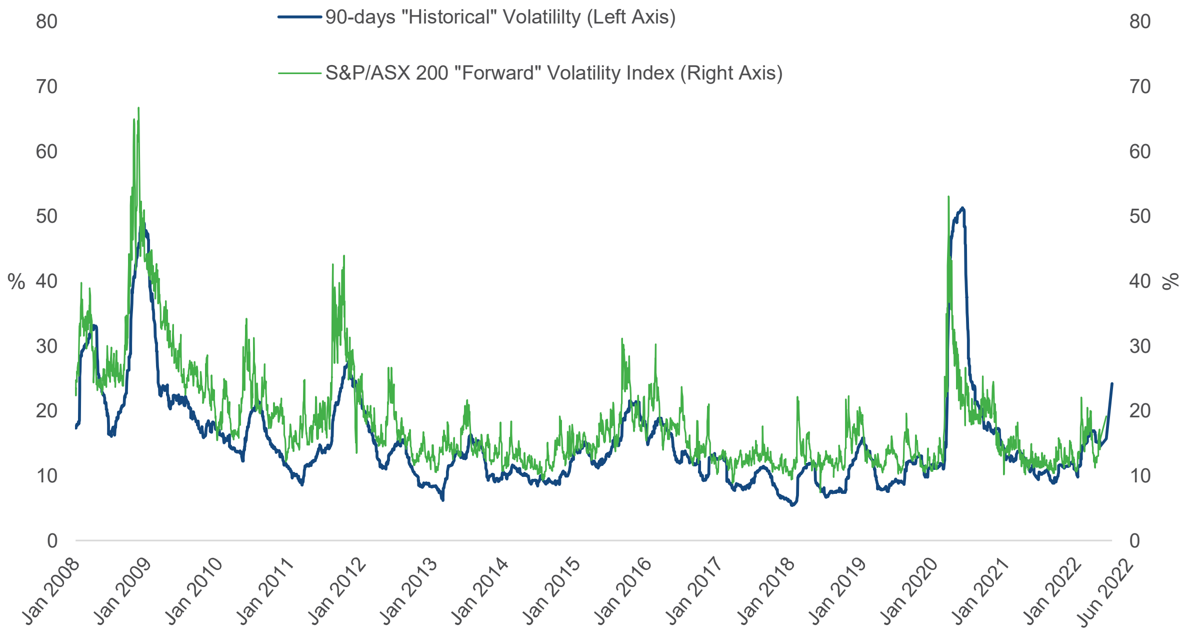
73 The relative stability is a function of the weight of years: one year with a large positive or negative ERP outcome will have a smaller impact on a long-term average than on a short-term average.

74 The S&P/ASX 200 Volatility Index long-term average is calculated from inception in January 2008 to June 2020.

75 As paraphrased from the ASX website at: https://www2.asx.com.au/investors/learn-about-our-investment-solutions/indices/types/s-p-asx-200-vix-index.

**Exhibit 3B.8:** Annualized 90-Day Rolling Historical Volatility of All Ordinaries (ASX) and S&P/ASX 200 VIX Index (January 2008–June 2022) (Daily)




**Source of underlying data:** DataStream/Refinitiv

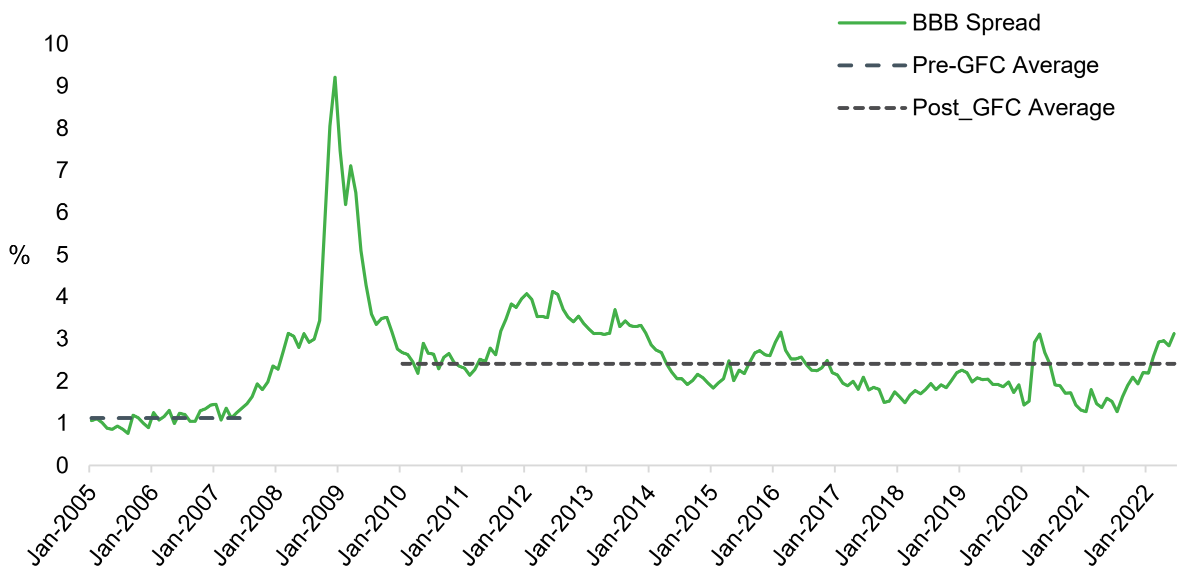
However, the COVID-19 crisis changed market conditions considerably. The high level of uncertainty about the impact of the pandemic and the subsequent lockdown policies adopted worldwide led to investors' exodus from risky assets (including equities) into government securities issued by countries considered "safe" from the risk of default. During March and April 2020, the level of both historical and implied volatilities jumped to levels last seen during the Global Financial Crisis. On March 18, 2020, S&P/ASX 200 VIX Index reached a local high of 53.1, but by December 31, 2021 it had declined to 10.6. More recently it has fluctuated between this level and 22, finishing at 19.2 at the end of June 2022.

## Attitude towards Risk

There is some evidence that investors have become more risk averse since the Global Financial Crisis, resulting in a higher required ERP relative to typical risk-free measures (e.g., the spot yield on 10-year CGBs).

Exhibit 3B.9 shows the spread between BBB-rated corporate bond yields and 10-year CGB yields *before* and *after* the Global Financial Crisis. The average spread before the Global Financial Crisis (i.e., from January 2005 to June 2007) was 1.1%, whereas the average spread after the Global Financial Crisis (i.e., from January 2010 onwards) was 2.4%, representing an increase of 1.3%.

**Exhibit 3B.9:** Spread of Australian BBB-Rated Corporate Bond Yields Over 10-Year CGB Yields *Before* and *After* the 2008 Global Financial Crisis (GFC) (January 2005–June 2022)




**Source of underlying data:** Reserve Bank of Australia and Bloomberg

Because corporate bonds are also financial assets with systematic risk, one might assume that the equity premium would move (at a minimum) with perceived risks embedded in the bond premium. On this basis, the current view of a forward ERP might be around 1.3% higher than the historical average. For example, using a historical ERP of 6.9% and adding the 1.3% average corporate credit spread results in an adjusted ERP of 8.2%. An average of the two indications (6.9% and 8.2%) results in a 7.6% ERP.[76]

[76] The Independent Pricing and Regulatory Tribunal (IPART) forms a view of an appropriate ERP using a similar logic of an average of historical and current ERP measures. IPART's estimate of the current rate is based on several forward-looking models. See IPART, (2013) "Review of WACC Methodology: Research – Final Report", December. Frequent updates are also available on IPART's website at https://www.ipart.nsw.gov.au/Home.

## Implied ERP as a Forward View

Some researchers use a version of the Dividend Discount Model (DDM) to estimate a forward-looking measure of the expected equity market return, then deduct the current risk-free rate to estimate an implied ERP. There is a website that has gained some recognition in the valuation world by showing implied ERP estimates over time for a variety of countries.[77] This site estimated an implied Australian ERP at the end of June 2022 of 3.7% (an indication significantly lower than the historical ERP), which compares with an implied ERP of approximately 5.0% in February 2020, immediately prior to the onset of the pandemic. This decline in implied ERP estimates is inconsistent with corporate bond risk premia and short-term market volatility trends.

The range of implied ERPs for Australia is also quite wide, varying from 2.4% to 7.7% over the entire time horizon (January 1998–present, monthly) for which the Australian implied ERP is calculated. The lower end of the range may represent an unreasonable proxy for a forward-looking ERP estimate. However, the general trends over time do appear, in general, to reflect substantive changes in market volatility: the implied Australian ERP estimates are consistent with other risk measures discussed earlier. For example, the highest implied ERP of 7.7% was reached in November 2008, at the height of the Global Financial Crisis. More importantly, after COVID-19 was declared a pandemic on March 11, 2020, there was noticeable surge in the implied ERP for Australia, reaching a high of 6.8% at the end of March. This was followed by a decline through the end of June 2022, which is consistent with the fall in market volatility, but this implied ERP measure has yet to reflect the increase in equity market volatility towards the end of the 2022 financial year.

## Developing a Reasonable Range for Australian ERP Estimates

To the extent that the realized (i.e., historical) ERP equates on average to expected premia in prior periods, the historical average ERP may be a useful starting point in developing a current forward-looking ERP estimate.[78] A reason one might look to the historical ERP is that the expectations of investors will be framed from their experiences, and the average historical ERP might be expected to have an influence on investors' expectations about the future. Hence there is usually at least some reliance on average historical ERPs when developing current forward-looking ERP estimates.

However, this does not mean that the ERP estimate should be static over time. Periods of market stability (low volatility) likely indicate that the current forward-looking ERP estimate is *below* the historical average, and periods of heightened volatility likely indicate that the current forward-looking ERP estimate is *above* the historical average.

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77 For more details about the methodology and data used in the implied Australia ERP derived using this model, please visit: http://www.market-risk-premia.com/au.html.

78 Alternatively, to the extent that prior events are *not* expected to reoccur, such samples may need to be adjusted to remove the effects of these nonrecurring events.

At the end of 2019, observed volatility was not far different from historical levels of volatility. However, there is evidence of investors requiring a higher premium per unit of risk in the aftermath of the Global Financial Crisis relative to prior to the crisis. Therefore, a current forward-looking Australia ERP estimate as of December 31, 2021 in the range of 6.0%–7.0% appears reasonable, with a preference for the higher end of the range of 7.0%.

COVID-19 upended the global economy and created an even higher level of uncertainty about short-term and medium-term economic growth prospects. Australia, like most countries in the world, adopted a lockdown policy that restricted population movement and closed businesses. The economy rebounded in 2021, but considering the headwinds inflicted by the Russia-Ukraine war and the recent inflationary pressures, the shape and the time of the recovery have become more uncertain. As such, an even higher ERP may be considered reasonable as of June 30, 2022 (relative to year-end 2019).

Having said that, there is yet another important consideration that needs to be incorporated prior to concluding on an Australia ERP: the Australian Dividend Imputation Tax System. This system and its impact on the ERP is discussed in the following sections.

## Concluding on an ERP Estimate for Australia

The ERP in Australia is impacted by the Dividend Imputation Tax System which provides tax relief on dividends paid to Australian taxpayers out of Australian earnings, but not to overseas investors.

## Overview of the Australian Dividend Imputation Tax System

In 1987, Australia introduced an imputation tax system, with the objective of removing double taxation to shareholders from the receipt of dividend income. In the classical tax system, dividend income is taxed twice: once at the corporation level and once at the shareholder level.

Under the dividend imputation tax system, when a dividend is paid out of Australian earned corporate profits that have been taxed at the statutory corporate tax rate, the shareholder receives a cash dividend plus an imputation tax "credit". This tax credit was changed to a rebate after July 2000 enabling it to be included in tax returns to offset, or in some cases, more than offset individual income tax obligations. An outcome is that tax is effectively only levied at the personal level while debt and equity income are taxed similarly. Overseas investors are precluded from claiming the imputation tax credits. Therefore, it is often the case that not all of the overall distributed imputation credits can be utilized by a company's shareholders. Accordingly, local resident tax-paying shareholders will value these imputation tax credits, while other investors will not.

Consequently, Australian resident taxpayers earn an additional return over and above capital gains and dividends compared with overseas investors. This extra return is not captured in published total return (accumulation) indices for the Australian stock market. As a result, traditional historical ERP computations will not capture this incremental return accruing to

Australian resident tax-paying shareholders. Additional procedures are needed to estimate an ERP for these investors, so that the incremental return associated with the benefits from the imputation tax credits (a.k.a. franking credits) can be captured. It is beyond the scope of this chapter to fully address how dividend imputation tax systems work in practice or how to place a value on such imputation credits. Several academic papers have been written on the subject, including some focused in the Australian market.[79]

## Australian Equity Risk Premium Under Three Investor Perspectives

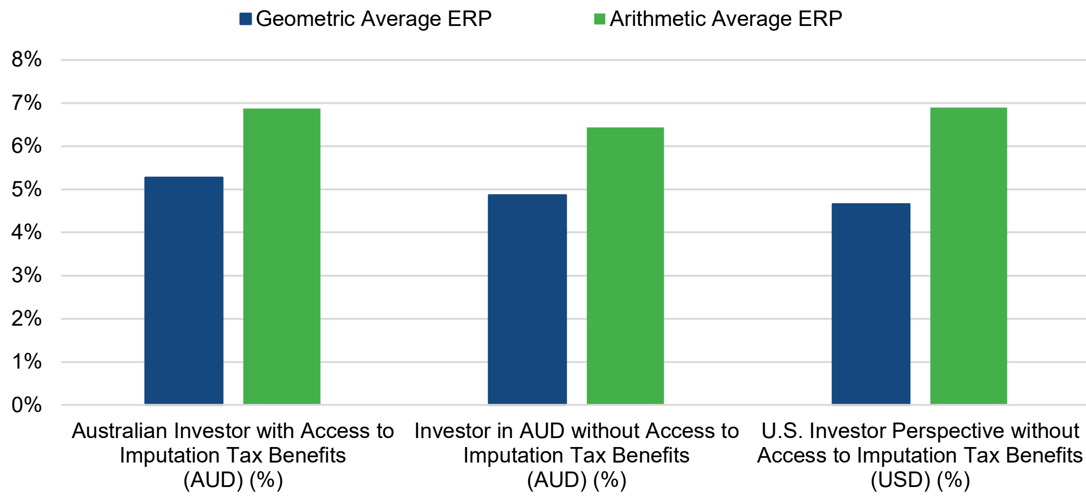
The historical ERP in Australia has been estimated from an Australian investor perspective (in AUD) over different periods by researchers and regulatory authorities. It was not our intent to summarize or reconcile that body of work.[80]

Dr. Bishop estimated the historical Australian ERP for the period of 1900–2021 under three different investor perspectives: (i) an Australian investor (in Australian Dollars, or AUD) *with* access to (i.e., eligible to receive) imputation tax benefits; (ii) an investor in AUD *without* access to imputation tax benefits; and (iii) a U.S. investor (in U.S. Dollars, or USD) *without* access to imputation tax benefits.

79 See for example Damien Cannavan, Frank Finn, Stephen Gray, "The value of dividend imputation tax credits in Australia", *Journal of Financial Economics* 73, no. 1 (July 2004): 167–197.

80 For a non-exhaustive list, see for example: (1) T. Brailsford, J. Handley and K. Maheswaran, "The historical equity risk premium in Australia: Post-GFC and 128 Years of Data", *Accounting and Finance*, 2012, 237–247; (2) Dimson, E., P. Marsh, and M. Staunton, *Credit Suisse Global Investment Returns Yearbook 2018*, February 2018; (3) Bishop, S., T. Carlton and T. Pan, "Market Risk Premium; Australian Evidence" Research Paper for the CAANZ Business Valuation Specialist Conference, 13- 14 August, 2018. (4) NERA, "Historical Estimates of the Market Risk Premium – A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy", February 2015.

**Exhibit 3B.10:** Estimated Australian ERP Under Three Investor Perspectives Based on Dr. Bishop's Analysis, as Calculated over the Period 1900–2021




**Explanation and Source of underlying data:** Imputation tax benefits were included in the total return to shareholders by adding a yield calculated as dividend yield * (company tax rate) / (1- company tax rate) * % dividends franked * PV factor. For current purposes, the PV factor used reflected the underlying risk of the market. The PV (present value) factor captures the loss in value of $1 of imputation tax benefits distributed but not claimed until personal tax returns are filed (assumed to be a delay of 9 months). Data from 1900 to 1980 was from Elroy Dimson, Paul Marsh, and Mike Staunton, *Credit Suisse Global Investment Returns and Yearbook 2018*, as was the data underlying the changes in the real exchange rate. Subsequent return data was from the All Ordinaries Accumulation and Price Index series, with the Australian Tax Office being used for the percentage of franked dividend data for the period of 1997 and onward, while an average franking rate was applied to the prior period data (where applicable). Australian long-term government bond return data until 1986 was from Officer, R.R. (1989) "Rates of Return to Shares, Bond Yields and Inflation Rates: An Historical Perspective", in Ball, Brown, Finn, and Officer, "Share Markets and Portfolio Theory: Readings and Australian Evidence", second edition, University of Queensland Press; then Reserve Bank of Australia for the periods thereafter. Inflation data was from the Australian Retail Price Index until December 1948 and the Australian Consumer Price Index thereafter.

The geometric average and the arithmetic average realized ERP were both calculated relative to Australian long-term government bonds, as illustrated in Exhibit 3B.9.[81, 82] Both the geometric and arithmetic average ERP indications were estimated directly from the underlying data.

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81 All additions and subtractions were performed in geometric terms, with the exception of the arithmetic average indication (the last step in each of the columns).

82 For a detailed discussion of Dr. Bishop's Australian ERP estimates, including a decomposition of each these estimates into its underlying elements ((i.e., dividend yield, growth rate of real dividends, expansion of price-to-dividend ratio, and changes in real exchange rate), please see the Resources Library of the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator.

The Global Financial Crisis has had a significant impact on capital markets and ERP indications. ERP is a forward-looking concept and it will change over time to reflect the financial and economic conditions as of a certain valuation date. In a relatively recent research paper, Dr. Bishop and his co-authors proposed a method for adjusting the ERP to reflect unusual risk situations, such as the Global Financial Crisis. Based on this work, the authors would expect the ERP to vary beyond the widely accepted range of 6% to 7% in high and low risk market environments such as the COVID-19 pandemic. This would be applicable to all three types of investors in Australia outlined above.[83]

[83] Steven Bishop, Michael Fitzsimmons, and Bob Officer, "Adjusting the Market Risk Premium to Reflect the Global Financial Crisis", *JASSA*, no. 1 (2011), 2011: 8–14.

# Appendix 3C
# Additional Sources of Equity Risk Premium Data – Canada

The Cost of Capital Navigator's International Cost of Capital Module at kroll.com/cost-of-capital includes long-horizon historical equity risk premia (ERPs) estimates for 16 economies around the world, through December 2021.[1] Appendices 3A through 3C provide additional sources of international ERP information that could be utilized to either adjust or corroborate historical measures of ERPs.

In Appendix 3C of the *2022 Valuation Handbook – International Guide to Cost of Capital*, we provide ERP information specifically focused on Canada. We asked Dr. Laurence Booth, who is renowned in Canada for his ERP research, to assist us in developing the forward-looking ERP and base cost of equity estimates for Canada included in Appendix 3C.[2]

In arriving at his ERP estimates, Professor Booth has also considered the current state of the Canadian government bond market and corresponding impact on the risk-free rate, as documented herein. As a reminder, the risk-free rate and the ERP are interrelated concepts. All ERP estimates are, by definition, developed in relation to the risk-free rate. Specifically, the ERP is the extra return investors expect as compensation for assuming the additional risk associated with an investment in a diversified portfolio of common stocks, compared to the return they would expect from an investment in risk-free securities.

Throughout this appendix, the International Organization for Standardization (ISO) currency codes will be used as a convention: CAD stands for Canadian Dollars, while USD stands for U.S. Dollars.

### The Current State of the Canadian Bond Market, and an Estimate of the Canadian Equity Risk Premium

Capital has traditionally been in short supply in Canada relative to demand. This shortage was worsened in the 1970s, 1980s, and 1990s when the Government of Canada crowded out private borrowers from the bond market, forcing many, including the Canadian provinces, into the U.S. market (see the middle of Exhibit 3C.1). This crowding-out effect was reduced when the

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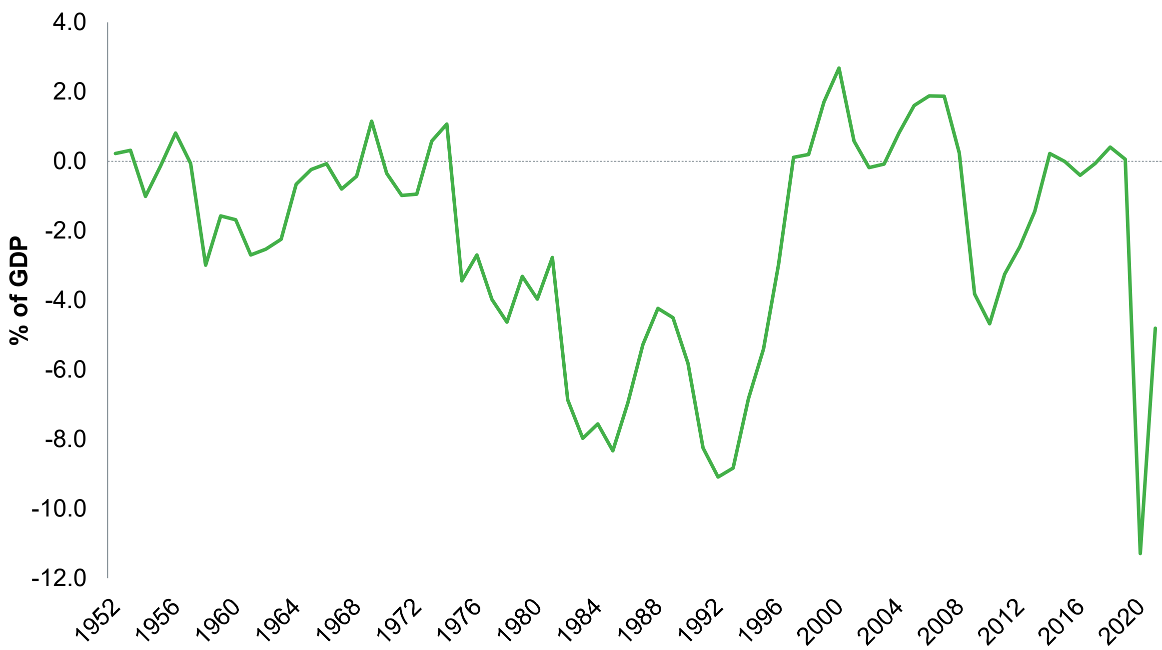
1 The ERPs for the 16 countries are calculated annually as of December 31. As of the date of publication (late 2022), the most recent update was December 31, 2021.

2 Dr. Laurence Booth is a Professor of Finance and the CIT Chair in Structured Finance at the Rotman School of Management, University of Toronto. His major research interests are in corporate finance and the behavior of regulated industries. He has published extensively in top academic and professional journals and is the co-author of three major textbooks: *International Business*, *Introduction to Corporate Finance*, and *Corporate Finance*. The latter book was the first Wiley Canada text to be edited for sale in the United States. Professor Booth is on the editorial board of five academic journals and in 2003 was awarded the *Financial Post's* Leader in Management Education Award.

Canadian government budget moved from deficits to surpluses in the late 1990s and early to mid-2000s (see the mid-right section of Exhibit 3C.1). Canada returned to federal deficits in the aftermath of the 2008 global financial crisis but returned to a balanced budget by mid-2010s.

In March 2020 when the World Health Organization declared COVID-19 a pandemic, Canada issued stay-at-home orders; businesses were forced to close, and Canadians were asked to stay at home. To help workers and business weather these uncertain times the Canadian federal government provided extensive financial support. This resulted in a massive federal government budget deficit, larger than any seen after the end of World War II (see the rightmost section of Exhibit 3C.1).[3] During 2021, the Canadian federal budget deficit started to decline but it is still far higher than the pre-pandemic levels.

**Exhibit 3C.1:** Federal Surplus or Deficit [-] as Percent of Gross Domestic Product (GDP) 1952–2021




**Source of underlying data:** Statistics Canada. The Federal Surplus or Deficit is calculated as the ratio of Consolidated Federal Government Budget, measured as Net Lending or Borrowing by the Canadian government (CANSIM Table: 10-10-0015-01) to nominal GDP (CANSIM Table: 36-10-0104-01).[4]

Exhibit 3C.2 depicts U.S. and Canadian long-term government bond yields since 1994 through 2021. There are two major insights that can be gleaned from Exhibit 3C.2: (i) the collapse in the level of sovereign yields in both the U.S. and Canada, and (ii) the change in the relationship between yields in Canada versus the U.S.

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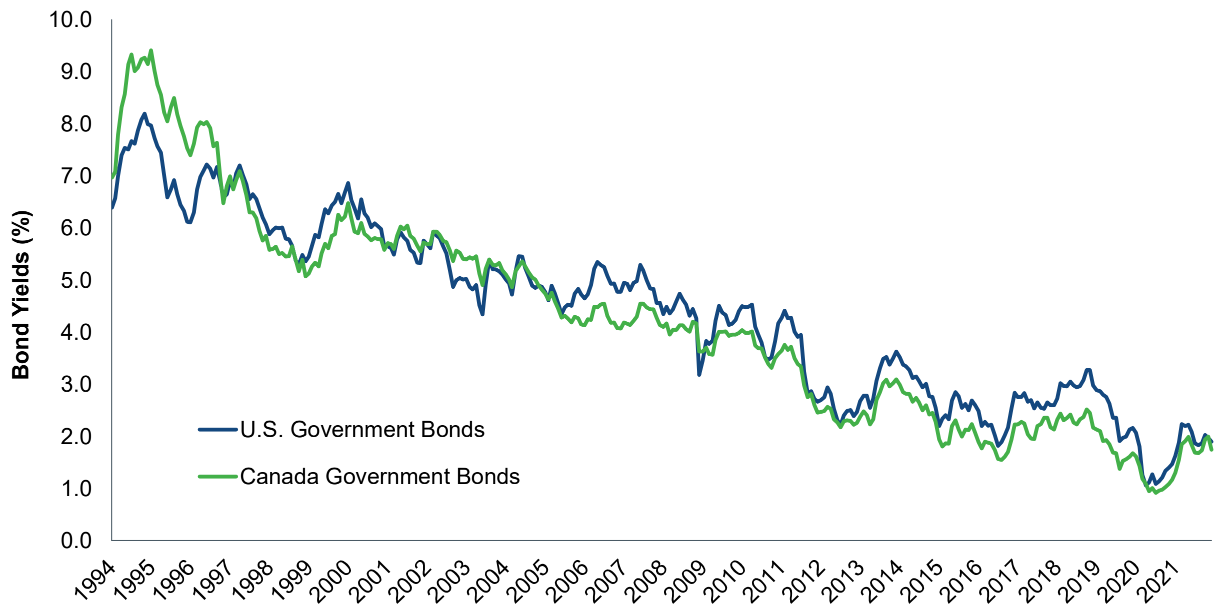
3 For more details on Canada's COVID-19 Economic Response Plan, please visit: https://www.canada.ca/en/department-finance/economic-response-plan.html.

4 Net Lending or Borrowing by the Canadian Government series is annualized by taking the sum of all quarters within the year. The Canadian nominal GDP series is annualized by averaging reported annualized quarterly GDP numbers.

**Exhibit 3C.2:** Canadian and U.S. Government Bond Yields 1994–2021[5]




**Source of underlying data:** U.S. data from Federal Reserve Bank of St Louis Database (FRED GS20). Canadian data from Statistics Canada (CANSIM Table: 10-10-0122-01).

In the mid-1990s Canadian yields averaged 1.1% more than those in the U.S., primarily due to: (i) the budget deficits in Canada, and (ii) the international importance of the U.S. government bond market.

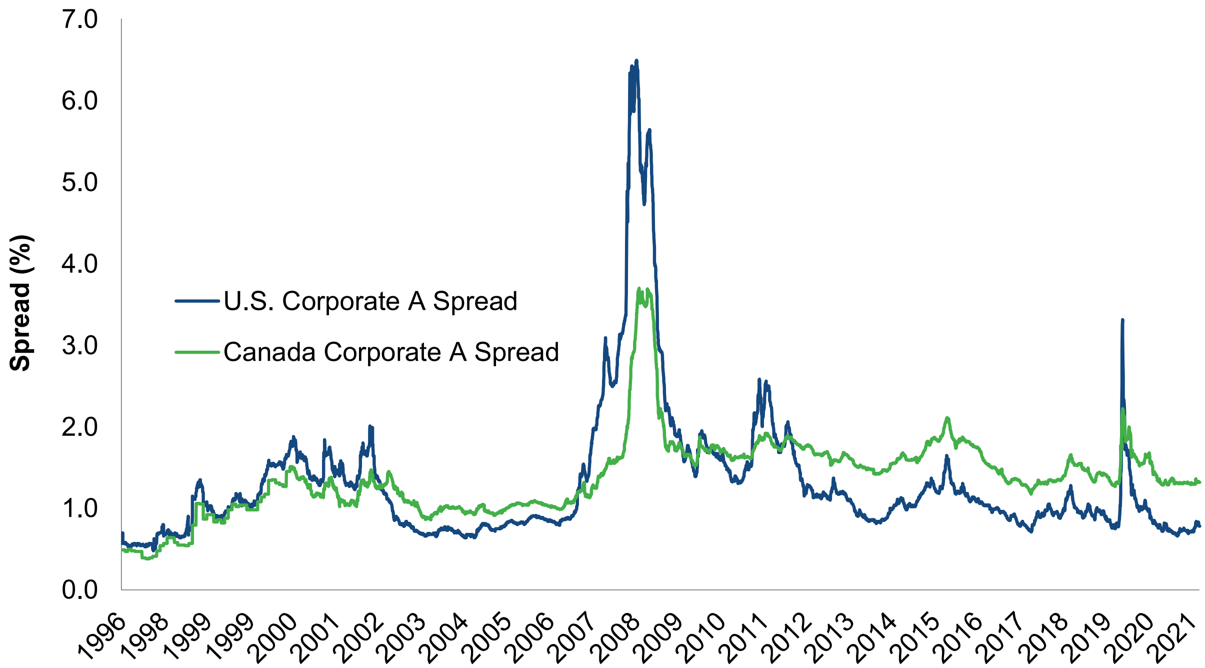
This started to change as Canadian government budgets became balanced and the supply of bonds dropped. From 1997 until 2005, Canadian and U.S. government bond yields were similar, with Canadian yields sometimes slightly above and sometimes slightly below those in the U.S. Since 2006, Canadian long-term government bond yields have been on average 0.42% below those in the U.S. This difference in yields approached zero or reversed only during crises periods: the 2008–2009 global financial crisis, the 2011–2012 Euro sovereign debt crisis, and briefly at the height of COVID-19 in 2020 and during the pandemic recovery in late 2021.

Lower long-term Canadian government bond yields have not translated into significantly lower borrowing costs for A-rated corporate debt issuers in Canada, primarily due to the importance of changes in the Government of Canada segment of the Canadian bond market (rather than changes in the overall market). Prior to 2002, A-rated corporate debt spreads were similar in both countries (see Exhibit 3C.3). After 2002, Canadian credit spreads have tended to be *wider* (i.e., larger*)* than those in the U.S. The only exceptions were observed during the 2008–2009 financial crisis, the 2011 Euro sovereign debt crises, and the COVID-19 pandemic.

[5] Canadian data based on the average yield on Government of Canada Marketable Bonds with maturities over 10 years. U.S. data based on 20-year constant maturity U.S. Treasury Yields.

Since 2013, Canadian A-rated corporate bond spreads (over Canadian government bonds) have been fairly stable and averaged 0.51% wider than those in the U.S.[6] This suggests that the Canadian corporate bond market may not have been as affected by an increased demand by foreign investors, relative to that seen for Canadian government bonds. In contrast, U.S. government bond yields have dropped dramatically during the three crises periods mentioned above, primarily due to flights to quality by global investors, while corporate bond yields have increased substantially, leading to a widening of U.S. corporate spreads to higher levels than in Canada.

**Exhibit 3C.3:** Canadian and U.S. A-rated Corporate Bond Spreads
January 1996–December 2021




**Source of underlying data:** U.S. data sourced from Bank America Merrill Lynch's U.S. A-rated Option-adjusted Spread. The Canadian data is based on the spread between DataStream series SCM1ALG for A-rated corporate issuers and SCMCLNG for government bonds.

[6] U.S. banks were far more exposed to the 2008 financial crisis and the 2012 European debt crisis than were Canadian banks.

At the end of 2021, Canada was still perceived as one of a very small number of safe-haven countries carrying a AAA sovereign credit rating, and thus an attractive destination to invest central bank reserves. This is the case, despite a downgrade by Fitch Ratings on June 24, 2020 of Canada's rating from AAA to AA+, citing the deterioration of public finances as a result of the pandemic (this rating was reaffirmed in 2021 and 2022).[7,8] However, the other two major ratings agencies (namely, S&P Global Ratings and Moody's) did not share the same opinion and reaffirmed their top rating of AAA for Canada at the height of the pandemic and more both 2021 and 2022.[9,10]

The International Monetary Fund (IMF) collects data from 149 reporters on world currency composition of official foreign exchange reserves.[11] This data shows that the proportion of official foreign exchange reserves allocated to Canadian dollars has marginally changed over the last five years, even after an increase in debt issuance by the Canadian government and Fitch's downgrade in 2020. The IMF started to report data on reserves holdings in Canadian dollars in the last quarter of 2012. At that point in time, Canadian securities held in official reserves amounted to USD 86 billion, or 1.43% of total worldwide allocated reserves. This amount represented 13.7% of the outstanding bills and bonds issued by the Canadian government. Since then, total official foreign exchange reserves grew considerably worldwide, while the demand for Canadian dollars also followed. On a relative basis Canadian dollar claims continued to represent a small percentage of world foreign exchange reserves, stabilizing at around 2% for most of the period 2016-2020.[12] At the end of 2021, this percentage had increased to 2.38%.

The issuance of Canadian government securities grew modestly over the last decade with the exception of 2020, leading to an increase in Canadian securities held in foreign reserves as a percentage of all outstanding Canadian government bills and bonds. As the Bank of Canada statement explained in 2015:[13]

*"In the post-crisis [2008 Financial Crisis] period, Canada has experienced sizable foreign portfolio investment flows, particularly in Government of Canada (GoC) bonds, which has resulted in an*

7 For more information about Fitch Ratings' decision following the outbreak of COVID-19, please visit: https://www.fitchratings.com/research/sovereigns/fitch-downgrades-canada-ratings-to-aa-outlook-stable-24-06-2020.

8 For more information about Fitch Rating's most recent decisions on Canada sovereign rating please visit: https://www.fitchratings.com/entity/canada-80442192

9 For more information about S&P Global Ratings decision following the outbreak of COVID-19, please visit: https://www.spglobal.com/ratings/en/research/articles/200722-research-update-canada-ratings-affirmed-at-aaa-a-1-outlook-remains-stable-11583818
For more information about S&P Global Ratings' decision in 2021, please visit: https://www.bnnbloomberg.ca/s-p-maintains-aaa-rating-on-canada-despite-historic-deficits-1.1595533.

10 For more information about Moody's decision at the outset of the pandemic, please visit: https://www.moodys.com/research/Moodys-announces-completion-of-a-periodic-review-of-ratings-of--PR_425248?cy=fra&lang=fr
For more information about Moody's decision in 2021, please visit: https://www.moodys.com/research/Moodys-announces-completion-of-a-periodic-review-of-ratings-of--PR_455925?cy=fra&lang=en.

11 Source: International Monetary Fund's database on Currency Composition of Official Exchange Rate Reserves (COFER), International Financial Statistics (IFS), available here: http://data.imf.org/regular.aspx?key=41175. Foreign exchange reserves reported under COFER consist of monetary authorities' claims on non-residents in the form of currency and deposits, securities, financial derivatives and other claims.

12 The percentages were 1.8%, 1.9%, 2.0%, 1.8%, 1.9% and 2.1% for end of 2015, 2016, 2017, 2018, 2019 and 2020 respectively.

13 Bank of Canada, Financial System Review, June 2015 page 25.

*increase in the share of GoC bonds held by foreigners. These portfolio investment inflows had a significant downward influence on interest rates in Canada".*

The proportion of Canadian government bills and bonds held in foreign reserves reached a high of 39.1% in Q4 of 2018, but dropped to 31.1% at the end of Q4 of 2021.[14,15] The COVID-19 pandemic forced the Canadian government to borrow heavily to finance different fiscal programs to support the economy. As a result, the amount of outstanding Canadian bills and bonds increased by approximately 67% from December 31, 2019 to December 31, 2021. The surge in government debt issuance was partly financed by the Bank of Canada's quantitative easing policies ("QE"), which entailed intervening in financial markets to purchase Canadian government bills and bonds.

The other major trend is the temporal change in the level of government interest rates in both the U.S. and Canada. For example, in December 2021, the average nominal yield on Canadian long-term government bonds (those with maturities greater than 10 years) was 1.8%, or 0.2% *below* the Bank of Canada's 2.0% inflation target, which historically is abnormally low and implies a negative real interest rate.[16] Several academics have suggested that this is part of a global trend towards declining nominal and negative real interest rates, which has been aggravated by a flight to safety during the pandemic and the implementation of massive QE policies by major central banks.[17]

### Monetary Policy's Effect on Rates

Bank of Canada researchers Eric Santor and Lena Suchanek analyzed the impact of "unconventional monetary policy" by the major central banks around the world, where "unconventional" is their euphemism for massive bond-buying programs (i.e., "quantitative easing" or "QE").[18] These researchers estimated that as of the end of 2015:

- The Federal Reserve had bought USD 4.2 trillion in bonds, amounting to 18% of the U.S. Treasury Bond market and 28% of the agency and mortgage-backed security markets.
- The Bank of England had bought 32% of the U.K. government bond market.
- The European Central Bank had bought 21% of the Eurozone government debt market.

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14 The Government of Canada Treasury Bills and Bonds Outstanding at the end of 2018 and 2021 (in CAD) were: 689 bn and 1,178 bn respectively. Obtained from the Bank of Canada website at: https://www.bankofcanada.ca/markets/gvernment-securities-auctions/goc-t-bills-and-bonds-outstanding/.

15 The exchange rate used to convert the total amount of Canadian outstanding securities at the end of 2018 and 2021 into USD are: 1.3644 and 1.2777, respectively. Canadian exchange rates were obtained from St. Louis Federal Reserve Bank (FRED).

16 Average yield on Canadian long-term government bonds (those with maturities greater than 10 years) was obtained from government of Canada statistics (CANSIM) Table: 10-10-0122-01.

17 See, for example, Lukasz Rachel and Thomas D Smith, "Secular Drivers of the Global Real Interest Rate", Bank of England Staff Working Paper No. 571, December 2015.

18 Eric Santor and Lena Suchanek, "A New Era of Central Banking: Unconventional Monetary Policies", *Bank of Canada Review*, Spring 2016.

- The Bank of Japan had bought 36% of the Japanese government bond market.

In total, these purchases amounted to almost CAD 13 trillion (or USD 10 trillion), depending on the exchange rates used.[19] Since this study was prepared, the share of government bonds held by central banks globally has increased further especially after the start of the COVID-19 pandemic, reaching approximately USD 26 trillion at the end of March 2022. The combined increase in total assets held by the Fed, ECB, BOE and BOJ between the end of February 29, 2020 (pre-pandemic) and March 31, 2022 approached 70%.[20]

In the wake of the COVID-19 pandemic, the Bank of Canada introduced its own QE program for the first time. It committed to temporarily buy 40% of all Canadian Treasury bills offered at auction and CAD 5 billion of Canadian federal government bonds each week, as well as corporate and provincial government bonds.[21] As a result, the balance sheet of the Bank of Canada increased from CAD 154.1 billion on March 31, 2020 to a record high of CAD 575.4 billion on March 10, 2021, an increase of 273%.[22] As the economy improved and the need for QE decreased, the Bank of Canada decided to start unwinding some of its QE measures.[23] On October 27, 2021 the Bank of Canada ended the expansion of its QE program and announced a move into the reinvestment phase effective November 1, 2021.[24] This meant that no new net purchases would take place and the size of its balance sheet would remain at similar levels. By March 31, 2022, the balance sheet of the Bank of Canada stood at CAD 486.5 billion a decrease of 15.4% since the peak reached in early March 2021.

Following this period of extraordinary stimulus, to support the economic recovery from the pandemic, on March 2, 2022 the Bank of Canada rose its policy interest for the first time since the outbreak of COVID-19 and began quantitative tightening (QT) on April 25, 2022. This was a response to global inflationary pressures that got exacerbated by the invasion of Ukraine by Russia on February 24, 202. Maturing Government of Canada bonds on the central bank's balance sheet are no longer being replaced and, as a result, the size of our balance sheet is declining over time. [25]

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19 During 2016 and 2017, new rounds of QE were implemented by the European Central Bank, the Bank of Japan, and the Bank of England. For a summary discussion on this topic, refer to the Cost of Capital Navigator's U.S. Cost of Capital Module's "Resources Library" at kroll.com/cost-of-capital.

20 The sum of the U.S. Federal Reserve Bank, the European Central Bank, the Bank of England and the Bank of Japan was USD 15.3 trillion on February 29, 2020 and increased to USD 26.0 trillion. Source of data: Federal Reserve Bank of St. Louis database, FRED and the Bank of England.

21 The Bank of Canada announced on March 27, 2020 the launch of a program to purchase in the secondary market a minimum of CAD 5 billion per week of Government of Canada securities across the yield curve. The program's effective start date was April 1, 2020. https://www.bankofcanada.ca/2020/03/operational-details-for-the-secondary-market-purchases-of-government-of-canada-securities/ In addition, on April 15, 2020 the Bank of Canada announced an increase in the amount of treasury bills it acquires at auctions to a maximum of 40% up from 25%, as a means to support market liquidity. https://www.bankofcanada.ca/2020/04/bank-canada-announces-increase-amount-government-canada-treasury-bills/

22 Difference due to rounding. Details of the Bank of Canada balance sheet can be found here: https://www.bankofcanada.ca/rates/banking-and-financial-statistics/bank-of-canada-assets-and-liabilities-weekly-formerly-b2/.

23 On April 21, 2021 the Bank of Canada lowered the minimum amount of federal government bonds it would purchase per week to CAD 3 billion from CAD 4 billion, and discontinued its corporate and provincial bonds purchase program. This announcement made the Bank of Canada the first major central bank to decelerate the pace of its QE program. More details available here: https://www.bankofcanada.ca/2021/04/fad-press-release-2021-04-21/.

24 The Bank of Canada announced that it will keep the stock of Government Bonds of Canada "roughly" constant. The target range for total purchases would initially be between CAD 4 billion and CAD 5 billion per month and it will be adjusted as needed. Details of the announcement can be found here: https://www.bankofcanada.ca/2021/10/balance-sheet-operations-for-the-reinvestment-of-proceeds-of-maturing-government-of-canada-bonds/

25 For more details regarding recent monetary policy decisions, visit: https://www.bankofcanada.ca/press/press-releases/

The specific objective of the QE asset buying programs was to support short-term liquidity and lower long-term interest rates, while still using conventional monetary policy to lower short term interest rates. The Bank of Canada was successful in reaching its objective during the pandemic recovery period, with long-term rates at 1.8% at the end of December 2021. Even now, after several interest rate hikes, long-term interest rates are still relatively low compared to historical levels observed prior to the 2008 global financial crisis.

To assess how much current government bond yields have been distorted by unconventional monetary policies across the globe, Professor Booth performed a regression analysis of the real Canadian bond yield since 1936 against five independent variables. These five independent variables are defined as follows: risk, the budget surplus/deficit, and three indicator variables that capture periods of unconventional intervention in financial markets. These periods are: (i) both World War II and its aftermath ("War"); (ii) the 1970s period of the global oil crisis (“Petro”); and (iii) the period following the 2008 global financial crisis, when bond-buying programs by major central banks became a significant factor influencing global interest rates (“Crisis”).

The real Canadian yield is defined here as the average yield on long-term Canadian government bonds (those with a maturity over 10 years) minus the average Consumer Price Index (CPI) rate of inflation, calculated as the average of the current, past, and forward-year rates of inflation.[26] The results of the impact of each of these five variables on Canadian real long-term yields are shown in Exhibit 3C.4. This regression model explained approximately 83% of the variation in Canada’s real yields, and each of the five explanatory (or independent) variables was statistically significant.

**Exhibit 3C.4:** Factors Influencing Canadian Long-Term Real Yields and Their Impact Calculated through 2021

| Explanatory (Independent) Variable | Impact on Real Rates | Regression Analysis Coefficient |
|---|---|---|
| Risk | Upward | 0.24 |
| Budget Surplus (Deficit) | Downward (Upward) | -0.23 |
| War | Downward | -5.28 |
| Petro | Downward | -3.63 |
| Crisis | Downward | -3.14 |
| Constant (Regression Intercept) | n/a | 1.38 |

The two main independent variables in the regression analysis are:

[26] Before 1991 there was no real return bond in Canada.

- **Risk:** Bond market uncertainty (risk), which affects the demand for government bonds. Risk is defined as the standard deviation of the returns on long-term Canada government bonds over the preceding ten years.

- **Budget Surplus/Deficit:** Government deficit, which affects supply of government bonds. Budget Surplus/Deficit is defined as the aggregate government (net) lending as percentage of nominal GDP.

All other things held the same, more uncertainty (risk) or a greater supply of government securities (i.e., more debt issuance) causes bond values (prices) to fall and interest rates to rise (note: bond yields move in the opposite direction of bond prices). The coefficient on the bond market risk variable in Exhibit 3C.4 indicates that for every 1% increase in volatility, real Canada yields are expected to increase by about 24 basis points.

The coefficient on the budget surplus/deficit variable in Exhibit 3C.4 indicates that for every 1% increase in the budget surplus (deficit), the real Canada yield is expected to decrease (increase) by 23 basis points. Historically, a relative increase in government borrowing has driven up real interest rates.

When these two effects are added together, we can explain the huge increase in real yields in the early 1990s. For example, in 1994 real yields exceeded 7%. According to this model, the budget deficit contributed to a 1.57% (= -6.84% 1994 deficit * -0.23 coefficient) of overall real yields (difference due to rounding), whereas bond market uncertainty contributed with another 2.64% (=11.0% bond market risk * 0.24 coefficient) increase. These factors combined contributed a 4.21% (=1.57% + 2.64%) to the real yield, which represented three-quarters of this model's predicted yield of 5.59% (=1.38% regression intercept +1.57%+2.64%), and well over half the actual real yield of 7.4%.

In addition to the demand and supply variables, there are three "indicator" variables in this analysis that represent three unique periods of intervention in financial markets.[27] The three indicator variables are summarized as follows:

- **War:** War captures the years from 1940–1951, which includes both World War II and its aftermath (the "war" years), when interest rates were controlled to finance the war and the subsequent reconstruction efforts. The coefficient indicates that government controls like those imposed during these years *reduced* real Canada yields by over 5.28% below where they would otherwise have been.[28,29]

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27 Indicator variables are sometimes referred to as "dummy" variables. The indicator variable in this case inserts a "1" for the years when a unique period of intervention in the financial markets is present, and a "0" for the years when it is not present.

28 We normally refer to these years of financial repression as periods when governments needed to get their war debt back to normal levels.

29 This is akin to the "World War II Interest Rate Bias" years in the U.S., as discussed in the Cost of Capital Navigator's U.S. Cost of Capital Module's "Resources Library" at kroll.com/cost-of-capital. From 1942 through 1951 the U.S. Treasury decreed that interest rates had to be kept at artificially low levels to reduce government financing costs related to World War II. See the "Risk-free Rate & Equity Risk Premium" methodology section. Subscription required.

- **Petro:** Petro captures the years 1972–1980, which were the global oil crisis years, when huge amounts of "petrodollars" were recycled from the suddenly rich Organization of the Petroleum Exporting Countries (OPEC) back to Western capital markets, thereby essentially acting as a tax to depress real yields. The coefficient indicates that this recycling and the oil crisis *reduced* real yields by about 3.63% below where they would otherwise have been.

- **Crisis:** Crisis captures the recent period of unconventional monetary policy from 2010 through 2021. The coefficient indicates that bond buying measures like those imposed from 2010–2021 taken primarily by central banks in the U.S., U.K., Eurozone, Japan and more recently Canada, *reduced* real yields by about 3.14% below where they would otherwise have been.

## Conclusions

There is a wealth of data on rates of return. These estimates are extremely useful in constraining the exercise of judgment, but they also assume that the process is stationary, which implies that estimating over longer time horizons delivers a better estimate of the equity risk premium.[30,31] However, the historical record also indicates that the average return on the government bond has not been constant and in particular imparts a noticeable bias when we average the data back versus forward; that is, we get a different interpretation based on how we order the data. For this reason, adding more data may not be as useful as understanding what has happened in the bond market.

In standard finance models the equity risk premium reflects the price of risk, as investors trade-off the higher expected return from the riskier security against its increased risk.[32] It may be plausible that this price of risk should be relatively constant, since it reflects the aggregate risk aversion of the investing public. However, in such models debt is in zero excess supply and there is no government or monetary policy. Yet, the dominant fact since the 1930s has been the growth in the size of government and regulation, and since 2008 the key players in capital markets have been the central banks.[33]

30 The historical equity risk premium has not been constant, primarily due to changes in the bond market over time. To some extent the huge cycle in Canadian bond yields increasing from the approximate 4% *average* level of 1957, after markets were liberalized, to the approximate 15% level of 1981, and back down to the approximate 4% level of 2007–2008 completed an adjustment to changes in fiscal versus monetary policy. However, since 2009 long Canada bond yields have dropped to the anomalous 1.9% average for 2021.

31 For a summary discussion of equity risk premium estimation methodologies and changing relationship between equities and the so-called risk-free security, refer to the Cost of Capital Navigator's U.S. Cost of Capital Module's "Resources Library" at kroll.com/cost-of-capital.

32 For example, the capital asset pricing model or CAPM.

33 A simple listing of the key government initiatives in the U.S. introduced by President Roosevelt's New Deal that have never been reversed would take several pages.

Overall, Professor Booth concludes:

- The historical Canadian equity risk premium as calculated over the time horizon 1926–2021 is somewhat below 5.0% (based on arithmetic mean returns) and lower than the approximate 6.0% arithmetic value for the U.S.[34,35,36]

- The approximate 5.0–6.0% range of the Canadian historical equity risk premium and the historical U.S. equity risk premium is generally consistent with survey data.[37]

- The drop in Canadian government bond yields (relative to U.S. government bond yields) has not translated into significantly lower borrowing costs for A-rated issuers in Canada relative to their U.S. counterparts. After 2002, except for periods of crisis, such as the 2008–2009 financial crisis, the 2011 Euro sovereign crises, and the onset of the COVID-19 pandemic in the first quarter of 2020, Canadian credit spreads have tended to be *wider* (i.e., larger) than those in the U.S., largely offsetting lower Canadian government bond yields.

- Using an indicator variable for the post-2009 years, a simple regression analysis indicates that current long-term Canadian government bond yields would be approximately 3.14% higher. These results suggest that at the end of December 2021, the spot yield of long-term Canadian Government bonds of 1.8% would have been approximately 4.9% (1.8% + 3.14%) in the absence of QE policies. Apart from the impact of higher government deficits, this is generally consistent with average yields observed during 2005–2008.

- Adding 4.9% to the historical equity risk premium in Canada of 5.0% implies an estimated base cost of equity capital in Canada of 9.9%, or (using the Bank of Canada's target inflation rate of 2.0%) a real equity return of 7.9%. This result is consistent with long-run averages. However, the latest survey data show a decrease in respondents' current base cost of equity in nominal terms.[38]

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34 The Canadian and U.S. equity risk premia reported in this Appendix 3C is calculated as the historical difference between the *total* returns of equities ("stocks") and the *total* returns of the risk-free security ("long-term government bonds"). If one were to use the income returns of the risk-free security, these ERP estimates would be higher.

35 Kroll employs a multi-faceted analysis to estimate a "conditional" ERP that considers a broad range of economic information and multiple ERP estimation methodologies to arrive at its recommendation. Kroll Recommended U.S. ERP as of December 31, 2021 was 5.5%, developed in relation to a 3.0% "normalized" risk-free rate, implying an 8.5% (3.0% + 5.5%) base cost of equity capital in the U.S. as of the end of 2021. To learn more about cost of capital issues, and to ensure that you are using the most recent Kroll Recommended ERP, visit kroll.com/cost-of-capital, and click "View historical equity risk premium recommendations".

36 There is no "perfect" way of estimating the equity risk premium, and D&P/Kroll therefore discusses (and publishes) equity risk premia based upon multiple calculation methodologies, including "historical" equity risk premia (i) for 16 different countries (including the U.S.) in the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/cost-of-capital. This methodology is in harmony with the methodology used in all yearly versions of the former Ibbotson/Morningstar *International Equity Risk Premium Report* (2000 –2013), and in all yearly versions of the former *Stocks, Bonds, Bills, and Inflation (SBBI) Valuation Yearbook* (1999–2013). Using this method, the equivalent arithmetic-average historical ERP would be 5.52% for Canada and 7.46% for the U.S. as of December 31, 2021.

37 A good example is Fernandez, Pablo and García de Santos, Teresa and Fernández Acín, Javier, Survey: Market Risk Premium and Risk-Free Rate Used for 95 Countries in 2022 (May 23, 2022). Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3803990

38 Ibid. According to the Fernandez et al. survey, in May 2022, the average of survey respondents was using an ERP of 5.7% for Canada, with a median of 5.6%. The average and median base cost of equity (i.e., risk-free rate + ERP) indications for Canada in *nominal* terms were 8.5% and 8.4%, respectively.

In 2019, Dr. Booth published an article where he reiterates the message of this appendix.[39] In this article, he argues that, in the current Canadian market conditions, using the historical Canadian ERP and Canadian spot risk free rate is inconsistent with the true level of risk in the market, since the risk-free rate is biased low as the base for any risk-return tradeoff absent central bank bond buying programs. He regards long term yields below 4.0% as anomalous and recommends adjusting the risk-free rate upward to a more appropriate level.

### Final Thoughts: Kroll Analysis on Methods of Estimating a Normalized Risk-free Rate

To corroborate Professor Booth's analysis of the Canadian government bond market and his observation that Canadian yields are currently abnormally low, Kroll conducted a separate analysis – similar to that prepared for the U.S. in a sister publication – on possible methods to normalize the risk-free rate.[40]

Estimating a normalized risk-free rate can be accomplished in a number of ways, including (i) simple averaging, or (ii) various "build-up" methods.

The first method of estimating a normalized risk-free rate entails calculating averages of yields to maturity on long-term government securities over various periods. This method's implied assumption is that government bond yields revert to the mean. In Exhibit 3C.5, the solid green line is the spot yield on long-term (greater than 10-year) Canadian government bonds (December 2007– August 2022), whereas the dashed dark gray line shows a 2.2% average monthly yield of the long-term (greater than 10-year) Canadian government bond over the previous 10 years ending on August 31, 2022. Canadian government bond spot yields at the end of August 2022 were significantly higher than the monthly average over the last 10 years.[41]

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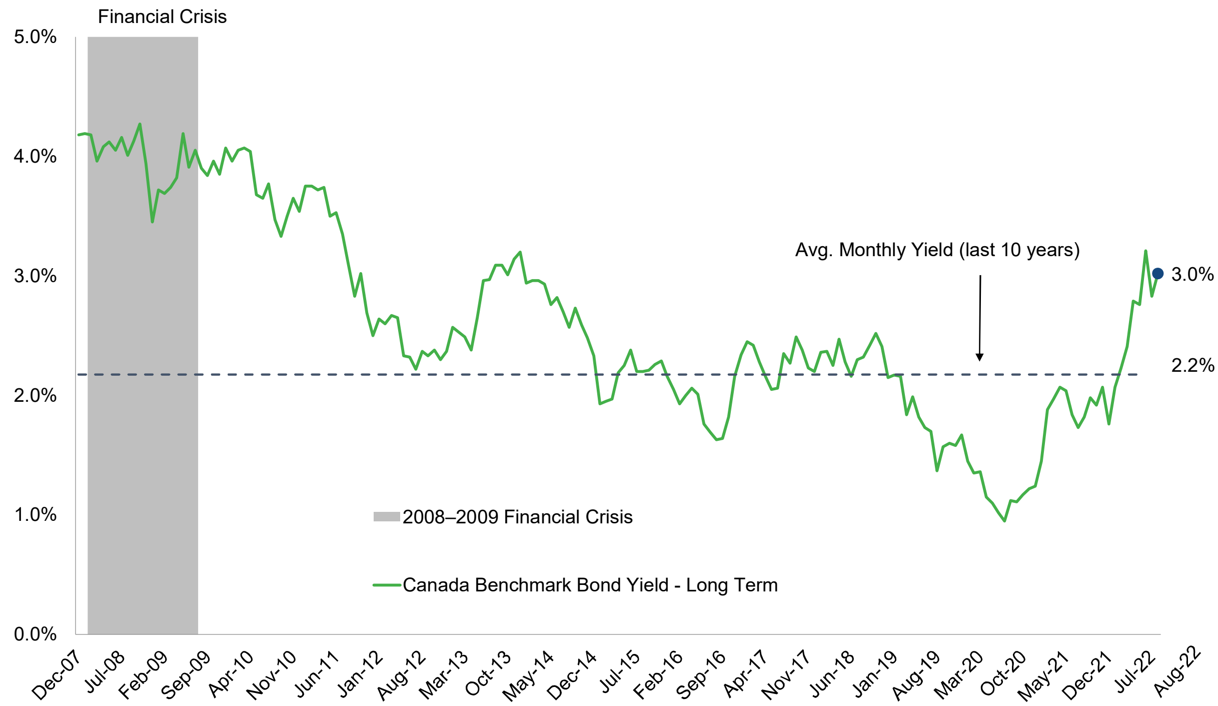
39 Booth, Laurence. "Estimating the Equity Risk Premium and Expected Equity Rates of Return: The Case of Canada." *Journal of Applied Corporate Finance* 31, no. 1 (2019): 113-125.

40 For a summary discussion of equity risk premium estimation methodologies and changing relationship between equities and the so-called risk-free security, refer to the Cost of Capital Navigator's U.S. Cost of Capital Module's "Resources Library" at kroll.com/cost-of-capital..

41 CANSIM (database), Bank of Canada (2020). Table 10-10-0139-01– Bank of Canada, money market, and other interest rates, daily percent. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1010013901.

**Exhibit 3C.5:** Spot and Average Yields on Long-Term (Greater than 10-year) Canadian Government Bonds December 2007–August 2022




**Source of Underlying data:** Bank of Canada

Taking the average over the last 10 years is a simple way of "normalizing" the risk-free rate. An issue with using historical averages, though, is selecting an appropriate comparison period that can be used as a reasonable proxy for the future.

The second method of estimating a normalized risk-free rate entails using a simple build-up method, where the components of the risk-free rate are estimated and then added together. Conceptually, the risk-free rate can be (loosely) illustrated as the return on the following two components:[42]

| | | | | |
|---|---|---|---|---|
| Risk-Free Rate | = | Real Rate | + | Expected Inflation |

42 This is a simplified version of the "Fisher equation", named after Irving Fisher. Fisher's "The Theory of Interest" was first published by Macmillan (New York), in 1930.

We assembled data from various sources for long-term Canadian government bonds, which are commonly used as inputs to cost of equity estimates, comparing the estimated normalized rates relative to the spot rates as of August 31, 2022. We present the results of this analysis in Exhibit 3C.6. Adding the estimated ranges for the "real" risk-free rate and longer-term inflation together produced an estimated normalized risk-free rate range of 2.0% to 5.0%, with a midpoint of 3.5% and a median of 3.7% for Canada.[43]

**Exhibit 3C.6:** Long-Term Spot and Normalized Risk-Free Rates for Canada as of August 31, 2022[44, 45]

| **Method 1: Long-Term Average** | | |
|---|---|---|
| Gov't of Canada Benchmark Bond Yields – Long-term: | | |
| - Spot Rate | 3.0% | |
| - Long-Term (10-year) Trailing Average Yield | 2.2% | |
| **Method 2: Fisher Equation** | **Range** | **Median** |
| Estimated Long-term Real Risk-Free Rate | -0.6% to 2.0% | 1.0% |
| Expected Long-term Inflation [46] | 2.6% to 3.0% | 2.7% |
| **Range of Estimates** | **2.0% to 5.0%** | **NMF** |
| Midpoint | 3.5% | 3.7% |
| **Concluded Normalized Risk-free Rate** | **3.5%** | |

43 While the overall conclusion for the normalized risk-free rate was 3.5% in June 2022, we have subsequently updated our guidance for Canada. Effective October 18, 2022, we recommend using the spot Government of Canada Benchmark Long-Term Bond yield as the proxy for the risk-free rate if the prevailing yield as of the valuation date is higher than our normalized Canadian risk-free rate of 3.5%. For the latest recommendations on Canada, please visit: https://www.kroll.com/en/insights/publications/cost-of-capital/normalized-risk-free-rate-guidance-united-kingdom-canada.

44 Sources for estimated real rate: Mendes, Rhys R. "The neutral rate of interest in Canada." No. 2014-5. *Bank of Canada Discussion Paper*, 2014; Reza, Abeer, and Subrata Sarker. "Is Slower Growth the New Normal in Advanced Economies?" *Bank of Canada Review 2015*, no. Autumn (2015), pp. 1-13; Williams, John C. 'Monetary policy in a low R-star world." *FRBSF Economic Letter 23*, 2016, pp. 1-23; Holston, Kathryn, Thomas Laubach, and John C. Williams. "Measuring the natural rate of interest: International trends and determinants." *Journal of International Economics*, vol. 108, 2017, pp. S59-S75 (data update as of August 2020 available here: https://www.newyorkfed.org/research/policy/rstar); Dorich, José, Abeer Reza, and Subrata Sarker. "An update on the neutral rate of interest." *Bank of Canada Review 2017*, no. Autumn, 2017, pp. 27-41; Chen, Xin Scott, and José Dorich. "The Neutral Rate in Canada: 2018 Estimates." No. 2018-22. *Bank of Canada*, 2018; Amiri, Suhail. "Natural Rate of Interest, Demographics and Income Inequalities". HEC Montréal, 2018; Carter, Thomas J., Xin Scott Chen, and José Dorich. "The Neutral Rate in Canada: 2019 Update." No. 2019-11. *Bank of Canada*, 2019; Matveev, Dmitry, Julien McDonald-Guimond, and Rodrigo Sekkel. "The Neutral Rate in Canada: 2020 Update." No. 2020-24. Bank of Canada, 2020; Davis, Josh, Cristian Fuenzalida, and Alan M. Taylor. "The Natural Rate Puzzle: Global Macro Trends and the Market-Implied R*". *NBER Working Paper No. w26560*, 2019; Ferreira, Thiago, and Samer Shousha. "Supply of Sovereign Safe Assets and Global Interest Rates". *International Finance Discussion Paper*, vol 2021, no. 1315, 2021, pp. 1-49. Board Of Governors of The Federal Reserve System; Wang, Bin, and Yum K. Kwan. "Measuring the natural rates of interest of OECD and BRICS economies: A time varying perspective". *Journal of International Money and Finance*, vol. 112, 2021 p. 102326; Brouillette, Dany, Guyllaume Faucher, Martin Kuncl, Austin McWhirter, and Youngmin Park. "Potential output and the neutral rate in Canada: 2021 update." No. 2021-6. *Bank of Canada*, 2021; Christensen, Jens HE, Glenn D. Rudebusch, and Patrick J. Shultz. "Accounting for Low Long-Term Interest Rates: Evidence from Canada". *Federal Reserve Bank of San Francisco Working Paper Series*, 2021, Federal Reserve Bank of San Francisco; Faucher, Guyllaume, Christopher Hajzler, Martin Kuncl, Dmitry Matveev, Youngmin Park, and Temel Taskin. "Potential output and the neutral rate in Canada: 2022 reassessment". No. 2022-3. *Bank of Canada*, 2022; Gray, Alexis, Roxane Spitznagel and Adam J. Schickling, "Resetting to a modestly higher neutral rate", *Vanguard Research – Megatrends*, June 2022.

45 Sources for expected long-term inflation: Consensus Forecasts: Global Outlook, August 2022; Economist Intelligent Unit, Global Forecast Services, August 2022; IHS Markit's long-term average CPI inflation forecasts for Canada, August 2022; IMF World Economic Outlook dated April 2022; Oxford Economics: Canada Country Economic Forecast dated August 2022; PwC's Global Economic Watch dated August 2022 .

Previously, the long-term average of government long-term bonds yields was an important input in developing our normalized risk-free rate conclusions for Canada. We believe that giving some weight to long-term averages was especially appropriate when the Bank of Canada's monetary policy was very accommodative, and inflation was close to the official target i.e., a 2.0% midpoint within an inflation-control range of 1.0% to 3.0%). However, given the rapid rise in inflation expectations and interest rates, we believe that long-term average yields of government bonds induce a downward bias, and therefore we are placing a lower weight on this method when arriving at our normalized risk-free rate conclusions.

For perspective, the annual consumer price inflation had averaged 1.8% in Canada over the 2011–2021 period on a rolling 12-month basis. By contrast, in recent months inflation has continued to surprise on the upside—reaching multidecade highs—with the recent Russia-Ukraine war exacerbating inflationary pressures, especially in energy prices. In addition, the long-term inflation expectations for Canada increased considerably in the last few months. The median long-term inflation expectations for Canada increased from 2.2% at the end of December 2021 to 2.7% at the end of August 2022. This significant change in outlook precipitated an important shift in the Bank of Canada's monetary policy stance relative to December 2021. The central bank adopted a more restrictive stance by: (i) raising its policy interest rate several times and signaling more hikes to come; and (ii) ending its QE programs.

How should the analyst use this information? One can calculate the cost of equity by either starting with a normalized risk-free rate or a spot rate. However, it's critical to match the second building block, the estimated ERP, to the selected risk-free rate. There must be internal consistency between these two inputs.

Adjustments to the ERP or to the risk-free rate are, in principle, a response to the same underlying concerns and should result in broadly similar costs of capital. Adjusting the risk-free rate in conjunction with the ERP is only one of the alternatives available when estimating the cost of equity capital.

For example, one could use a spot yield for the risk-free rate but increase the ERP or other adjustment to account for higher (systematic) risk. If the valuation analyst chooses to use the spot yield to estimate the cost of capital during periods when those yields are less than "normal", the valuation analyst must use an estimated ERP that is matched to (or implied by) those below-normal yields. However, we note that the most commonly used data sources for ERP estimates are long-term series measured when interest rates were largely not subject to such market intervention. Using those data series with an abnormally low spot yield creates a mismatch.

Alternatively, if the valuation analyst chooses to use a normalized risk-free rate in estimating the cost of capital, the valuation analyst must again use an estimated ERP that is matched to those normalized yields. Normalizing the risk-free rate is likely a more direct (and more easily implemented) analysis than adjusting the ERP due to a temporary reduction in the yields on risk-free securities, while longer-term trends may be more appropriately reflected.

As final through, if interest rates continue to move upwards to levels considered to be more normal (i.e., not kept artificially repressed through QE policies), the use of a normalized risk-free rate may cease to be as important when estimating a base cost of equity capital.

# Chapter 4
# Country Yield Spread Model

## Introduction

The Country Yield Spread Model is a practical adaptation of the CAPM to an international setting. This model was originally developed in U.S. Dollars (USD) in 1993 by researchers at investment bank Goldman Sachs.[1] In order to arrive at a USD-denominated cost of equity capital for each foreign country, a country risk premium (CRP) was added to the cost of equity capital derived for the domestic base country (the "home country").[2] In simple terms, the country risk was quantified as the spread between the foreign country's government bond yield denominated in USD and the U.S. government bond yield of the same maturity.[3]

The CRP results from the Country Yield Spread Model attempt to isolate the incremental risk premium associated with investing in another market (i.e., "foreign" country) other than the "home" country (i.e., the country in which the investor is based) as a function of the spread between the foreign country's sovereign yields and the home country's sovereign yields (both denominated in the home country currency).

The Country Yield Spread Model as presented herein starts by calculating observed yield spreads, but uses alternative analyses when countries do not issue publicly-traded government debt denominated in either USD or in EUR (see the section entitled "Methodology – Country Yield Spread Model").

## Brief Background on Euromoney's ECR Score[4]

Euromoney Country Risk (ECR) is an online community of economic and political experts that provides real time scores in categories that relate to economic, structural and political risk. The consensus expert scores, combined with scores on sovereign borrowers' access to international capital markets, together with data from the IMF/ World Bank on debt indicators, create the Euromoney Country Risk score for approximately 180 individual countries (updated monthly).

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1 Jorge O. Mariscal, and Rafaelina M. Lee, "The Valuation of Mexican Stocks: An Extension of the Capital Asset Pricing Model", 1993, Goldman Sachs, New York.

2 Throughout this book and in the Cost of Capital Navigator's International Cost of Capital Module at: kroll.com/costofcapitalnavigator, "investor perspective" (i.e., the "home" country; the country in which the investor is based) is defined by the currency in which the inputs used in each respective model are expressed. The investee country (the country in which the investment resides) is referred to as the "foreign" country.

3 The Country Yield Spread Model is also referred to as the "Sovereign" Yield Spread Model.

4 This section paraphrased from Institutional Investor's website country credit ratings "Methodology" page at: https://www.euromoney.com/country-risk/methodology#AboutUs.

ECR evaluates the investment risk of a country, such as risk of default on a bond, risk of losing direct investment, risk to global business relations etc., by taking a qualitative model, which seeks an expert opinion on risk variables within a country (90% weighting) and combining it with a basic quantitative value (10% weighting). The qualitative score is visible independently of the ECR score, and it reflects a snapshot of a country's current position.

The ECR score is displayed on a 100-point scale, with 100 being nearly devoid of any risk, and 0 being completely exposed to every risk. This is the same scale previously used by Institutional Investor.

To obtain the overall Euromoney Country Risk score, a weighting is assigned to five categories. The four qualitative expert opinions are political risk (35% weighting), economic risk (35%), structural risk (10%) and access to international capital markets (10%). The quantitative value comes from the sovereign debt indicators (10%).

In the model version presented herein, "monthly" CCR values are calculated with a simple interpolation between each country's semi-annual Institutional Investor CCRs. For example, if the published March 20XX CCR is 76 and the published September 20XX CCR is 70, then one would subtract (76 – 70) ÷ 6 = 1 from each intra-semi-annual period to calculate CCRs for months April through August 20XX.[5]

### Investor Perspectives

The CRPs derived from the Country Yield Spread Model are presented in the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator from two investor perspectives: (i) from the perspective of a U.S.-based investor and (ii) from the perspective of an investor based in Germany, who uses the Euro as their local currency. For CRPs calculated from the perspective of a German investor, the yields on German government debt instruments are used in all cases.[6]

Each of the two investor perspectives include approximately 180 investee countries each, with a corresponding CRP listed.[7] The CRPs are:

- Updated quarterly[8]
- Different for each investor perspective.

5 In this example, March, April, May, June, July, August, and September 20XX CCRs would be 76, 75, 74, 73, 72, 71, and 70, respectively.

6 It is not unusual for German securities to be used as proxies in these types of calculations. Germany is the largest economy in Europe, and in the Eurozone, therefore the yields on German government debt instruments are considered by market participants as the 'gold standard' for the risk-free security denominated in Euros.

7 Depending on data availability; some countries may not have adequate data available.

8 The Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator is updated quarterly, with data as of March 31, June 30, September 30, and December 31. The Country Yield Spread Model, the Relative Volatility Model and the Erb-Harvey-Viskanta Country Credit Rating (CCR) Model are updated quarterly, while International Equity Risk Premia are updated at year-end only. To learn more, visit kroll.com/costofcapitalnavigator.

This means that:

- If the valuation analyst's cash flows projections are denominated in U.S. Dollars, the valuation analyst should use the country risk analysis denominated in U.S. Dollars.

- If the valuation analyst's cash flows projections are denominated in Euros, the valuation analyst should use the country risk analysis denominated in Euros, if performing the analysis from a German investor perspective.

For example, a U.S.-based investor (i.e., cash flows projections are denominated in U.S. Dollars) who is valuing a business, business ownership interest, security, or intangible asset that is located in, say, India, would use the country risk premium analysis in the International Cost of Capital Module which is denominated in *U.S. Dollars*.

Alternatively, a German-based investor (i.e., cash flows projections are denominated in Euros) who is valuing a business, business ownership interest, security, or intangible asset that is located in, say, Brazil, would use the country risk premium analysis from the Country Yield Spread Model which is denominated in *Euros.* Note that an investor based in other countries within the Eurozone (e.g., Spain) investing in say, Brazil, could use the same CRP information in the Country Yield Spread Model provided that German government securities are being used as the basis for the risk-free rate when estimating the cost of equity for the subject company. This is because the analysis in the Country Yield Spread Model is all being conducted in Euros, calculated against German government debt yields.

In the following sections, the Country Yield Spread Model is described in detail.

### Country Yield Spread Model

The Country Yield Spread Model is expressed as follows:

$$k_{e,foreign\ country} = R_{f,home\ country} + \beta_{home\ country} \times ERP_{home\ country} + CRP$$

Where:

| | | |
|---|---|---|
| $k_{e,foreign\ country}$ | = | Cost of equity capital in the foreign country (denominated in the home country currency) |
| $R_{f,home\ country}$ | = | Risk-free rate on government bonds in the home country currency. "Home country" means either the (i) United States (if discount rate is being developed in USD) or (ii) Germany (if discount rate is being developed in Euros) |
| $\beta_{home\ country}$ | = | Beta appropriate for a company located in the home country in a similar industry as the foreign country's subject company (i.e., beta is measured using returns expressed in the home currency) |
| $ERP_{home\ country}$ | = | Equity risk premium of home country |
| $CRP$ | = | Country risk premium, in its general form, determined as the difference between the yield-to-maturity on a foreign country government bond issued in the home country's currency and the yield-to-maturity on a home country government bond with a similar maturity |

The Country Yield Spread Model has particular appeal where debt securities denominated in USD (or EUR) issued by the local country government can be observed (i.e., they are publicly traded). In that case, if the government debt instrument (of the foreign country) denominated in, say, U.S. Dollars has a higher yield than the yield observed on U.S. government debt of the same maturity, the yield difference may be looked upon as the market's pricing of country specific risk of default. This country-specific risk is clearly not included in the U.S.-based risk premium, so it must be added separately.[9]

[9] An alternative way of looking at this is that the analyst would be double-counting country risk if the yield on the foreign country's government debt were used in the Country Yield Spread Model equation (instead of the home country's risk-free rate). This is because the "country risk premium" is assumed to be embedded in the foreign country's sovereign yield by the model itself, when that country's debt is not perceived to be risk-free by market participants.

At first glance, the risk of government default is correlated with, and arguably a proxy for, one type of country risk. Emerging market countries tend to default on their sovereign debt when their economic conditions deteriorate, and bond betas for sovereign debt are a meaningful indicator of their relative risks.[10]

However, researchers have found that sovereign yield spreads measure not just default risk, but also capture stock market risk:[11]

> *"Sovereign ratings are used to evaluate the credit risk of the country. The rating considers, in particular, the factors that affect a country's ability to fulfil its obligations of the issued bonds in time and in full. These are primarily financial indicators like the level of debt, deficit, debt or deficit to GDP, etc. On the other hand, bond spreads are used to measure the country risk not only on the bond market, but also on the stock market. The spreads are more sensitive to market changes and are characterized by higher volatility."*

Furthermore, the level a country's observed yield spread depends on the level of integration of its sovereign bond market into global markets. Recent research shows that local characteristics drive sovereign bond market integration: (1) political stability; (2) credit quality; (3) macroeconomic conditions, including, inflation and real economic activity; and (4) liquidity. Integration of sovereign bond markets increases by about 10% on average, when a country moves from the 25th to the 75th percentile in terms of higher political stability and credit quality, lower inflation and inflation risk, and lower illiquidity. The 10% increase in integration leads to a decrease in the sovereign cost of funding of about 1% per annum on average across the countries analyzed.[12]

Exhibit 4.1 shows a sampling of observed yield spreads as of March 31, 2022.

**Exhibit 4.1:** Sample Country Yield Spreads as of March 31, 2022

| | USD-Perspective (%) | EUR-Perspective (%) |
|---|---|---|
| Brazil | 3.3 | 4.2 |
| Indonesia | 1.5 | 1.8 |
| Israel | 1.2 | 1.2 |
| Romania | 2.3 | 3.9 |
| South Africa | 4.2 | 2.6 |
| Turkey | 5.5 | 5.4 |

10 Borri, Nicola and Verdelhan, Adrien, "Sovereign Risk Premia" (September 14, 2011). AFA 2010 Atlanta Meetings Paper, Available at SSRN: https://ssrn.com/abstract=1343746 or http://dx.doi.org/10.2139/ssrn.1343746.

11 Chovancová, Božena, Peter Árendáš, Patrik Slobodník, and Iveta Vozňáková. "Country Risk at Investing in Capital Markets – The Case of Italy." *Problems and Perspectives in Management* 17, No. 2 (2019): 440.

12 Chaieb, Ines, Vihang Errunza, and Rajna Gibson Brandon. "Measuring Sovereign Bond Market Integration. "*The Review of Financial Studies*" 33, No. 8 (2020): 3446-3491.

## Potential Weaknesses of the Country Yield Spread Model

There are several potential issues with the Country Yield Spread Model approach:[13]

- In some cases, the local *government's* credit quality may be a very poor proxy for risks affecting *business* cash flows.

- This approach may double-count country-level risks that are already incorporated into projections of expected cash flows.

- A method based on spot observed yield is prone to be more volatile from period to period than, for example, a country risk estimated via the Country Credit Rating Model. The point is to be aware of extremes in yields. This may cause the spread method to have extreme indications in some crisis environments.

- Debt is typically less volatile than equity, so by using debt yields as the reference point, this method inherently could underestimate equity risk.

- Depending on facts and circumstances, the yield spread method may, in fact, be less appropriate in industries that are global in nature (integrated oil, chemicals, mining and minerals, other global sectors) where *country* is less important than *industry/sector*. This would also be true of other models that are focused on capturing country risk.

During the financial crisis that began in 2008, observed yield spreads increased, dramatically so, for certain countries. As of September 30, 2009, yield spreads on *higher* credit rating countries' debt had mostly returned to pre-crisis levels, whereas the observed yield spreads on lower credit rating countries' debt, while subsiding from their crisis peak levels, remained somewhat high. The Euro sovereign debt crisis that started in 2010, reaching its peak in 2012, caused yield spreads in lower-rated countries to go up significantly again. A similar trend was observed with the outbreak of COVID-19 and the concurrent collapse of global oil prices. The coronavirus heath crisis was declared a pandemic by the World Health Organization on March 11, 2020. Many emerging and frontier markets saw their sovereign yield spreads surge after that. In particular, countries heavily dependent on oil revenues felt the double impact of COVID-19 and the plunge in oil prices, with their sovereign yield spreads surging through the end of March 2020.

Exhibit 4.2 shows the changes in observed yield spreads by debt quality (investment grade versus non-investment grade) at each quarter end from December 2007 to March 2022. Note the marked increase in risk indicated by this model in March 2020 at the onset of the COVID-19 pandemic.

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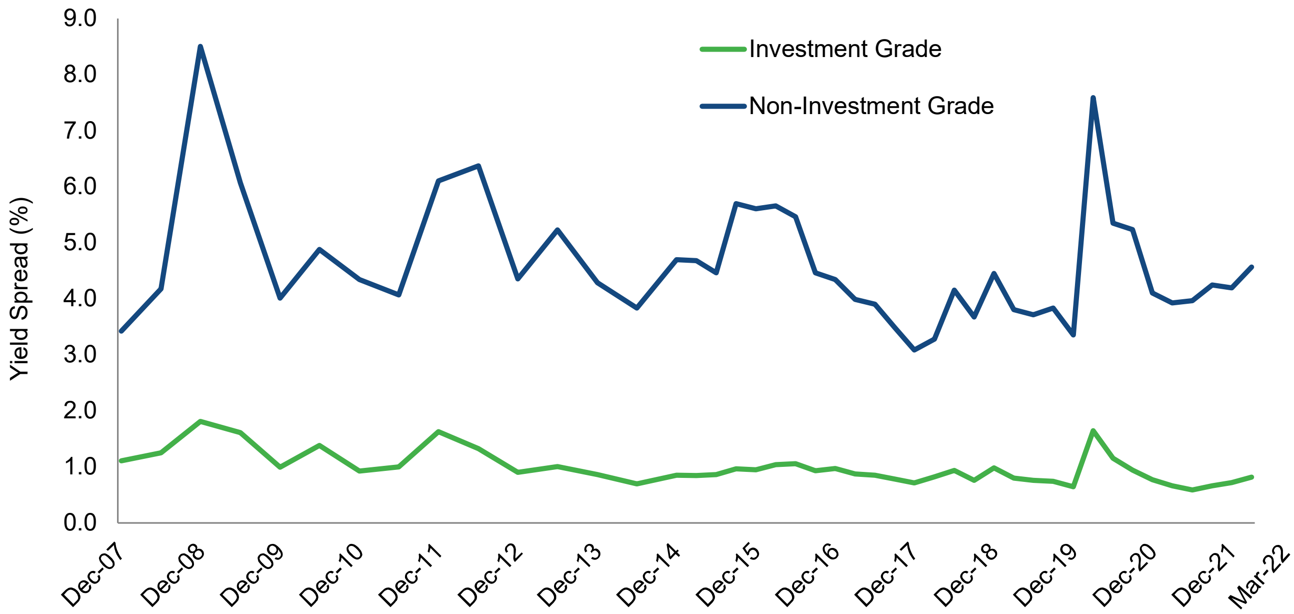
13 Between quarterly updates of the Cost of Capital Navigator's International Cost of Capital Module, an additional adjustment to the provided country risk premium data is warranted for countries whose sovereign debt credit rating is upgraded or downgraded intra-year. Additional analyses may be necessary, due to the timing of the update versus recent developments in the specific country. To learn more, visit kroll.com/costofcapitalnavigator.

**Exhibit 4.2:** Observed Yield Spreads By S&P Country Credit Rating (Investment Grade versus Non-Investment Grade) from December 2007 through March 2022 (in USD)




## Methodology – Country Yield Spread Model

The CRPs presented in the Cost of Capital Navigator's International Cost of Capital Module that are derived under the Country Yield Spread Model based on a four-tiered algorithm (in the following order of preference):

- **Tier 1 CRPs:** Tier 1 CRPs are, by definition, 0.0%. In all cases in which a foreign country has an S&P credit rating of AAA, the country is assumed to have a CRP of 0.0%. In addition, despite having been downgraded to AA+ by S&P in 2011, our analysis treats the U.S. as if it were an AAA-rated country (see rationale behind this assumption later in this chapter).

- **Tier 2 CRPs:** Tier 2 CRPs are based on observed yield spreads. Tier 2 CRPs can be calculated when the foreign country has sovereign bonds denominated in either USD or EUR (depending on the investor perspective being analyzed). When this is true, the foreign country sovereign bond with the longest maturity is selected.[14] The yield of an equivalent U.S. or German government security (depending on the investor perspective being analyzed) of the same (or similar) maturity is then subtracted from the yield of the foreign country sovereign bond to arrive at the CRP.

[14] Foreign country bond is screened for the longest maturity USD (or EUR) fixed coupon bullet bond, with no callable features or make-whole provisions, and for which a U.S. or German government security of similar maturity exists.

- **Tier 3 CRPs:** Tier 3 CRPs are based on a regression of S&P sovereign credit ratings and observed yield spreads. This method is employed when the foreign country does *not* have publicly traded sovereign bonds denominated in either USD or EUR (depending on the investor perspective being analyzed), but *does* have an S&P sovereign credit rating. In this method, all observed yield spreads (i.e., Tier 2 CRPs as the *dependent* variable; the variable being predicted) are regressed against a numerical equivalent of each of the respective country's S&P sovereign credit rating (as the *independent* variable; the "predictor" variable). Then, the resulting regression equation is used to estimate a Tier 3 CRP for all foreign countries with an S&P sovereign credit rating, but no observable yields.

- **Tier 4 CRPs:** Tier 4 CRPs are based on a regression of Euromoney country risk (ECR) scores and observed yield spreads. This method is employed when the foreign country does *not* have publicly traded sovereign bonds denominated in either USD or EUR (depending on the investor perspective being analyzed), and does *not* have an S&P sovereign credit rating.

  In this method, all Tier 2 CRPs (as the *dependent* variable; the variable being predicted) are regressed against Tier 2 CRP countries' ECR score (as the *independent* variable; the "predictor" variable). Then, the resulting regression equation is used to estimate a Tier 4 CRP for all foreign countries with no observable yields and no S&P sovereign credit rating.

Whether the estimated CRPs were categorized as "Tier 1", "Tier 2", "Tier 3", or "Tier 4" CRPs is reported in the Resources section of the International Cost of Capital Module. Exhibit 4.3 illustrates this concept. For example, as of December 2019, Sierra Leone's CRP was derived in Tier 4 calculations, indicating that as of the December 2019 calculations, Sierra Leone did not have an observable yield spread, and also did not have an S&P sovereign credit rating.

Alternatively, as of March 2020, Singapore's CRP was derived in Tier 1 calculations, indicating that as of the March 2020 calculations, Singapore had an S&P sovereign credit rating of "AAA", and thus the CRP is assumed to be 0.0%.

**Exhibit 4.3:** Country Yield Spread Model CRP Categorization by "Tier"
Investor Perspective: Germany (EUR)

| Investee Country | Dec-2018 | Mar-2019 | June-2019 | Sept-2019 | Dec-2019 | Mar-2020 |
|---|---|---|---|---|---|---|
| Senegal | 3 | 3 | 3 | 3 | 3 | 3 |
| Serbia | 2 | 2 | 2 | 2 | 2 | 2 |
| Seychelles | 3 | 3 | 3 | 3 | 3 | 3 |
| Sierra Leone | 4 | 4 | 4 | 4 | 4 | 4 |
| Singapore | 1 | 1 | 1 | 1 | 1 | 1 |

## Why Is the United States Being Treated as a 'AAA' Rated Country?

On August 5, 2011, S&P's Ratings Services lowered its long-term sovereign credit rating on the United States to "AA+" from "AAA". S&P indicated that lowering the U.S. rating was prompted by S&P's view on the rising U.S. public debt burden and S&P's perception of greater policymaking uncertainty. On the other hand, S&P stated that their opinion of the U.S. federal government's other economic, external, and monetary credit attributes, which form the basis for the sovereign rating, were broadly unchanged.

This move triggered a number of discussions around the finance community on whether or not the U.S. sovereign debt could still be considered "risk-free." If U.S. government bond yields are no longer deemed risk-free, then issues arise regarding a key input to corporate finance and valuation models. This would also impact the current methodology we use to estimate country risk premia.

We believe that for the short- and medium-term the U.S. government will continue to be perceived by market participants as risk-free. The following are some reasons supporting that belief (this is a non-exhaustive list):

- **S&P's rating opinion differs from that of other rating agencies:** The other two major rating agencies, Moody's and Fitch Ratings, have reaffirmed the United States sovereign rating as AAA. On August 2, 2011, Moody's confirmed the Aaa government bond rating of the United States following the raising of the statutory debt limit on August 2. Similarly, on August 16, 2011, Fitch Ratings confirmed the U.S.'s AAA credit rating after evaluating Congress's agreement to raise the U.S's debt ceiling. These decisions have been reaffirmed several times since then by both Moody's and Fitch Ratings.

- **Flight-to-quality:** The week following S&P's downgrade, signs of a global economic slowdown resurfaced. Financial markets reacted by moving away from risky securities, such as equities and high yield debt, into U.S. government debt securities, in search for a safe haven. As a result, the yields on U.S. Treasuries (which have an inverse relationship to price) declined significantly and continued to do so through August 2011. While U.S. government bond yields are now above their record lows reached in 2016, interest rates still remain at what are arguably historically low levels. For instance, the 20-year U.S. government bond yield was 1.15% as of March 31, 2020, while the average monthly yield for the 20-year U.S. government bond over the last ten years (April 2010 – March 2020) was 2.8%.[15]

- **Lack of alternatives:** U.S. Treasury's market liquidity is unparalleled to any other government security. According to Fitch Ratings, daily trading volumes in 2011 of U.S. Treasuries ($580 billion) were almost 10 times higher than that of U.K. gilts ($34 billion)

[15] For a more detailed discussion about the U.S. equity risk premium (ERP) and U.S. risk-free rates, see the Cost of Capital Navigator's U.S. Cost of Capital Module's "Resources Library" at kroll.com/costofcapitalnavigator. Specifically, refer to the "Risk-free Rate & Equity Risk Premium" methodology section.

and German bunds ($28 billion) combined. In a report,[16] Fitch Ratings indicated that this deep market liquidity enables holders to convert U.S. Treasury securities into Dollars with negligible transaction costs, irrespective of market conditions. Fitch also stated that the size of the U.S. Treasury securities market at that time ($9.3 trillion) was roughly five times the size of French ($1.9 trillion), U.K. ($1.8 trillion), and German ($1.6 trillion) government bond markets. In 2016, an analysis from the U.S. Department of the Treasury stated that:[17]

> ***"The U.S. Treasury market is the deepest and most liquid government securities market in the world.*** *Treasuries play a unique role in the global economy, serving as the primary means of financing the U.S. federal government, a critical store of value and hedging vehicle for global investors and savers, the key risk-free benchmark for other financial instruments, and an important conduit for the Federal Reserve's implementation of monetary policy." [Emphasis Added]*

In the following section, three examples for estimating cost of equity capital are presented using Country Yield Spread Model CRPs:[18]

- **Example 4-1:** Estimating base country-level cost of equity capital assuming an investment in the foreign country's "market" *as a whole* (i.e., an assumed beta of 1.0), using *published* values.

- **Example 4-2:** Estimating base country-level cost of equity capital assuming an investment in the foreign country's "market" *as a whole* (i.e., an assumed beta of 1.0), using the valuation analyst's *own* estimate of his/her home country's base country-level cost of equity capital.

- **Example 4-3:** Estimating cost of equity capital for use in evaluating a subject business, asset, or project.

## Using Country Yield Spread Model CRPs to Estimate Base Country-level Cost of Equity Capital

The CRPs derived from the Country Yield Spread Model can be used by the analyst to calculate base country-level cost of equity capital estimates for any of the over 175 countries listed in the International Cost of Capital Module from the perspective of (i) a U.S.-based investor and (ii) an investor based in Germany.[19]

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16 "U.S. Treasuries Expected to Remain Global Benchmark", Fitch Ratings, July 27, 2011.

17 Clark, James and Gabriel Mann, "A Deeper Look at Liquidity Conditions in the Treasury Market", Treasury Notes blog, May 6, 2016. For the full analysis, visit: https://www.treasury.gov/connect/blog/Pages/A-Deeper-Look-at-Liquidity-Conditions-in-the-Treasury-Market.aspx.

18 For additional examples estimating cost of equity capital, please refer to the complementary CFA Institute webinar entitled "Quantifying Country Risk Premiums", presented on December 6, 2016 by James P. Harrington and Carla S. Nunes, CFA. This webcast can be accessed here: https://www.cfainstitute.org/en/research/multimedia/2016/quantifying-country-risk-premiums.

19 Note that an investor based in other countries within the Eurozone (e.g., Spain) investing in say, Brazil, could use the same CRP information, provided that German government securities are being used as the proxy for the risk-free security when estimating

By “base country-level cost of equity capital estimate” we mean an estimate of cost of equity capital in foreign Country Y from the perspective of home Country X; this can be thought of as the sum of the risk-free rate plus the equity risk premium in the foreign country, but denominated in the home country’s currency.

Note that a base country-level cost of equity capital estimated in this fashion assumes an investment in the “market” of the foreign country as a whole, *and does not include any adjustment for company/industry risk*.

This is equivalent to substituting a beta of 1.0 (i.e., the market’s beta) into the Country Yield Spread Model formula:

$$k_{e,foreign\ country} = R_{f,home\ country} + \beta_{home\ country} \times ERP_{home\ country} + CRP$$

$$k_{e,foreign\ country} = R_{f,home\ country} + 1.0 \times ERP_{home\ country} + CRP$$

The analyst can develop a base country-level cost of equity capital estimate for a foreign country derived by (i) using home country base country-level cost of equity capital estimates *published* herein, or (ii) the analyst’s *own* custom estimate of the home country base country-level cost of equity capital.

**Example 4-1:** Estimating base country-level cost of equity capital from the perspective of an investor based in Germany investing in Brazil's “market” *as a whole* (i.e., an assumed beta of 1.0), using *published* values, as of March 2020.

Estimating cost of equity in this example is a four step process:

**Step 1:** In the International Cost of Capital Module, select Germany as your “Investor Perspective” country

**Step 2:** Identify the base country-level cost of equity capital for an investor based in Germany *investing in Germany* as a whole as of March 2020 (as calculated within the context of the Erb-Harvey-Viskanta Country Credit Rating Model, presented in the Resources section of the International Cot of Capital Module).[20] As of March 2020, the base country-level cost of equity capital for an investor based in Germany *investing in Germany* as a whole is 6.4%.

the cost of equity for the subject company. This is because the analysis is all being conducted in Euros, calculated against German government debt yields.

20 Base country-level cost of equity capital estimates are presented in the “Base Cost of Equity Over Time” for each of 56 different investor perspectives, based on the Erb-Harvey-Viskanta Country Credit Rating Model. Base country-level cost of equity capital estimates are not presented within the International Cost of Capital Module itself, but are available to subscribers in the Cost of Capital Navigator’s Resources Library.

**Step 3:** Identify the Country Yield Spread Model CRP as of March 2020 from the perspective of a German investor, investing in Brazil. As of March 2020, the CRP was 3.5%.

**Step 4:** Add the CRP from Step 3 to the base country-level cost of equity capital for an investor based in Germany investing in the German *market as a whole* identified in Step 2 (6.4% + 3.5%). The result (9.9%) is the base country-level cost of equity capital estimate for an investor based in Germany investing in the Brazilian market *as a whole* as of March 2020.

**Example 4-2:** Calculate the base country-level cost of equity capital estimate for an investor based in the U.S. investing in the Brazilian market *as a whole* (i.e., can assume beta of 1.0)*,* as of March 2020, using the valuation analyst's *own* estimate of his/her home country's base country level cost of equity capital.

Financial professionals often come to different conclusions as far as cost of capital (and the inputs for its components) is concerned. For example, as of March 31, 2020 Kroll's internal estimate of base country-level cost of equity capital for a U.S. investor investing in the U.S. market *as a whole* is 9.0% (based on a *normalized* risk-free rate of 3.0% and a conditional ERP of 6.0%).[21] Using this custom estimate, base country-level cost of equity capital for an investor based in the U.S. investing in Brazil as of March 2020 is a three-step process:

**Step 1:** In this example, the valuation analyst's *own* custom estimate of base country level cost of equity capital for an investor based in the U.S., *investing in the U.S.,* is 9.0%.

**Step 2:** Identify the Country Yield Spread Model CRP as of March 2020 from the perspective of an investor based in the U.S., investing in Brazil. As of March 2020, the CRP was 4.6%.

**Step 3:** Add the CRP from Step 2 to the base country-level cost of equity capital for an investor based in the U.S. investing in the U.S. *market as a whole* identified in Step 1 (9.0% + 4.6%). The result (13.6%) is the base country-level cost of equity capital estimate for an investor based in the U.S. investing in the Brazilian *market as a whole* as of March 2020.

Again, the base country-level cost of equity capital estimates in Example 4-1 and Example 4-2 assumes an investment in the foreign country's market *as a whole* (i.e., a beta of 1.0) *<u>and do not include any adjustment for company/industry risk</u>.*

[21] For more information on the equity risk premium, risk-free rates, the size effect, and other valuation issues, visit: www.kroll.com/en/cost-of-capital. Kroll regularly reviews fluctuations in global economic and financial market conditions that warrant a periodic reassessment of the ERP. To ensure you are always using the most recent recommendation, check www.kroll.com/en/cost-of-capital.

## Using Country Yield Spread Model CRPs to Estimate Cost of Equity Capital for Use in Evaluating a Subject Business, Asset, or Project

The ability to estimate base country-level cost of equity capital from the perspective of an investor in Country X into Country Y's *market as a whole* (as was done in Examples 4-1 and 4-2) is very valuable information that can be used for *benchmarking* and *support* purposes. Most of the time, however, valuation analysts are developing discount rates for use in evaluating a subject *business*, *asset*, or *project*.

For example, valuation analysts are often confronted with the following problem: "I know how to value a company in the United States, but this one is in Country ABC, a developing economy. What should I use for a discount rate?" Can the CRP be used as an input in developing cost of equity capital estimates for, say, a company that operates in GICS 3030 (household & personal products) in a different country? Yes, but it is important to understand the assumptions one is making when doing this.

Using the household & personal products company as an example, an analyst typically would develop discount rates for this company *as if it were located in* the "home" country, and then add a CRP to account for the differences in risk between the home country, and the country in which the household & personal products company is *actually* located (i.e., the investee or "foreign" country).

The implied assumption in this analysis is that what it means to be a household & personal products company in the home country means the same thing as being a household & personal products company in the foreign country. Some questions that the analyst may wish to consider:

- Are the risks of being a household & personal products company in the foreign country the *same* as the risks of being a household & personal products company in the home country?

- Does a household & personal products company in the foreign country have the *same* beta ($\beta$) as a household & personal products company in the home country?[22]

- Does the household & personal products company in the foreign country operate in a different industry environment from a household & personal products company in the home country?

- Did the analyst apply any additional adjustments when the discount rate was developed for the household & personal products company *as if it were located in* the home country? For example, was a size premium applied? "Large company" and "small company" can mean very different things from country to country. For example, a smaller-sized company in the U.S. or Germany may be a "large" company in Estonia or Norway.

[22] Beta (β) is a measure of systematic risk used as an input in some methods of estimating cost of equity capital (e.g., the CAPM requires a beta).

Valuation analysis is an inherently comparative process, so questions like these are no different from the type of questions that are asked in any valuation analysis. For example, a subject company might be compared to a set of companies (i.e., peer group, or comparables) that possess characteristics that are arguably similar to the characteristics of the subject company. To the degree that the subject company and the peer group *do* have differences, further adjustment(s) may be required.

The process for using the information in the International Cost of Capital Module for estimating cost of equity capital for a subject *business*, *asset*, or *project*, is quite similar to developing base country-level cost of equity capital (as was done in Examples 4-1 and 4-2). The difference is that *additional* adjustments may be necessary, as outlined earlier.

In the case of our household & personal products company located in the foreign country, the "peer group" is household & personal products companies in the home country, and to the extent that a household & personal products company located in the foreign country is different (other than location), further adjustments may be required. Again, the CRP attempts to isolate the incremental risk premium associated with investing in another market *as a whole*, without regard to differing *industry* risks or other risks that may be particular to that type of business in the foreign country.

**Example 4-3:** Estimate cost of equity capital for a company in Belgium that operates in GICS 3030 (household & personal products) as of March 2020, from the perspective of an investor based in the U.S.

Estimating cost of equity in this example is a three-step process:

**Step 1:** Calculate a cost of equity capital estimate for a household & personal products company located in the U.S. For the purposes of this example, assume 8.0%.[23]

**Step 2:** Identify the Country Yield Spread Model CRP as of March 2020 from the perspective of an investor based in the U.S., investing in Belgium. As of March 2020, the CRP was 0.3%.

**Step 3:** Add the CRP identified in Step 2 to the cost of equity capital estimate for a household & personal products company in the U.S. estimated in Step 1 (8.0% + 0.3%). The result (8.3%) is the cost of equity capital estimate for an investor based in the U.S. investing in a household & personal products company located in Belgium, *prior* to any adjustments due to intrinsic differences in the household & personal products industry environment (or other risks) between the U.S. and Belgium.

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[23] An excellent source of international industry statistics (including cost of equity capital estimates and peer group betas for use in CAPM estimates) is the Cost of Capital Navigator's International Industry Benchmarking Module. The International Industry Benchmarking Module includes industry-level analyses for: (i) the World, (ii) the European Union, (iii) the Eurozone, and (iv) the United Kingdom in three currencies: (i) the euro (€ or EUR), (ii) the British pound (£ or GBP), and (iii) the U.S. dollar ($ or USD). Includes industry-level cost of equity, debt, and WACC estimates, performance statistics, valuation multiples, levered and unlevered betas, capital structure, profitability ratios, equity returns, aggregate forward-looking earnings-per share (EPS) growth rates, and additional statistics. To learn more, visit kroll.com/costofcapitalnavigator.

# Chapter 5
# Relative Volatility Model

## Relative Volatility Model

In the Relative Volatility Model (originally developed for segmented capital markets), the traditional beta is replaced by a modified beta.[1] The modified beta is a result of multiplying the selected subject company beta by the ratio of the volatility of the foreign equity market to the volatility of the home market's benchmark market index. An alternative version, which we present herein (and which produces the same net result), is to adjust the home country's market equity risk premium by this relative volatility (RV) factor.

The RV factor attempts to isolate the incremental risk premium associated with investing in the foreign country as a function of the relative volatility of the foreign country's equity market and the home country's equity market.

The Relative Volatility Model can be expressed as follows:[2]

$$k_{e,foreign\ country} = R_{f,home\ country} + \beta_{home\ country} \times ERP_{home\ country} \times Relative\ Volatilty$$

Where:

| | | |
|---|---|---|
| $k_{e,foreign\ country}$ | = | Cost of equity capital in the foreign country (denominated in the home country currency) |
| $R_{f,home\ country}$ | = | Risk-free rate on government bonds in the home country currency. "Home country" means either the (i) United States (if discount rate is being developed in USD) or (ii) Germany (if discount rate is being developed in Euros) |
| $\beta_{home\ country}$ | = | Beta appropriate for a company located in the home country in a similar industry as the foreign country's subject company (i.e., beta is measured using returns expressed in the home currency) |

1 "Segmentation" in this context refers to markets (i.e., economies) that are not fully integrated into world markets (i.e., to some degree isolated from world markets). Markets may be segmented due to a host of issues, such as regulation that restricts foreign investment, taxation differences, legal factors, information, and trading costs, and physical barriers, among others.

2 Versions of this model have been published by MIT professor Donald Lessard (see Donald Lessard, "Incorporating Country Risk in the Valuation of Offshore Projects", *Journal of Applied Corporate Finance* (Fall 1996): 9(3), 52–63) as well as by analysts at Goldman Sachs and Bank of America, Stephen Godfrey and Ramon Espinosa, "A Practical Approach to Calculating Costs of Equity for Investments in Emerging Markets", *Journal of Applied Corporate Finance* (Fall 1996): 80–89.

| | | |
|---|---|---|
| $ERP_{home\ county}$ | = | Equity risk premium of home country |
| *Relative Volatility* | = | In its general form, determined as the ratio of the annualized monthly standard deviation of the foreign country equity returns (denominated in home country currency) relative to the annualized monthly standard deviation of the home country equity returns (denominated in home country currency) |

This approach has appeal in cases where the stock market in the foreign country is relatively diversified. If the foreign country's stock market has greater volatility than the U.S. stock market (or the German stock market, depending on the investor perspective being employed), that greater volatility may be evidence of differences in country-level market risk and, therefore, may indicate that the cost of equity capital estimate should incorporate a country risk premium. The adjustment shown re-scales a home country equity risk premium to foreign country volatility.

### Potential Weaknesses of the Relative Volatility Model

This approach has two primary potential issues:

- The observed difference in volatilities may reflect mostly a difference in the composition of the subject country's economy and particular concentration in certain industries (e.g., lots of natural resources but not many service businesses). This is not a country effect but an industry effect. It is incorrect to apply it to other industries.

- This adjustment is troublesome when the investor (e.g., a multi-national firm) clearly has access to global markets.

Again, some countries do not have local stock markets, or their stock markets are so thin (small volumes of trading moves the market up or down with wide swings) that observed variance in returns may not be representative of the true risk from that country. For certain "frontier" countries, the opposite occurs: the local stock markets have very little trading volume, but prices move very little. This means that the equity market volatility is much lower than would be expected for a liquid stock market of a mature market, resulting in a RV factor close to, or even lower than 1.0. In such cases, relying on the Relative Volatility Model would potentially result in a significantly underestimated cost of equity capital.

### Investor Perspectives

The RV factors derived from Relative Volatility Model are presented in the International Cost of Capital Module from two investor perspectives: (i) from the perspective of a U.S.-based investor, wherein the RV factor is calculated as the standard deviation of the equity returns of the foreign country (the "investee" country; the country in which the investment is located) divided by the standard deviation of the equity returns of the U.S., and (ii) from the perspective of a German investor in which EUR is the local currency, wherein the RV factor is calculated as the standard deviation of the equity returns of the foreign country divided by the standard deviation of the equity returns of Germany.[3]

Each of the two investor perspectives include over 70 investee countries each, with a corresponding RV factor listed. The RV factors are:

- Updated quarterly[4]

- Different for each investor perspective.

This means that:

- If the valuation analyst's cash flow projections are denominated in U.S. Dollars, the valuation analyst should use the country risk analysis denominated in U.S. Dollars.

- If the valuation analyst's cash flow projections are denominated in Euros, the valuation analyst should use the country risk analysis denominated in Euros, if performing the analysis from a German investor perspective.

For example, a U.S.-based investor (i.e., cash flow projections are denominated in U.S. Dollars) who is valuing a business, business ownership interest, security, or intangible asset that is located in, say, India, would use country risk analysis in which is denominated in *U.S. Dollars*.

Alternatively, a Germany-based investor (i.e., cash flow projections are denominated in Euros) who is valuing a business, business ownership interest, security, or intangible asset that is located in Brazil, would use country risk analysis in which is denominated in *Euros.* Note that an investor based in other countries within the Eurozone (e.g., Spain) investing in Brazil, could use the same RV factor information, provided that a German risk-free rate and equity risk premium (ERP) are being used as inputs when estimating the cost of equity for the subject company. This is because the analysis is all being conducted in *Euros*, calculated against Germany's equity market volatility.

3 It is not unusual for German securities to be used as proxies in these types of calculations. For example, the yields on German government debt instruments are considered by market participants as the 'gold standard' for the risk-free security denominated in Euros. Germany is the largest economy in Europe.

4 The Cost of Capital Navigator's International Cost of Capital Module provides measures of relative country risk (updated quarterly since March 2014) for over 175 countries from the perspective of investors in over 50 countries based upon (i) the Country Yield Spread Model, (ii) the Relative Volatility Model and (iii) the Erb-Harvey-Viskanta Country Credit Rating (CCR) Model. Additional data includes equity risk premia (ERPs) for 16 countries, risk-free rates and industry betas for developed markets, long-term inflation expectations, and tax rates. To learn more and to subscribe, visit kroll.com/costofcapitalnavigator.

### Methodology – Relative Volatility Model

MSCI Global Equity Indices for a total of 74 countries are used in calculating the Relative Volatility Model.[5,6]

In all cases presented herein, annualized monthly standard deviation of equity returns is calculated using the following formula:

$$\textit{Annualized Monthly Standard Deviation} = \sqrt{\left[\sigma_n^2 + \left(1+\mu_n\right)^2\right]^n - \left(1+\mu_n\right)^{2n}}$$

Where:

| | | |
|---|---|---|
| $\sigma_n$ | = | Standard deviation of $n$-period returns |
| $\mu_n$ | = | Average of $n$-period returns |
| $n$ | = | Number of periods in one year (i.e., monthly returns, $n$ = 12) |

The RV factors are calculated in the following fashion:

**Step 1:** In all cases in which a foreign country has an S&P credit rating of AAA, the country is assumed to have an RV factor of 1.0. The United States is treated as an AAA-rated country (see rationale in Chapter 4).

**Step 2:** Trailing 60-months of equity returns (denominated in either USD or EUR, depending on the investor perspective) ending December 2019 and March 2020 (in turn), are used to calculate annualized monthly standard deviations for each of the 74 MSCI equity indices (in turn).[7]

**Step 3:** The annualized monthly standard deviation result from Step 2 (based upon equity returns denominated in either USD or EUR, depending on the investor perspective) for *each* of the 74 MSCI equity indices is divided (in turn) by the annualized monthly standard deviation from Step 2 for the U.S. or Germany (depending on the investor perspective). The resulting ratio is the RV factor.

For example, the annualized monthly standard deviation of equity returns (in USD) for the 60-month period ending March 2020 for Slovenia was 19.4%, and the annualized monthly standard

[5] The MSCI series used are GR series (except for Botswana Ghana, and Jamaica). "GR" indicates that total return is calculated reinvesting gross dividends. The MSCI series used for Botswana, Ghana, and Jamaica are based on NR series. "NR" indicates the net total return is calculated applying a withholding tax rate on dividends. Use of net returns does not materially impact the RV results.

[6] MSCI is a leading provider of investment decision support tools to clients worldwide. MSCI provides indices, portfolio risk and performance analytics, and ESG data and research. To learn more about MSCI, visit www.msci.com.

[7] "December 2019" and "March 2020" are used in this discussion for illustrative purposes only. The Cost of Capital Navigator's International Cost of Capital Module includes relative volatility factors from March 2014 to present (updated quarterly). For more information visit kroll.com/costofcapitalnavigator.

deviation of equity returns (in USD) for the 60-month period ending March 2020 for the U.S. was 13.8%. The resulting RV factor is 1.4 (19.4% ÷ 13.8%). Similarly, the annualized monthly standard deviation of equity returns (in EUR) for the 60-month period ending March 2020 for Greece was 33.8, and the annualized monthly standard deviation of equity returns (in EUR) for the 60-month period ending March 2020 for Germany was 16.6%. The RV factor is 2.0 (33.8% ÷ 16.6%).

In the following section, two examples for estimating cost of equity capital are presented using Relative Volatility Model RV factors:[8]

- **Example 5-1:** Using Relative Volatility Model RV factors to estimate base country-level cost of equity capital assuming an investment in the foreign country's market as a whole (i.e., an assumed beta of 1.0).

- **Example 5-2:** Using Relative Volatility Model RV factors to estimate cost of equity capital for use in evaluating a subject business, asset, or project.

### Using Relative Volatility Model RV Factors to Estimate Base Country-level Cost of Equity Capital

The RV factors derived from the Relative Volatility Model are presented in the International Cost of Capital Module from two investor perspectives: (i) from the perspective of a U.S.-based investor for which USD is the local currency, and (ii) from the perspective of a German investor for which EUR is the local currency. The RV factors can be used by the analyst to calculate base country-level cost of equity capital estimates for the countries listed in the International Cost of Capital Module.

By "base country-level cost of equity capital estimate" we mean an estimate of cost of equity capital in foreign Country Y from the perspective of home Country X; base country-level cost of equity in this sense can be thought of as the sum of the risk-free rate plus the equity risk premium in the foreign country (in terms of the home country's currency).

Note that a base country-level cost of equity capital estimated in this fashion assumes an investment in the "market" of a foreign country *as a whole*, <u>*and does not include any adjustment for company/industry risk*</u>.

**Example 5-1:** Calculate the base country-level cost of equity capital estimate for an investor based in the U.S. investing in the India market *as a whole,* as of March 2020.

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8 For additional examples estimating cost of equity capital, please refer to the complementary CFA Institute webinar entitled "Quantifying Country Risk Premiums," presented on December 6, 2016 by James P. Harrington and Carla S. Nunes, CFA (both of Kroll). This webcast can be accessed here: https://www.cfainstitute.org/en/research/multimedia/2016/quantifying-country-risk-premiums.

Because we are calculating a base level cost of equity capital estimate for an investment in the Indian market as a whole, this is equivalent to substituting a beta of 1.0 (i.e., the market's beta) into the Relative Volatility Model formula:

$$k_{e,foreign\ country} = R_{f,home\ country} + \beta_{home\ country} \times ERP_{home\ country} \times Relative\ Volatilty$$

$$k_{e,foreign\ country} = R_{f,home\ country} + 1.0 \times ERP_{home\ country} \times Relative\ Volatilty$$

*Three* additional inputs are needed to calculate the base country-level cost of equity capital estimate: (i) the home country's risk-free rate, (ii) the home country's equity risk premium (ERP), and (iii) an RV factor from the Cost of Capital Navigator's International Cost of Capital Module.

The analyst can select a risk-free rate and ERP of his or her own choosing. Financial professionals often come to *different* conclusions as far as cost of capital and its components (e.g., risk-free rates, betas, equity risk premia) is concerned. There are a number of sources for risk-free rates and ERP estimates.

In the U.S., for example, a long-term government bond yield can be used as a proxy for the long-term risk-free rate. This is typically the practice in other countries as well: a long-term sovereign is selected as a proxy for the long-term risk-free rate.

As far as selection of an appropriate ERP, financial analysts and academics oftentimes have *very* different opinions of what the long-term ERP is at any given time. In the Cost of Capital Navigator, for example, several U.S. ERP estimates are reported, including the "historical" ERP (as estimated over the time horizon 1926–2020), the "supply-side" ERP, "implied" ERP estimates, ERP estimates developed by surveying academics and financial professionals, and the Kroll recommended U.S. ERP.[9]

In the Cost of Capital Navigator's International Cost of Capital Module's "Resources" section there are several estimates provided, including International Equity Risk Premia (ERPs), and historical ERP estimates for 16 world economies, through December 2021.[10] The ERPs in the Cost of Capital Navigator's International Cost of Capital Module provide the same type of "historical" ERP calculations as were previously provided in the (now discontinued) Morningstar/ Ibbotson *International Equity Risk Premium Report*.[11]

9 The Cost of Capital Navigator includes two U.S. valuation data sets: (i) the critical data (U.S. ERPs, size premia, industry risk premia) previously published in the (now discontinued) *Valuation Handbook – U.S. Guide to Cost of Capital* as well as the Morningstar/Ibbotson® *SBBI® Valuation Yearbook*, and (ii) the U.S. risk premia and size premia data previously published in the Kroll *Risk Premium Report*. For more information, visit: kroll.com/costofcapitalnavigator.

10 The ERPs for the 16 countries are calculated annually as of December 31. The most recent update was December 31, 2021.

11 Additional sources of international ERP estimates are provided in the Resources Library of the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator.

For this example, we will use the Kroll recommended U.S. ERP as of March 31, 2020 (6.0%), coupled with a *normalized* risk-free rate of 3.0%[12,13] to calculate a base country-level cost of equity capital estimate for an investor based in the U.S. investing in India as of March 2020.

Estimating cost of equity in this example is a four-step process:

> **Step 1:** The analyst selects the appropriate long-term risk-free rate (*Rf*) for the home country (the U.S. in this example) as of March 2020. For the purposes of this example, we have assumed a normalized long-term risk-free rate of 3.0%.
>
> **Step 2:** The analyst selects the appropriate long term equity risk premium (ERP) for the home country (the U.S. in this example) as of March 2020. For the purposes of this example, we have assumed a long-term ERP of 6.0%.
>
> **Step 3:** In the International Cost of Capital Module, identify the Relative Volatility model's RV factor as of March 2020 from the perspective of an investor based in the U.S., investing in India. As of March 2020, the RV was 1.4.
>
> **Step 4:** Multiply the assumed beta (in this case the assumed beta is 1.0, the beta of the "market"), the ERP identified in Step 2, and the RV factor identified in Step 3 together (1.0 x 6.0% x 1.4); the result is 8.4%. Add this number to the risk-free rate identified in Step 1 (3.0% + 8.4%). The resulting 11.4% is the country-level cost of equity capital estimate for an investor based in the U.S. investing in the Indian *market as a whole* as of March 2020.

### Using Relative Volatility Model RV Factors to Estimate Cost of Equity Capital for Use in Evaluating a Subject Business, Asset, or Project

The ability to estimate base country-level cost of equity capital from the perspective of an investor in a home country into a foreign country's *market as a whole* (as was done in Example 5-1) is very valuable information that can be used for *benchmarking* and *support* purposes. Most of the time, however, valuation analysts are developing discount rates for use in evaluating a subject *business*, *asset*, or *project*.

For example, valuation analysts are often confronted with the following problem: "I know how to value a company in the United States, but this one is in Country ABC, a developing economy. What should I use for a discount rate?" Can an RV factor be used as an input in developing cost of equity capital estimates for, say, a company that operates in GICS 3030 (household & personal products) in a different country? Yes, but it is important to understand the assumptions one is making when doing this.

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[12] The analyses presented here assume that that the assets being valued are long-lived assets, and therefore a long-term risk-free rate and long-term ERP are appropriate.

[13] In this example, the normalized long-term risk-free rate and long-term ERP estimates are Kroll's outlook as of December 18, 2019 for the U.S. This implies a base cost of equity capital in the U.S. market as a whole of 9.0% (3.0% + 6.0%). Kroll regularly reviews fluctuations in global economic and financial market conditions that warrant a periodic reassessment of the ERP. To ensure you are always using the most recent recommendation, check: https://www.kroll.com/en/insights/publications/cost-of-capital and click "Click here for the latest recommended U.S. guidance".

Using the aforementioned household & personal products company as an example, an analyst typically would develop discount rates for the household & personal products company *as if it were located in* the “home” country, and then use an RV factor to account for the differences in risk between the “home” country, and the “foreign” country in which the household & personal products company is *actually* located (i.e., the investee country, or “foreign” country).

The implied assumption in this analysis is that what it means to be a household & personal products company in the home country means the same thing as being a household & personal products company in the foreign country. Some questions that the analyst may wish to consider:

- Are the risks of being a household & personal products company in the foreign country the *same* as the risks of being a household & personal products company in the home country?

- Does a household & personal products company in the foreign country have the *same* beta ($\beta$) as a household & personal products company in the home country?[14]

- Does the household & personal products company in the foreign country operate in a different industry environment from a household & personal products company in the home country?

- Did the analyst apply any additional adjustments when the discount rate was developed for the household & personal products company *as if it were located in* the home country? For example, was a size premium applied? “Large company” and “small company” can mean very different things from country to country. For example, a smaller-sized company in the U.S. or Germany may be a “large” company in Estonia or Norway.

Valuation analysis is an inherently comparative process, so questions like these are no different from the type of questions that are asked in any valuation analysis. For example, a subject company might be compared to a set of companies (i.e., peer group, or comparables) that possess characteristics that are arguably similar to the characteristics of the subject company. To the extent that the subject company and the peer group *do* have differences, further adjustment(s) may be required.

The process for using the RV factor information in the International Cost of Capital Module for estimating cost of equity capital for a subject business, asset, or project, is quite similar to developing base country-level cost of equity capital (see example 5-1). The difference is that *additional* adjustments may be necessary, as outlined earlier.

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[14] Beta (β) is a measure of systematic risk used as an input in some methods of estimating cost of equity capital (e.g., the CAPM requires a beta).

In the case of our household & personal products company located in the foreign country, the "peer group" is household & personal products companies in the home country, and to the extent that household & personal products companies located in the investee country are different (other than location), further adjustments may be required.

**Example 5-2:** Estimate cost of equity capital for a company in Austria that operates in GICS 3030 (household & personal products) as of March 2020, for an investor based in France, taking a German investor perspective (France's local currency is also the Euro).[15]

Within the context of the Relative Volatility Model, the only difference in estimating cost of equity capital for use in evaluating a business, asset, or project in a foreign country (as is being done in this example) and estimating cost of equity capital for an investment in a foreign market as a whole (as was done in the previous example) is the beta estimate. In the previous examples, the "market's" beta of 1.0 was used; in this example, the analyst must supply a beta for a household & personal products company located in the home country. In this example we will assume a beta of 1.2:[16]

$$k_{e,foreign\ country} = R_{f,home\ country} + \beta_{home\ country} \times ERP_{home\ country} \times Relative\ Volatilty$$

$$k_{e,foreign\ country} = R_{f,home\ country} + 1.2 \times ERP_{home\ country} \times Relative\ Volatilty$$

Three additional inputs are needed to calculate the base country-level cost of equity capital estimate: (i) the home country's risk-free rate, (ii) the home country's ERP, and (iii) an RV factor. Estimating cost of equity in this example is a four-step process:

> **Step 1:** The analyst selects the appropriate long-term risk-free rate (*Rf*) for the home country (France, in this example, taking a German investor perspective) as of March 2020. For the purposes of this example, we assume a German risk-free rate of 2.0%.[17]

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15 It is important to understand that all Relative Volatility Model RV factors "from the perspective of an investor based in Germany" are calculated relative to the annualized monthly standard deviation of the German equity market (Germany is the largest economy in Europe). It is not unusual for German benchmarks to be used as inputs in valuation analyses in Europe. For example, the yields on German government debt instruments are often used as the risk-free security (when the analysis cash flows are denominated in Euros).

16 An excellent source of international industry statistics (including cost of equity capital estimates and peer group betas for use in CAPM estimates) is the Cost of Capital Navigator's International Industry Benchmarking Module. The International Industry Benchmarking Module includes industry-level analyses for: (i) the World, (ii) the European Union, (iii) the Eurozone, and (iv) the United Kingdom in three currencies: (i) the euro (€ or EUR), (ii) the British pound (£ or GBP), and (iii) the U.S. dollar ($ or USD). Includes industry-level cost of equity, debt, and WACC estimates, performance statistics, valuation multiples, levered and unlevered betas, capital structure, profitability ratios, equity returns, aggregate forward-looking earnings-per share (EPS) growth rates, and additional statistics. To learn more, visit kroll.com/costofcapitalnavigator.

17 In the Eurozone, the yields on German government debt instruments are often used as the risk-free security (when the analysis cash flows are denominated in Euros).

**Step 2:** The analyst selects the appropriate long-term ERP for the home country (France in this example, taking German investor perspective) as of March 2020. For the purposes of this example, we assume a German long-term ERP of 5.16% in Euro terms.[18]

**Step 3:** In the International Cost of Capital Module, identify the Relative Volatility model's RV factor as of March 2020 from the perspective of a German investor investing in Austria. As of March 2020, the RV factor was 1.4.

**Step 4:** Multiply the assumed beta (1.2), the ERP identified in Step 2, and the RV factor identified in Step 3 together (1.2 x 5.16% x 1.4). The result is (8.7%). Add this number to the risk-free rate identified in Step 1 (2.0% + 8.7%). The result (10.7%) is the cost of equity capital estimate for an investor based in France (taking a German investor perspective) investing in an household & personal products company located in Austria, *prior* to any adjustments due to intrinsic differences in the household & personal products industry environment (or other risks) between France and Austria.

[18] The historical ERP for Germany as measured over the time horizon 1970–2019 is 5.16%, in local terms (€ EUR). Kroll calculates historical ERP estimates for 16 world economies (annually, through December 31) in the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator.

# Chapter 6
# Erb-Harvey-Viskanta Country Credit Rating Model

The Erb-Harvey-Viskanta Country Credit Rating Model ("CCR Model") is one of the more widely known methods to estimate cost of equity capital in an international setting.[1] Whereas the application of a single-country version of the CAPM or a Relative Volatility Model requires that a country have equity returns data, the CCR Model allows for the estimation of cost of equity capital for countries that have a country credit risk rating – even if they do not have a long history of equity returns available (or even if they have no equity returns history at all).

This model is based on the assumption that countries with lower creditworthiness, which is translated into *lower* credit ratings, are associated with *higher* costs of equity capital, and vice versa.

The valuation data calculated using the CCR Model and reported in the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator is calculated using:

- The *same* (or similar) data sources that were used to calculate the base country-level cost of equity estimates previously published in the now discontinued Morningstar/Ibbotson *International Cost of Capital Report*, and the *International Cost of Capital Perspectives Report*.

- The *same* (or similar) methodology that was used to calculate the base country-level cost of equity estimates previously published in the now discontinued Morningstar/Ibbotson *International Cost of Capital Report*, and the *International Cost of Capital Perspectives Report*.

The Cost of Capital Navigator's International Cost of Capital Module includes (although on a significantly larger scale) the international cost of capital data that was calculated using the CCR Model previously published in the (now discontinued) *Valuation Handbook – International Guide to Cost of Capital,* Morningstar/Ibbotson *International Cost of Capital Report*, and the *International Cost of Capital Perspectives Report*.

[1] "Erb-Harvey-Viskanta Country Credit Rating (CCR) Model", is based upon the work of Claude Erb, Campbell Harvey, and Tadas Viskanta, "Expected Returns and Volatility in 135 Countries", *Journal of Portfolio Management* (Spring 1996): 46–58. See also Claude Erb, Campbell R. Harvey, and Tadas Viskanta, "Country Credit Risk and Global Portfolio Selection: Country Credit Ratings Have Substantial Predictive Power", *Journal of Portfolio Management*, Winter 1995. We thank Professor Campbell Harvey of the Duke University Fuqua School of Business for his insights and guidance in performing this analysis.

We say "on a significantly larger scale" because the (former) Morningstar/Ibbotson international reports used the CCR Model to estimate base country-level cost of equity capital for over 180 countries from the "perspective" of investors (through the lens of the currency changes) based in (i) the U.S. and (ii) six additional countries (Australia, Canada, France, Germany, Japan, and the U.K.).[2]

In the CCR model analyses presented in the Cost of Capital Navigator's International Cost of Capital Module base country-level cost of equity estimates are calculated for over 175 countries and converted into country risk premium indications from the "perspective" of investors (again through the lens of the currency used) based in (i) the U.S. and (ii) 55 additional countries.[3,4]

In the International Cost of Capital Module the country risk premium indications are calculated quarterly, from March 2014 to present.[5]

### A Notable Difference with Previous Reports: Country Risk Premia (CRPs)

In the previous Morningstar/Ibbotson international reports, base country-level cost of equity capital estimates were published. In the Cost of Capital Navigator's International Cost of Capital Module, country risk premia (CRPs) are the primary data presented. Through consultation with various stakeholders using this type of data, it is clear that users are typically more interested in CRP information that they can incorporate into their own custom cost of equity estimates, in lieu of data presenting base country-level cost of equity capital estimates.

The CRP attempts to isolate the *incremental* risk premium associated with investing in a "foreign" country (i.e., the investee country; the country in which the investment is located) other than the "home" country (i.e., the country in which the investor is based).

Calculation of the CRP is straightforward: the base country-level cost of equity capital estimate for a home-country-based investor investing in the *home country* (in the home country currency) is subtracted from the base country-level cost of equity capital estimate for a home-country-based investor investing in the *foreign country* (in the home country currency). The difference is the CRP.

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2 This is done with the reasonable assumption that just as the regression results using returns in USD can be interpreted as being from the "perspective" of a U.S.-based investor, the regression results using returns transformed into currency X can be interpreted as being from the perspective of an investor based in country X.

3 Source of currency conversion data: Morningstar, Inc. Used with permission. All rights reserved. Exchange rate sources (as reported by Morningstar): 1960–1987 Main Economic Indicators Historical Statistics (Organization for Economic Cooperation & Development); 1988–present the *Wall Street Journal*.

4 Investee countries that have expected inflation rates that are very different from the perspective country's expected inflation rates may yield results that significantly under-/over-estimate expected return, and may require additional adjustments (i.e., the base country-level cost of equity capital should exceed the projected inflation, if the analysis is being conducted in nominal terms).

5 The Country Yield Spread Model, the Relative Volatility Model, and the Erb-Harvey-Viskanta Country Credit Rating (CCR) Model are updated quarterly; international equity risk premia (ERPs) are updated annually at year-end.

## Data Sources

### A Change in 2017

Country Credit Ratings (CCRs) are an important input used to produce the country risk premia (CRPs) in the Erb-Harvey-Viskanta Country Credit Rating Model. In February 2017, Institutional Investor LLC communicated to Kroll that it would no longer conduct and publish the results of its semi-annual "Country Credit Survey" from which CCRs were obtained.[6] September 2016 was the final publication date of Institutional Investor CCRs.[7]

Starting with the *2017 Valuation Handbook – International Guide to Cost of Capital*:[8]

1. The source of *new* country credit ratings (post September 2016) used to produce the CRPs in the Cost of Capital Navigator's International Cost of Capital Module is Institutional Investor's parent company, Euromoney Institutional Investor PLC.

   Specifically, the *previously published* Institutional Investor country credit ratings (through September 2016) will continue to be used in the regression analyses used to produce the CRPs in the Cost of Capital Navigator's International Cost of Capital Module, and from October 2016 forward Euromoney's country risk scores will be used.[9]

   **Note:** For simplicity, these inputs (the Institutional Investor country credit ratings and the Euromoney country risk scores) are referred to collectively herein as "country credit ratings", or "CCRs", and the model's name is unchanged and will continue to be referred to as the "Erb-Harvey-Viskanta Country Credit Rating Model", or "CCR Model".

2. The model has moved to a 30-year *rolling* regression, rather than using data back to September 1979. This reflects the trend observed in recent decades by individual countries' economies toward a greater integration with the global economy and global financial markets (i.e., "globalization"); moving this analysis to a 30-year rolling regression ensures that only (relatively) more recent information about the stage of development of each country's economy is impacting the results.

3. The model was enhanced to make the following assumptions:

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6 Institutional Investor LLC is a leading business-to-business publisher, focused on international finance. Institutional Investor LLC is a division of Euromoney Institutional Investor PLC. To learn more, visit http://www.institutionalinvestor.com.

7 Institutional Investor CCRs were published from September 1979 through September 2016 on a semi-annual basis (September, March), with one exception: Institutional Investor did not publish March 2010 CCRs.

8 Kroll previously published CRPs and other international valuation data in a physical book (the *Valuation Handbook – International Guide to Cost of Capital*) from 2014 to 2019. The valuation data previously published in the former *Valuation Handbook – International Guide to Cost of Capital* has been exclusively available in the online Cost of Capital Navigator's International Cost of Capital Module at Kroll.com/costofcapitalnavigator starting in 2020.

9 Euromoney Institutional Investor PLC ("Euromoney") is a global, multi-brand information business which provides critical data, price reporting, insight, analysis and must-attend events to financial services, commodities, telecoms and legal markets. Euromoney is listed on the London Stock Exchange and is a member of the FTSE 250 share index. The company's headquarters are in London with more than 20 other offices around the world. To learn more visit: http://www.euromoneyplc.com/.

a) If both the “home” country (i.e., the country in which the investor is based) and the “foreign” country (i.e., the investee country; the country in which the investment resides) have an S&P sovereign credit rating of AAA, the concluded country risk premium (CRP) is 0.0%. The United States is treated as an AAA-rated country for purposes of implementing this model (see rationale in Chapter 4).
b) If the “home” country has an S&P sovereign credit rating of AAA and the “foreign” country has an S&P credit rating *below* AAA (i.e., a worse credit rating), *and* has a calculated CRP of *less* than 0.0% (i.e., a negative implied premium), the CRP assigned is 0.0% (and vice-versa).

The first change was out of necessity: a new source of country credit ratings was needed to replace the discontinued series. The source that was identified as being the best fit for a substitute is produced by Institutional Investor’s own parent company (Euromoney Institutional Investor PLC).

The second change (use of a 30-year rolling regression) was a methodological change that was designed with the goal of better reflecting the ongoing change and evolving integration of global markets. These changes may entail significant changes to some countries’ relative risk relative to what has been reported in prior years.

The third change (3a) harmonized the Country Credit Rating Model, the Country Yield Spread Model, and the Relative Volatility Model (this assumption was *already* in place in the latter two models).

The fourth change (3b) was put in effect starting in 2017 for (i) the Country Credit Rating Model and (ii) the Country Yield Spread Model, but *not* in the Relative Volatility Model.[10]

In the following section, a brief overview of Institutional Investor’s country credit ratings is first provided, and then a brief overview of Euromoney’s country risk scores is provided.

### About Institutional Investor “Country Credit Ratings” and Euromoney “Country Risk Scores”

Euromoney Country Risk (ECR) is an online community of economic and political experts that provides real time scores in categories that relate to economic, structural and political risk.[11] The consensus expert scores, combined with scores on sovereign borrowers' access to international capital markets, together with data from the IMF/ World Bank on debt indicators, create the Euromoney Country Risk score for over 180 individual countries (updated monthly).

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10 Change 3b may be instituted in the Relative Volatility Model in the future, pending further study.

11 This section paraphrased from Institutional Investor’s website country credit ratings “Methodology” page at: https://www.euromoney.com/country-risk/methodology#AboutUs.

ECR evaluates the investment risk of a country, such as risk of default on a bond, risk of losing direct investment, risk to global business relations etc., by taking a qualitative model, which seeks an expert opinion on risk variables within a country (90% weighting) and combining it with a basic quantitative value (10% weighting). The qualitative score is visible independently of the ECR score, and it reflects a snapshot of a country's current position.

The ECR score is displayed on a 100 point scale, with 100 being nearly devoid of any risk, and 0 being completely exposed to every risk. This is the same scale previously used by Institutional Investor.

To obtain the overall Euromoney Country Risk score, a weighting is assigned to five categories. The four qualitative expert opinions are political risk (35% weighting), economic risk (35%), structural risk (10%) and access to international capital markets (10%). The quantitative value comes from the sovereign debt indicators (10%).

In the model version presented herein, "monthly" CCR values are calculated with a simple interpolation between each country's semi-annual Institutional Investor CCRs. For example, if the published March 20XX CCR is 76 and the published September 20XX CCR is 70, then one would subtract (76 – 70) ÷ 6 = 1 from each intra-semi-annual period to calculate CCRs for months April through August 20XX.[12]

### Equity Returns

A total of 72 markets' MSCI Global Equity Indices are used in calculating the CCR Model analyses presented in the International Cost of Capital Module as summarized in Exhibit 6.1.[13,14]

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12 In this example, March, April, May, June, July, August, and September 20XX CCRs would be 76, 75, 74, 73, 72, 71, and 70, respectively.

13 The MSCI series used are GR series. "GR" indicates that *total return* is calculated reinvesting gross dividends.

14 MSCI is a leading provider of investment decision support tools to clients worldwide. MSCI provides indices, portfolio risk and performance analytics, and ESG data and research. To learn more about MSCI, visit www.msci.com.

**Exhibit 6.1:** MSCI Global Equity Indices Used in Calculating the CCR Model Analyses Presented in the Cost of Capital Navigator's International Cost of Capital Module

| | | |
|---|---|---|
| Argentina | Indonesia | Poland |
| Australia | Ireland | Portugal |
| Austria | Israel | Qatar |
| Bahrain | Italy | Romania |
| Bangladesh | Japan | Russia |
| Belgium | Jordan | Saudi Arabia |
| Brazil | Kazakstan | Serbia |
| Bulgaria | Kenya | Singapore |
| Canada | Korea (South) | Slovenia |
| Chile | Kuwait | South Africa |
| China (Mainland) | Lebanon | Spain |
| Colombia | Lithuania | Sri Lanka |
| Croatia | Malaysia | Sweden |
| Czech Republic | Mauritius | Switzerland |
| Denmark | Mexico | Taiwan |
| Egypt | Morocco | Thailand |
| Estonia | Netherlands | Trinidad & Tobago |
| Finland | New Zealand | Tunisia |
| France | Nigeria | Turkey |
| Germany | Norway | Ukraine |
| Greece | Oman | United Arab Emirates |
| Hong Kong | Pakistan | United Kingdom |
| Hungary | Peru | United States |
| India | Philippines | Vietnam |

## The CCR Model

The Erb-Harvey-Viskanta Country Credit Rating Model can be expressed as:

$$\boxed{k_{e,local} = \alpha + \beta \times Natural\ Log\left(CCR_{local}\right) + \varepsilon}$$

Where:

| | | |
|---|---|---|
| $k_{e,local}$ | = | Cost of equity capital in local country |
| $\alpha$ | = | Regression constant |
| $\beta$ | = | Regression coefficient |
| $CCR_{local}$ | = | Country credit rating of local country |
| $\varepsilon$ | = | Regression error term |

This model was originally developed in 1996 by academics Claude Erb, Campbell Harvey, and Tadas Viskanta. The objective of the research was to develop a country risk model that could be used to establish hurdle rates for segmented markets. The research showed that while models such as the World (Global) CAPM worked reasonably well for developed markets, they did a poor job in explaining returns for emerging markets. In subsequent work, Professor Harvey recommended the use of either a CAPM or a multi-factor model in developed, liquid markets. In emerging markets, Professor Harvey indicated that he would often examine the indications of a number of models, including, but not limited to, the Erb-Harvey-Viskanta CCR model and average the corresponding results.[15]

The Erb-Harvey-Viskanta Country Credit Rating Model regresses all available CCRs (as of the month of calculation) for all countries in a given period *t* against all the available (equivalent) equity returns (for all countries that have returns) in the *next* period *t + 1*.

For example, to estimate country-level cost of equity from a U.S. investor's perspective as of March 2020, all available countries' CCRs from March 1990 through February 2020 are matched with each of the 72 countries' respective monthly equity returns (in USD) from April 1990 through March 2020. This results in over 20,000 matched pairs of CCRs in period *t* and returns in period *t + 1*. A regression analysis is then performed, with the natural log of the CCRs as the independent variable (the "predictor" variable), and the equity returns as the dependent variable (what is being "predicted").

15 Campbell R. Harvey, "12 Ways to Calculate the International Cost of Capital" (Durham, NC: Duke University), National Bureau of Economic Research, Cambridge, MA, USA 02138.

Then, the March 2020 CCR for *each* of the over 170 countries for which Euromoney Institutional Investor PLC has a rating (as of March 2020, in this example) is then used (in conjunction with the *intercept* and *coefficient* generated by the regression) to predict the *next* 1-month period's return for each of the countries. This result is then multiplied by 12 to annualize the "monthly" estimate.

For example, as of March 2020 the CCR for Peru was 59.6 (on a 100-point scale). And, as of March 2020 the intercept and coefficient generated by regressing all available CCRs in time *t* against all available monthly returns (in USD, for the 72 countries that have returns) in time *t + 1* are 0.0437 and -0.0088 respectively.[16]

The country-level cost of equity estimate for Peru (from the perspective of an investor based in the U.S.) as of March 2020 (9.27%) is therefore calculated as follows:

$$COE_{Peru} = (Intercept_{U.S.,\ March\ 2020} + (Coefficient_{U.S.,\ March\ 2020} \times Natural\ Log\ (CCR\ Peru_{March2020}))) \times 12$$

$$COE_{Peru} = (0.0437 + (-0.0088 \times Natural\ Log\ (59.6))) \times 12 = 0.092743 = 9.27\%$$

### Potential Weaknesses of the Country Credit Rating Model

The Country Credit Rating (CCR) Model has several potential weaknesses:

- The CCR model is complex, and requires access to quality stock market return data from a large number of countries.

- There tends to be more stock market data and country credit rating data available, and over longer periods, for countries that are more developed. This disproportionate data availability may skew the results.

- The results of the CCR model are sensitive to the period chosen over which the regression is performed, due to the changing relationship between developed and lesser-developed countries over time. Starting in 2017, the model version presented herein moved to a 30-year rolling regression, rather than using data back to September 1979. This likely better captures the trend observed in recent decades by individual countries' economies toward a greater integration with the global economy and global financial markets (i.e., "globalization"); moving this analysis to a 30-year rolling regression ensures that only (relatively) more recent information about the stage of development of each country's economy impacts the results.

16 The negative coefficient implies that as credit ratings *increase* (better credit), country-level cost of equity estimates *decrease*, and vice versa.

- Both the Institutional Investor and Euromoney country credit ratings used as inputs in the CCR Model are (at least in part) based on qualitative factors that are subject to judgement (e.g., surveys of professionals, weights assigned to each risk factor, etc.).

### Different Investor Perspectives

In the previous example, the 72 MSCI equity return indices used in the regressions were expressed in U.S. Dollar (USD) terms, and the results can thus be interpreted as "from the perspective of a U.S. investor" investing in (in this case) Peru. Alternatively, transforming the 72 MSCI equity return indices (as a group) into Canadian Dollar (CAD) terms or Japanese Yen (JPY) terms and then recalculating the regressions would produce results that can be interpreted as "from the perspective" of investors in Canada and Japan, respectively. As such, investor perspective (i.e., the country in which the investor is based) is defined herein by the currency in which the equity returns used in the regression analyses are expressed in.

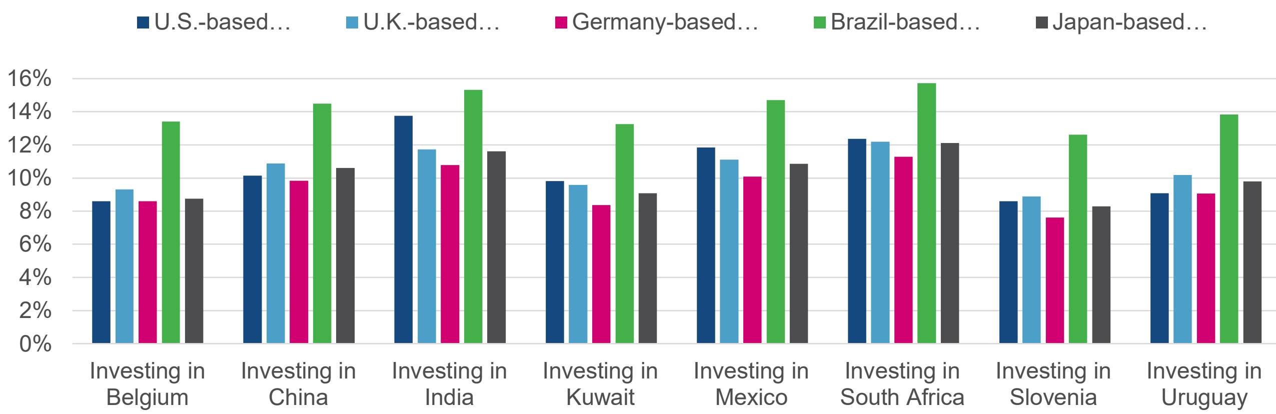
Unexpected changes in the value of one currency versus another can have significant effects on the "money in pocket" of an investor. For example, in 2004 a local investor in the German stock market would have realized an increase of approximately 8% in his or her equity investments. However, a U.S.-based investor investing in the German stock market would have realized an increase of approximately 17% in his or her investments that year. The reason is simple: the Euro appreciated significantly against the U.S. Dollar in 2004, so the U.S. investor could buy more Dollars per Euro at the end of 2004 when repatriating the Euro investment back home. This change in the value of the two currencies in relation to each other enhanced the U.S.-based investor's return by approximately 9% (17% – 8%).[17,18]

In Exhibit 6.2, the 72 MSCI equity return indices used in the analyses herein were translated into (as a group, and in turn) U.S. Dollars (USD), British Pounds (GBP), German Euros (EUR), Brazilian Reals (BRL), and Japanese yen (JPY). CCR Model regression analyses were then performed in each currency (in turn), and a base country-level cost of equity capital estimate for investors based in the U.S., the U.K., Germany, Brazil, and Japan was then developed for each investing in Belgium, China, India, Kuwait, Mexico, South Africa, Slovenia, and Uruguay. As can be seen, the effect of currency fluctuations can have significant impact on expected return.

[17] Source of underlying data: equity returns: MSCI German Gross Return (GR) Index as published in Morningstar *Direct*; exchange rates: Morningstar, Inc. Used with permission. All rights reserved.

[18] Unexpected changes in the relative value of currencies can work in the opposite direction also: In the following year (2005), the Euro significantly *declined* in value versus the U.S. Dollar. In this case, the "local" German investor would have realized a return of approximately 27%, whereas the U.S.-based investor would have realized a return of only 11%, that is, his or her Euros would have bought *fewer* U.S. Dollars per Euro at the end of 2005 than they could have at the beginning of 2005.

**Exhibit 6.2:** Using the CCR Model to Estimate Cost of Equity Capital from Differing Investor Perspectives (March 2022)




In the CCR Model analyses presented in the Cost of Capital Navigator's International Cost of Capital Module, 56 different investor perspectives are presented, as summarized in Exhibit 6.3.[19,20]

[19] Of the 56 investor perspectives, 19 of these investor perspective countries are members of the Eurozone, in which the local currency is the Euro (€). In the (former) Ibbotson Associates/Morningstar *International Cost of Capital Perspectives Report*, the Erb Harvey- Viskanta Country Credit Rating Model was used to estimate country-level cost of equity capital from the "perspective" of investors based in any one of *six* different countries (Australia, Canada, France, Germany, Japan, and the U.K.). In the analyses presented herein, the number of investor perspectives has been expanded to 56 investor perspectives.

[20] Source of local currency and currency code information used in Exhibit 6.3: International Organization for Standardization (ISO), "List one: Currency, fund and precious metal codes", published 8-29-18; http://www.iso.org/iso/currency_codes.

**Exhibit 6.3:** Investor Perspectives Presented Herein (total 56), calculated Using the CCR Model

| Investor Perspective | Currency | Investor Perspective | Currency |
|---|---|---|---|
| Argentina | Argentine Peso (ARS) | Latvia | Euro (EUR) |
| Australia | Australian Dollar (AUD) | Lithuania | Euro (EUR) |
| Austria | Euro (EUR) | Luxembourg | Euro (EUR) |
| Bahrain | Bahraini Dinar (BHD) | Malaysia | Malaysian Ringgit (MYR) |
| Belgium | Euro (EUR) | Malta | Euro (EUR) |
| Brazil | Brazilian Real (BRL) | Morocco | Moroccan Dirham (MAD) |
| Canada | Canadian Dollar (CAD) | Netherlands | Euro (EUR) |
| Chile | Chilean Peso (CLP) | New Zealand | New Zealand Dollar (NZD) |
| China (Mainland) | Yuan Renminbi (CNY) | Norway | Norwegian Krone (NOK) |
| Colombia | Colombian Peso (COP) | Philippines | Philippine Peso (PHP) |
| Cyprus | Euro (EUR) | Poland | Zloty (PLN) |
| Czech Republic | Czech Koruna (CZK) | Portugal | Euro (EUR) |
| Denmark | Danish Krone (DKK) | Qatar | Qatari Rial (QAR) |
| Estonia | Euro (EUR) | Russia | Russian Ruble (RUB) |
| Finland | Euro (EUR) | Saudi Arabia | Saudi Riyal (SAR) |
| France | Euro (EUR) | Singapore | Singapore Dollar (SGD) |
| Germany | Euro (EUR) | Slovakia | Euro (EUR) |
| Greece | Euro (EUR) | Slovenia | Euro (EUR) |
| Hong Kong | Hong Kong Dollar (HKD) | South Africa | Rand (ZAR) |
| Hungary | Forint (HUF) | Spain | Euro (EUR) |
| Iceland | Iceland Krona (ISK) | Sweden | Swedish Krona (SEK) |
| India | Indian Rupee (INR) | Switzerland | Swiss Franc (CHF) |
| Indonesia | Rupiah (IDR) | Taiwan | New Taiwan Dollar (TWD) |
| Ireland | Euro (EUR) | Thailand | Thai Baht (THB) |
| Italy | Euro (EUR) | United Arab Emirates | UAE Dirham (AED) |
| Japan | Yen (JPY) | United Kingdom | Pound Sterling (GBP) |
| Korea (South) | Won (KRW) | United States | U.S. Dollar (USD) |
| Kuwait | Kuwaiti Dinar (KWD) | Uruguay | Peso Uruguayo (UYU) |

## Global Cost of Equity Capital – High-level Comparisons

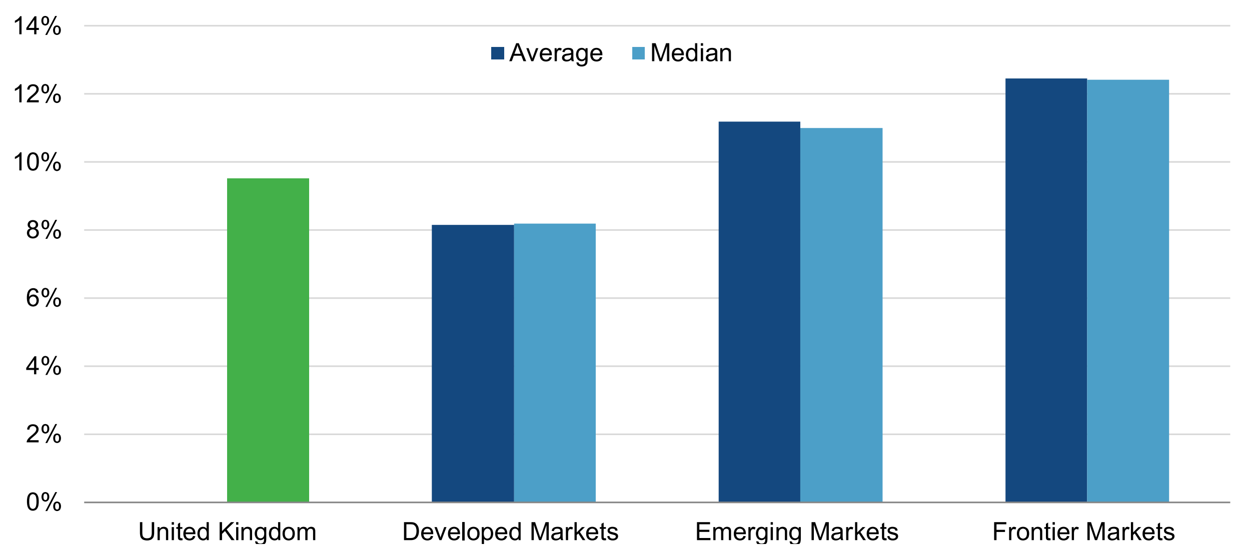
The CCR Model allows for the comparison of cost of equity capital estimates for any combination of available countries. We now present several examples of base country-level cost of equity capital estimated by (i) level of economic development, (ii) country, (iii) financial crisis impact, (iv) S&P sovereign credit rating, and (v) geographic region.

**Cost of Equity Capital by Level of Economic Development**

MSCI classifies the countries for which it has indices into various groupings, including level of economic development. This grouping categorizes countries as (i) developed markets, (ii) emerging markets, and (iii) frontier markets.[21]

In Exhibit 6.4, the CCR model is used to calculate a base country-level cost of equity capital from the perspective of a U.K.-based investor investing in (i) the U.K., (ii) developed markets, (iii) emerging markets, and (iv) frontier markets, as of March 2020.[22]

**Exhibit 6.4:** Base Country-level Cost of Equity Capital Estimates for the U.K., MSCI Developed Markets, MSCI Emerging Markets, and MSCI Frontier Markets, from the Perspective of a U.K.-based Investor (as of March 2020)




**Source of underlying data:** Institutional Investor's Country Credit Ratings; equity (stock) indices from MSCI Global Equity Indices, Morningstar, Inc. Used with permission. All rights reserved. All estimates are expressed in terms of British Pounds (GBP). All calculations by Kroll.

The relationships between the values are intuitively pleasing: the estimated cost of equity capital *increases* as we move from *more* developed economies to *less* developed economies. This makes sense – less-developed economies tend to have greater financial, economic, and political risks than more-developed economies do.

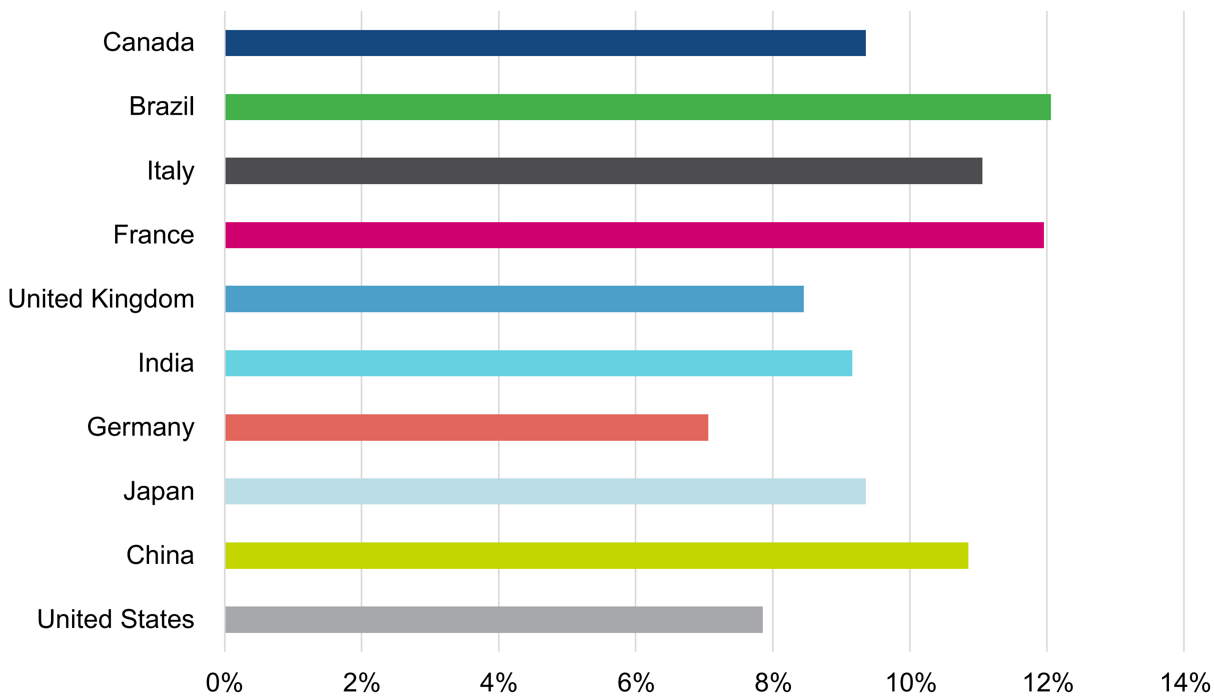
21 The MSCI Market Classification Framework consists of the following three criteria: economic development, size and liquidity, and market accessibility. Developed market countries are countries with the most developed economies. Emerging market countries have economies that are less developed than developed market economies, but whose markets have greater liquidity than frontier market economies, while exhibiting significant openness to capital inflows/outflows and openness to foreign ownership. Frontier market countries have economies that are less developed than both developed and emerging market economies, while exhibiting lower market size and liquidity, as well as more restricted market accessibility. To learn more about the MSCI Market Classification Framework, visit: https://www.msci.com/market-classification.

22 "From the perspective of a U.K.-based investor" means the returns for the 72 MSCI equity returns series used in the regression calculations used to perform this analysis were expressed in British Pounds (GBP).

### Cost of Equity Capital by Country

In another example, Exhibit 6.5 lists the base country-level cost of equity capital for the largest 10 countries ranked by 2019 gross domestic product (GDP) as calculated using the CCR Model, this time from the perspective of a China-based investor. Germany, which has the fourth-largest economy, has the *lowest* cost of equity capital estimate (a little over 7%) of the group as of March 2020. Alternatively, Brazil, which has the ninth-largest economy, has the *highest* cost of equity capital estimate (a little over 12%) in the group.

**Exhibit 6.5:** Cost of Equity Capital Estimates for the 10 Largest Countries by GDP from the Perspective of a China-based Investor (as of March 2020)




**Source of underlying data:** Institutional Investor's Country Credit Ratings; Euromoney Institutional Investor; equity (stock) indices from MSCI Global Equity Indices, in Morningstar, Inc. Used with permission. All rights reserved. GDP estimates are from the World Economic Outlook Database from the International Monetary Fund (IMF). For additional information, please visit: http://www.imf.org/external/pubs/ft/weo/2019/01/weodata/download.aspx. All estimates are expressed in terms of Yuan Renminbi (CNY). All calculations by Kroll.

### Cost of Equity Capital by Financial Crisis Impact

Possible weakening of Eurozone economies has been of interest recently, particularly after the 2008 financial crisis and the onset of the Eurozone sovereign debt crisis. The issues are often discussed within the framework of the “healthier” core economies (e.g., Germany, U.K., France) compared to “less healthy” periphery economies (e.g., Greece, Portugal, Spain).

In Exhibit 6.6, the CCR Model is used to calculate a base country-level cost of equity capital (again from the perspective of a U.S.-based investor) for each of the six "healthier" and "less healthy" countries listed earlier. Then, the median value of the two groupings ("healthier" and "less healthy") over the period January 2007–March 2020 was plotted.

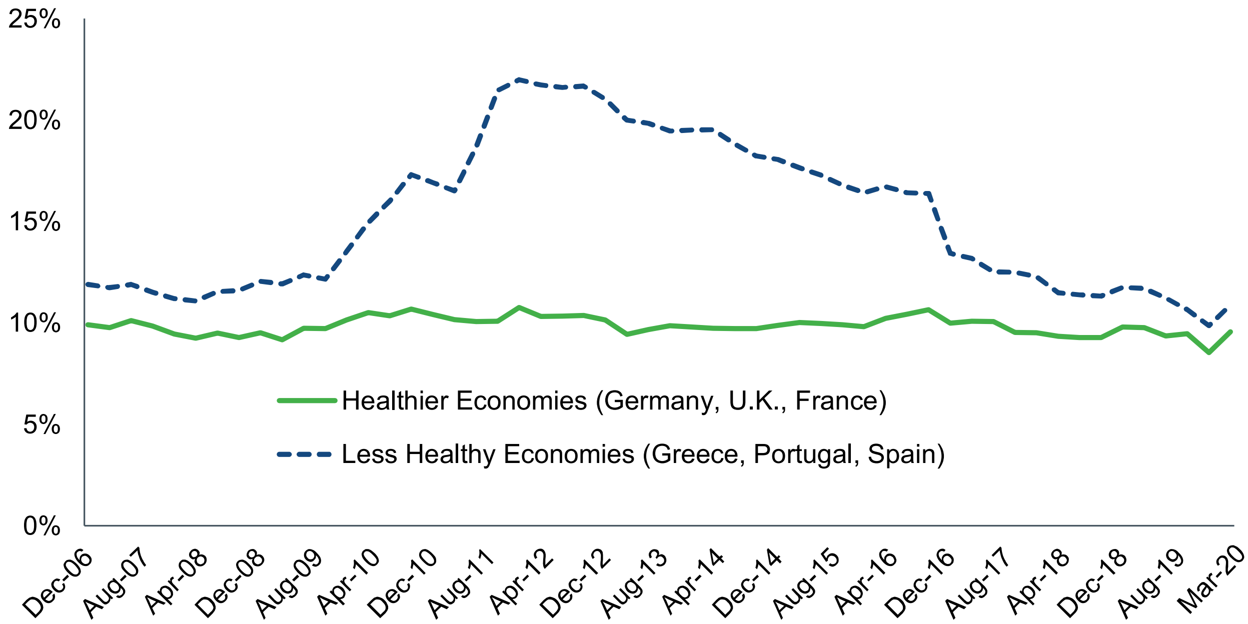
The model's output seems reasonable over this time period – the less healthy group is *riskier* than the healthier group over the entire 159-month period, and the gap *widens* after the 2008 financial crisis and the subsequent impact of the Eurozone sovereign debt crisis.

For example, by mid-2011 many analysts expected Greece to default on its government debt, despite the two bailout packages Greece was forced to accept in May 2010 and July 2011. Although not in such precarious conditions as Greece, Portugal was also forced into a bailout package in April 2011. Markets reacted negatively to the second EU-approved Greek bailout of July 2011 and the crisis spread to Spain and Italy, countries considered "too big to fail". In late summer 2012, the European Central Bank (ECB) was forced to reenact its government bonds purchase program and to provide additional liquidity to banks. In September 2012, the ECB also announced a new quantitative easing (QE) program to purchase certain sovereign debt securities in secondary markets, which resulted in peripheral sovereign yields declining significantly.

However, lackluster growth trends, coupled with deflation fears, induced the ECB to cut its benchmark rate to a new record low in early June 2014, while also announcing an unprecedented measure to charge negative interest rates on deposits held at the central bank. The loss in economic momentum, coupled with early third-quarter indicators falling short of expectations, prompted the ECB to again cut its benchmark rate to 0.05% in September 2014. The ECB also confirmed the start of an asset-backed securities purchase program and unveiled a new Euro-denominated covered bond purchase program. The continued threat of deflation led the ECB to announce a larger scale sovereign debt buying program in January 2015, which consists of €60 billion monthly asset purchases starting in March 2015, with a target end date of September 2016. In the midst of these events, a new government in Greece was elected in January 2014, bringing fears of a Greek exit from the Eurozone back to the forefront. These events impacted the CCRs for these countries, which translated into a higher cost of equity as implied by the CCR Model.

As time passes since the 2008 financial crisis and the 2010 and 2011 "bailouts" of Greece and Portugal, the spread between the base cost of equity capital of the "less healthy" and "healthier" European countries (as defined here) has seemingly returned to a pre-crisis level of approximately 200 basis points.

**Exhibit 6.6:** Median Calibrated Cost of Equity Capital Estimates for Healthier European Economies (Germany, U.K., France) versus Less Healthy European Economies (Greece, Portugal, Spain) From the Perspective of a U.S.-based Investor (Monthly, January 2007–March 2020)



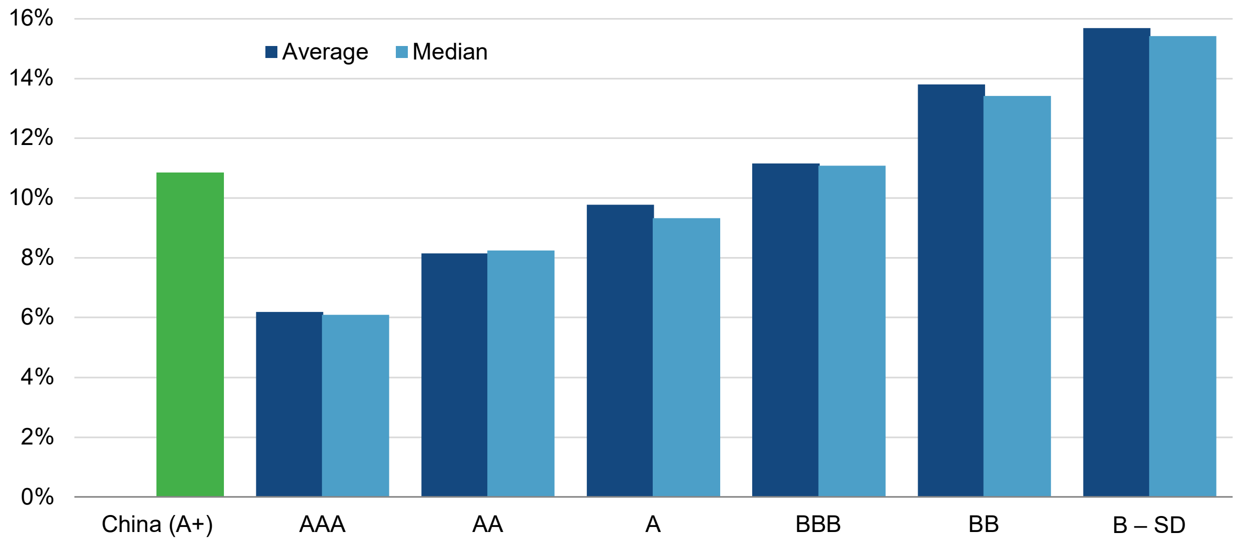

**Source of underlying data:** Institutional Investor's Country Credit Ratings; Euromoney Institutional Investor; equity (stock) indices from MSCI Global Equity Indices, Morningstar, Inc. Used with permission. All rights reserved. CCR-based estimates of cost of equity capital are calibrated in this exhibit to Kroll published "base" U.S. cost of equity capital estimates. All estimates are expressed in terms of U.S. Dollars. All calculations by Kroll.

### Cost of Equity Capital by S&P Sovereign Credit Rating

The CCR Model can also be used to compare the estimated cost of equity capital through the lens of credit rating agencies' debt ratings of countries.

In Exhibit 6.7, the CCR Model is used to estimate base country-level cost of equity capital (this time, from the perspective of a China-based investor) for countries with a Standard & Poor's (S&P) sovereign credit rating of AAA, AA, A, BBB, BB, and B–SD (SD stands for "Selective Default") as of March 2020; the median and average cost of equity capital estimates for countries in each rating group is then calculated. These groupings' median and average are then compared to the model's base country-level cost of equity capital estimate for a China-based investor investing in China. For purposes of this analysis, we have treated the U.S. as if it were rated AAA by S&P (see rationale in Chapter 4).

**Exhibit 6.7:** Median and Average Cost of Equity Capital Estimates from the Perspective of a China based Investor for Groupings of Countries with Various S&P Credit Ratings; Compared to China's Estimated Cost of Equity Capital (as of March 2020)




**Source of underlying data:** Institutional Investor's Country Credit Ratings; Euromoney Institutional Investor; equity (stock) indices from MSCI Global Equity Indices, Morningstar, Inc. Used with permission. All rights reserved. S&P credit ratings from Standard & Poor's Global Credit Portal. All estimates are expressed in terms of Yuan Renminbi (CNY). All calculations by Kroll.

Again, the relationships between the values make sense – countries with *lower* S&P credit grades tend to have *higher* cost of equity capital.

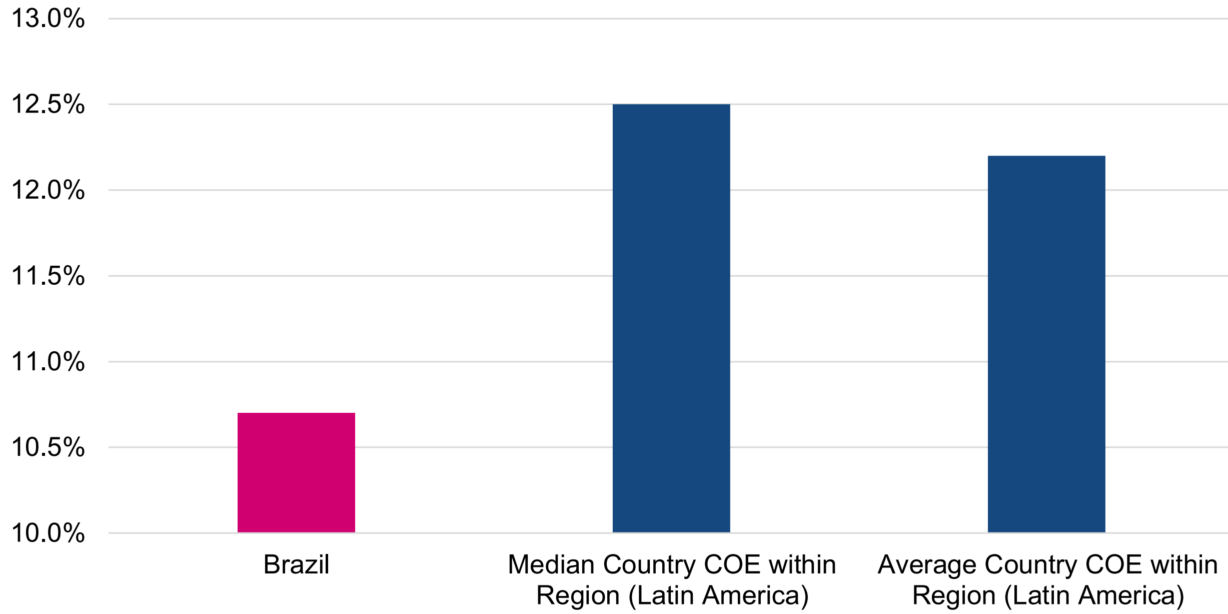
### Cost of Equity Capital by Geographic Region

The CCR Model can also be used to compare the estimated cost of equity capital across geographic regions.

In Exhibit 6.8, the model was used to estimate base country level cost of equity capital as of March 2020, from the perspective of a U.S.-based investor considering an investment in Brazil. This estimate is then compared to the median and average base country-level cost of equity estimate for countries in the Latin America geographic region (as a group).[23] The base country-level cost of equity capital for Brazil in U.S. dollars (a little over 10.5) is significantly *lower* than the median (i.e., typical) and average cost of equity capital for the region (over 12%).

[23] Regional classification based on Euromoney's Country Risk definitions. For further information please visit: http://www.euromoneycountryrisk.com.

**Exhibit 6.8:** Cost of Equity Capital for Countries in the Latin America Geographic Region, from the Perspective of a U.S.-based Investor (as of March 2020)




**Source of underlying data:** Regional classification based on Euromoney's Country Risk definitions; equity (stock) indices from MSCI Global Equity Indices, Morningstar, Inc. Used with permission. All rights reserved. All estimates are expressed in terms of U.S. Dollars. All calculations by Kroll.

## Presentation of Cost of Capital Data

In the previous Ibbotson Associates/Morningstar international reports, base country-level cost of equity capital estimates were published. In the Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator, however, country risk premia (CRPs) are the primary data presented.[24]

The CRP data presented in the Cost of Capital Navigator's International Cost of Capital Module can be used to estimate base country-level cost of equity capital estimates for over 175 countries, from the perspective of 56 investor perspectives (a U.S.-based investor, plus investors based in any one of 55 additional countries).

### Country Risk Premia (CRP) Defined

The CRP attempts to isolate the incremental risk premium associated with investing in a "foreign" country (i.e., the investee country; the country in which the investment is located) compared to the risk of investing in the "home" country (i.e., the country in which the investor is based).

24 "Base country-level cost of equity capital" estimates are also presented from the perspective of an investor based in Country X investing in Country X (e.g., a German-based Euro investor, an Australia-based Australian Dollar investor, etc.).

The publication of CRPs makes using the information published therein easier to use. Because the CRP is designed to isolate the *incremental* risks of investing in one country versus investing in another country (all other things held the same), the analyst can simply add the CRP to his or her own cost of equity estimate (see examples later in this section).

The International Cost of Capital Module includes 56 investor perspectives. In each of those 56 investor perspectives, over 175 investee countries are available to choose from, with a corresponding CRP. The CRPs are:

- Updated quarterly

- Different for each investor perspective

The CRPs presented in the Cost of Capital Navigator's International Cost of Capital Module are designed to be a gauge of the *relative* risks between investing in the "home" country and the "foreign" country, as determined within the framework of the Erb-Harvey-Viskanta Country Credit Rating Model, as calculated herein. This difference in relative risk is assumed to be a linear function, and remains the same regardless of the base country-level cost of equity capital for an investor investing in his or her home country selected by the analyst, whether that selection is (i) the *published* value, or (ii) a *custom* value calculated by the analyst. Examples for both of these scenarios are provided later in this section.

**How CRPs Are Calculated**

Calculation of the CRP is straightforward: the base country-level cost of equity capital estimate for a home-country-based investor investing in the home country is subtracted from the base country-level cost of equity capital estimate for a home-country-based investor investing in the foreign country. The difference is the CRP.

For example, the base country-level cost of equity capital as of March 2020 as estimated in the analyses herein using the CCR Model for a U.K.-based investor investing in the U.K. is 9.5% (in other words, 9.5% is the country-level discount rate for U.K. based British Pound (GBP) investors).

Alternatively, the base country-level cost of equity capital as of March 2020 for a U.K.-based investor investing in Russia is 13.1% (in other words, 13.1% is the country-level discount rate for U.K.-based investors in a Russia-based investment, denominated in GBP).[25] The CRP is calculated as follows:

---

[25] It is assumed that upon making the investment the investor must translate GBP into RUB, and upon repatriating returns must translate RUB back into GBP. In the implementation of the CCR Model presented herein, it is assumed that returns must ultimately be repatriated.

*CRP = (Base country-level cost of equity capital estimate for a home-country-based investor investing in the foreign country) – (Base country-level cost of equity capital estimate for a home-country- based investor investing in the home country)*

*2.6% = 13.1% – 9.5%*

A "base country-level cost of equity capital estimate" is the risk of investing in a country's market *as a whole* (i.e., an assumed beta of 1.0). The CRP therefore represents the *incremental* risk of investing in the foreign country's market *as a whole*, as opposed to investing in the home country's market *as a whole*.

In the following section, three examples are presented for estimating cost of equity capital using the CRPs derived using the Erb-Harvey-Viskanta Country Credit Rating Model:

- Estimating base country-level cost of equity capital assuming an investment in the foreign country's market as a *whole* (i.e., an assumed beta of 1.0), using *published* values.

- Estimating base country-level cost of equity capital assuming an investment in the foreign country's market as a *whole* (i.e., an assumed beta of 1.0), using the valuation analyst' s *own* estimate of his/her home country's base country-level cost of equity capital.

- Using CRPs to estimate cost of equity capital for use in evaluating a business, asset, or project.

### Using CCR Model CRPs to Estimate Base Country-level Cost of Equity Capital

In Resources section of Cost of Capital Navigator's International Cost of Capital Module at kroll.com/costofcapitalnavigator the base country-level cost of equity capital estimate *from the point of an investor based in each respective country (i.e., "home" country), investing in the home country as a whole* is presented.

For example, as calculated within the context of the CCR Model, the base country-level cost of equity capital for Brazil is 15.4% as of March 2020 of a Brazilian-based investor perspective in the Cost of Capital Navigator's International Cost of Capital Module. This represents the base country-level cost of equity capital for an investor based in Brazil, investing in Brazil. Alternatively, the base country-level cost of equity capital for Germany is 6.4%. This represents the base country-level cost of equity capital for an investor based in Germany, investing in Germany.

Investor "perspective" (i.e., the country in which the investor is based) is defined herein by the currency in which the equity returns used in the regression analyses are expressed in. An investor "based in Brazil" is therefore an investor who is estimating cost of capital with inputs (cash flows, etc.) that are expressed in the "local" currency of Brazil, the Real (BRL). Alternatively, an investor "based in Germany" is therefore an investor who is estimating cost of capital with inputs (cash flows, etc.) that are expressed in the "local" currency of Germany, the Euro (EUR).

Note that the base country-level cost of equity capital estimates reported in the Cost of Capital Navigator's International Cost of Capital Module Resources section assume an investment in the "market" of the home country *as a whole* (i.e., a beta of 1.0), *and do not include any adjustment for company/industry risk.* These values can be thought of as the sum of the risk-free rate plus the equity risk premium in each perspective country, expressed in the perspective country's local currency, as calculated within the context of the Erb-Harvey-Viskanta CCR model as presented herein. These values do not represent CRPs.

The base country-level cost of equity capital estimates are presented primarily for benchmarking purposes. They can also be used (in conjunction with the CRPs reported herein) to estimate base country-level cost of equity capital estimates from the perspective of an investor (based in any one of the 56 perspective countries) investing in any one of the over 175 investee countries markets *as a whole*, as outlined in Examples 6-1 and 6-2.[26]

**Example 6-1:** Calculate the base country-level cost of equity capital estimate for an investor based in Brazil, investing in the U.S. market *as a whole,* as of March 2020, using the *published* estimate of Brazil's base country-level cost of equity capital.

Estimating the base country-level cost of equity capital estimate for an investor based in Brazil investing in the U.S. *market as a whole* as of March 2020 is a four-step process:

> **Step 1:** In the Cost of Capital Navigator's International Cost of Capital Module, locate the Base Cost of Equity Capital by Country in the Resources section
>
> **Step 2:** Identify the base country-level cost of equity capital for an investor based in Brazil, *investing in Brazil*. We have previously determined that this is 15.4% as of March 2020.
>
> **Step 3:** Identify the CRP as of March 2020 for the United States in the Brazilian-based investor perspective by (i) either starting an estimate or (ii) selecting the "Country Risk Template + Estimate WACC in Multiple Countries" option in the Resources section.[27] This value is –3.2% (which in this case is not a premium, but a discount instead; in *either* case the value is *added* in Step 4).
>
> **Step 4:** Add the CRP identified in Step 3 to the base country-level cost of equity capital for an investor based in Brazil, investing in the Brazil *market as a whole*, as identified in Step 2 (15.4% + (–3.2%)). The result (12.2%) is the base country-level cost of equity capital estimate for an investor based in Brazil investing in the United States market *as a whole* as of March 2020.

---

26 For additional examples estimating cost of equity capital, please refer to the complementary CFA Institute webinar entitled "Quantifying Country Risk Premiums", presented on December 6, 2016 by James P. Harrington and Carla S. Nunes, CFA. This webcast can be accessed here: https://www.cfainstitute.org/en/research/multimedia/2016/quantifying-country-risk-premiums.

27 *Individual* CRPs and other risk premia for any valid investee country/investor country combination are accessible to all subscribers of the Cost of Capital Navigator's International Cost of Capital Module regardless of subscriber level (Basic, Pro, or Enterprise subscription levels). However, Pro and Enterprise level subscribers have additional access to full tables of the universe of calculable CRPs for each of the 56 investor perspectives by valuation date in the Resources section.

**Example 6-2:** Calculate the base country-level cost of equity capital estimate for an investor based in Brazil, investing in the U.S. market *as a whole,* as of March 2020, using the valuation analyst's *own* estimate of Brazil's base country-level cost of equity capital.

Financial professionals often come to *different* conclusions as far as cost of capital (and the inputs used for its components) is concerned. If, for example, the analyst wishes to use a *different* base country-level cost of equity capital as of March 2020 for an investor based in Brazil investing in Brazil, say 14.5% (instead of 15.4%, the *published* value used in the previous example), the *same* process is followed, but with the analyst's own custom estimate (14.5%) substituted:

> **Step 1:** In Example 6-1, we first identified the base country-level cost of equity capital estimate for an investor based in Brazil, investing in Brazil. We determined that as of March 2020 this estimate is 15.4%. However, in this example we are using the valuation analyst's own estimate of base country-level cost of equity capital for an investor based in Brazil, investing in Brazil, which is 14.5%.
>
> **Step 2:** Identify the CRP as of March 2020 for the United States in the Brazilian-based investor perspective by either (i) starting an estimate or (ii) selecting the "Country Risk Template + Estimate WACC in Multiple Countries" option in the Resources section.[28] This value is −3.2% (which in this case is not a premium, but a discount instead; in either case the value is added in Step 4).
>
> **Step 3:** Add the CRP identified in Step 2 to the base country-level cost of equity capital for an investor based in Brazil, investing in the Brazil *market as a whole*, as identified in Step 2 (in this example we are using the analyst's own estimate (14.5%) instead of the published estimate from the Cost of Capital Navigator). The resulting 11.3% (14.5% + (–3.2%)) is the base country-level cost of equity capital estimate for an investor based in Brazil investing in the United States market *as a whole* as of March 2020.

Again, the base country level cost of equity capital estimates assume an investment in the "market" of the home country as a whole (i.e., a beta of 1.0), *and do not include any adjustment for company/ industry risk.* Adding the appropriate CRP for an investor based in the "home" country investing in the "foreign" country will thus *also* be an estimate of the base cost of equity capital for investing in the foreign country's *market as a whole*, from the perspective of an investor based in the home country.

---

[28] *Individual* CRPs and other risk premia for any valid investee country/investor country combination are accessible to all subscribers of the Cost of Capital Navigator's International Cost of Capital Module regardless of subscriber level (Basic, Pro, or Enterprise subscription levels). However, Pro and Enterprise level subscribers have *additional* access to full tables of the universe of calculable CRPs for each of the 56 investor perspectives by valuation date in the Resources section.

## Using CCR Model CRPs to Estimate Cost of Equity Capital for Use in Evaluating a Subject Business, Asset, or Project

The ability to estimate base country-level cost of equity capital from the perspective of an investor in the "home" country into the "foreign" country's *market as a whole* (as was done in Examples 6-1 and 6-2) is very valuable information that can be used for *benchmarking* and *support* purposes. Most of the time, however, valuation analysts are developing discount rates for use in evaluating a subject *business*, *asset*, or *project*.

For example, valuation analysts are often confronted with the following problem: "I know how to value a company in the United States, but this one is in Country ABC, a developing economy. What should I use for a discount rate?" Can the CRP be used as an input in developing cost of equity capital estimates for, say, a company that operates in GICS 3030 (household & personal products) in a different country? Yes, but it is important to understand the assumptions one is making when doing this.

Using the aforementioned household & personal products company as an example, an analyst typically would develop discount rates for this company *as if it were located in* the "home" country, and then add a country risk premium (CRP) to account for the differences in risk between the home country, and the country in which the household & personal products company is *actually* located (i.e., the investee or "foreign" country).

The implied assumption in this analysis is that what it means to be a household & personal products company in the home country means the same thing as being a household & personal products company in the foreign country. Some questions that the analyst may wish to consider:

- Are the risks of being a household & personal products company in the foreign country the *same* as the risks of being a household & personal products company in the home country?

- Does a household & personal products company in the foreign country have the *same* beta (*β)* as a household & personal products company in the home country?[29]

- Does the household & personal products company in the foreign country operate in a different industry environment from a household & personal products company in the home country?

[29] Beta (β) is a measure of systematic risk used as an input in some methods of estimating cost of equity capital (e.g., the CAPM requires a beta).

- Did the analyst apply any additional adjustments when the discount rate was developed for the household & personal products company *as if it were located in* the home country? For example, was a size premium applied? "Large company" and "small company" can mean very different things from country to country. For example, a smaller-sized company in the U.S. or Germany may be a "large" company in Estonia or Norway.

Valuation analysis is an inherently comparative process, so questions like these are no different from the type of questions that are asked in any valuation analysis. For example, a subject company might be compared to a set of companies (i.e., peer group, or comparables) that possess characteristics that are arguably similar to the characteristics of the subject company. To the degree that the subject company and the peer group *do* have differences, further adjustment(s) may be required.

The process for using CRPs from the Cost of Capital Navigator's International Cost of Capital Module for estimating cost of equity capital for a subject *business*, *asset*, or *project*, is quite similar to developing base country-level cost of equity capital (as was done in the previous examples). The difference is that *additional* adjustments may be necessary, as outlined earlier.

In the case of our household & personal products company located in the foreign country, the "peer group" is household & personal products companies in the home country, and to the extent that a household & personal products company located in the foreign country is different (other than location), further adjustments may be required. Again, the CRP attempts to isolate the incremental risk premium associated with investing in another market *as a whole*, without regard to differing *industry* risks or other risks that may be particular to that type of business in the foreign country.

**Example 6-3:** Estimate cost of equity capital for a company in India that operates in GICS 3030 (household & personal products) as of March 2020, from the perspective of an investor based in the U.S.

Estimating cost of equity in this example is a three-step process:

> **Step 1:** Calculate cost of equity capital estimate for household & personal products company located in the U.S. For the purposes of this example, assume 8.0%.[30]
>
> **Step 2:** Identify the country risk premium (CRP) as of March 2020 for India, from the perspective of a U.S.-based investor. This value is 3.5%.

[30] An excellent source of international industry statistics (including cost of equity capital estimates and peer group betas for use in CAPM estimates) is the Cost of Capital Navigator's International Industry Benchmarking Module. Learn more at kroll.com/costofcapitalnavigator.

**Step 3:** Add the CRP identified in Step 2 to the cost of equity capital estimate for a household & personal products company in the U.S. estimated in Step 1 (8.0% + 3.5%). The result (11.5%) is the cost of equity capital estimate for an investor based in the U.S. investing in a household & personal products company located in India, *prior* to any adjustments due to intrinsic differences in in the household & personal products industry environment (or other risks) between the U.S. and India.

# Chapter 7

# Firm Size and the Cost of Equity Capital in Europe

Chapter 7 is a brief synopsis of a Research Note authored by Professor Erik Peek of the Rotterdam School of Management, Erasmus University (RSM). The Research Note examines the relationships between firm size and the cost of equity capital in European equity markets.[1] While a statistically significant "size effect" was detected in Europe, this effect was (i) limited to only the smallest of companies, and (ii) was not uniformly detected in all countries examined.

In the analyses presented herein, Professor Peek updated his analysis through the end of 2021. Starting with the year-end 2020 analysis, the results summarized in Europe Size Study under International Supplementary Data in the Resources Library of the Cost of Capital Navigator are now in 10 portfolios versus 16 portfolios in previous updates.

### Differences in Returns Between Large and Small Companies in Europe

Numerous studies have examined U.S. equity returns and found that stocks of companies whose market capitalization is small (i.e., "small-cap" stocks) tend to earn greater returns, on average, than stocks of companies whose market capitalization is large (i.e., "large-cap" stocks), suggesting that small firms have a greater cost of equity capital. In fact, these studies show that depending on sample selection procedures, research period, and sorting methodology, the estimated monthly return difference between small-cap and large-cap stocks may range from approximately 0.4% to almost 2.5%.[2]

Researchers have posited many explanations for the size effect, including (i) firm size proxies for differences in liquidity, or for other priced (yet unobservable) risk factors, or (ii) investor preferences or recognition depend on firm size.

To potentially assist investors to estimate the cost of equity in non-U.S. markets, some researchers have investigated the size effect in samples of non-U.S. stocks. Many of these studies, especially those focusing on a single country, may have been inhibited by a lack of data. Another potential issue has been the historic lack of integration among some or all of the stock markets in the sample, particularly with studies examining various groups of countries during the

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[1] The full Research Note "A Study of Differences in Returns Between Large and Small Companies in Europe", is available at http://ssrn.com/abstract=2499205. The Research Note was published as part of the ongoing research that Kroll performs and sponsors in the area cost of capital and other valuation issues. Professor Erik Peek is at Rotterdam School of Management, Erasmus University (RSM), Netherlands. We thank Professor Peek for his expertise in exploring this important topic.

[2] In one recent study the authors find support for the existence and significance of the size effect across 30 industries and 23 countries outside of the United States and over different time periods. See: "Size Matters, If You Control Your Junk," Clifford S. Asness, Andrea Frazzini, Ronen Israel, Tobias J. Moskowitz, and Lasse Heje Pedersen, *Journal of Financial Economics* 129 (2018): 479-509.

1970s and 1980s. Moreover, it is entirely conceivable that the risk differences between small- and large-cap stocks in a segregated locality could differ significantly from the risk differences between small and large-cap stocks in an internationally diversified portfolio. This may occur, for example, if a lack of diversification opportunities in segregated markets makes investors averse to small-cap stocks' greater idiosyncratic risk.

In Professor Peek's research, the existence of the size effect outside the U.S. is reassessed using a large sample of Western European stocks over the period 1990–2021, a time in which the European economies and stock exchanges were largely and increasingly integrated.[3] The size effect is examined in a "pooled" sample in which all European exchanges are treated as a single integrated market, and also examined by splitting the sample into potentially more homogeneous geographic regions.

### Countries Included

The original Research Note (and the updated analysis herein) focused on a set of 17 Western European countries (and stock exchanges) that have exhibited a large degree of integration during the past two decades. These countries are summarized in Exhibit 7.1.

**Exhibit 7.1:** Countries Included

| | |
|---|---|
| Austria | Luxembourg |
| Belgium | The Netherlands |
| Denmark | Norway |
| Finland | Portugal |
| France | Spain |
| Germany | Sweden |
| Greece | Switzerland |
| Ireland | United Kingdom |
| Italy | |

### Data Sources

The sample of companies used to perform the analysis presented comes from the intersection of Refinitiv's *Datastream* database (from which market and return data were gathered) and Refinitiv's (formerly Thomson Financial) *Worldscope* database (from which fundamental or accounting-based data was gathered).[4]

[3] E. Freimann, "Economic Integration and Country Allocation in Europe", *Financial Analysts Journal* 54, no. 5 (1998): 32–41.

[4] Returns are expressed in Euros. For years prior to introduction of the Euro, the returns are expressed in Deutsche Mark. Company types included: non-start-up, financially healthy companies – the typical company in most investment portfolios (i.e., "Low-Financial -Risk" companies). Company types excluded: financial service companies, financially-distressed companies, companies having illiquid stock, companies in the early stages of their life cycle (see the original Research Note for details about the company set selection methodology employed).

## Regional Differences

Prior country-specific studies on the firm size effect have produced mixed evidence, leading some researchers and practitioners to conclude that the effect does not exist in some non-U.S. countries.[5]

To shed some light on the significance of the size effect across economic regions and their potential origin, the sample was split into groups of geographically proximate and economically integrated countries and the differences between returns for portfolios comprised of the largest and smallest companies were analyzed, with the data being subdivided into quartiles.[6]

Exhibit 7.2 displays the average portfolio return spreads between the bottom quartile portfolio (comprised of the smallest companies as measured by market capitalization) and the top quartile portfolio (comprised of the largest companies as measured by market capitalization) for the following four regions:

- Europe (as defined by the 17 countries listed in Exhibit 7.1)
- Continental Europe (i.e., the countries included in the Europe sample, excluding Ireland and U.K.)
- Ireland and United Kingdom (£ Investor)
- Ireland and United Kingdom (€ Investor)

The regional return spreads are presented in order of significance, measured as the (one-sided) probability that the differential (i.e., the size premium) is equal to or less than zero. The reader is cautioned to interpret the observed regional differences with care (especially because splitting up the sample unavoidably affects statistical power). On the whole, Exhibit 7.2 suggests that the size premium is positive in every economic region considered.

5 For example, some studies of the German equity market conclude that in recent decades stock returns of small German firms have not significantly exceeded stock returns of large German firms (see e.g., Schulz, 2009). With their view seemingly supported by these findings, the German Institute of Public Auditors ('Institut der Wirtschaftsprüfer') recommends in its (nationally authoritative) Principles for the Performance of Business Valuations not to add size premia to cost of capital estimates.

6 Firm-size breakpoints were first determined in the full European sample, and then these same breakpoints were used to construct portfolios in the regional samples (thus ensuring that size portfolios are consistently defined across samples).

**Exhibit 7.2:** Average Annual Return Spreads between Top and Bottom Market Capitalization Quartiles by Region (December 2021)

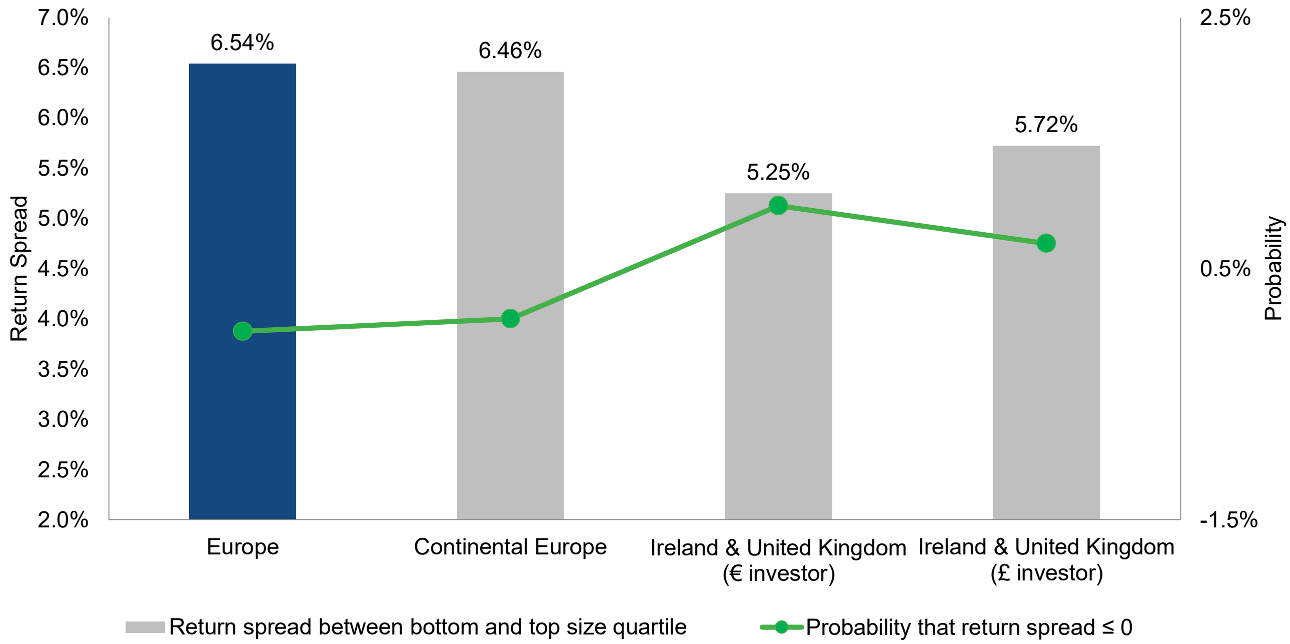


Exhibit 7.3 displays the average portfolio return spreads between the bottom quartile portfolio (comprised of the small countries as measured by size factor) and the top quartile portfolio (comprised of the largest countries as measured by size factor) for the same four regions listed above and in Exhibit 7.2.[7]

Once again, the reader is cautioned to interpret the observed regional differences with care, since splitting up the sample unavoidably affects statistical power. On the whole, Exhibit 7.3 suggests that the size premium is positive in every economic region considered; however, the economic and statistical significance of the return spreads varies. This is consistent with the original Research Note findings that the size effect varies across countries and regions within Europe. In this most recent update, however, Exhibits 7.2 and 7.3 suggest that regional differences are small and insignificant. The comparison with prior versions of the study would suggest that previously observed regional differences have disappeared or were driven by small sample sizes.

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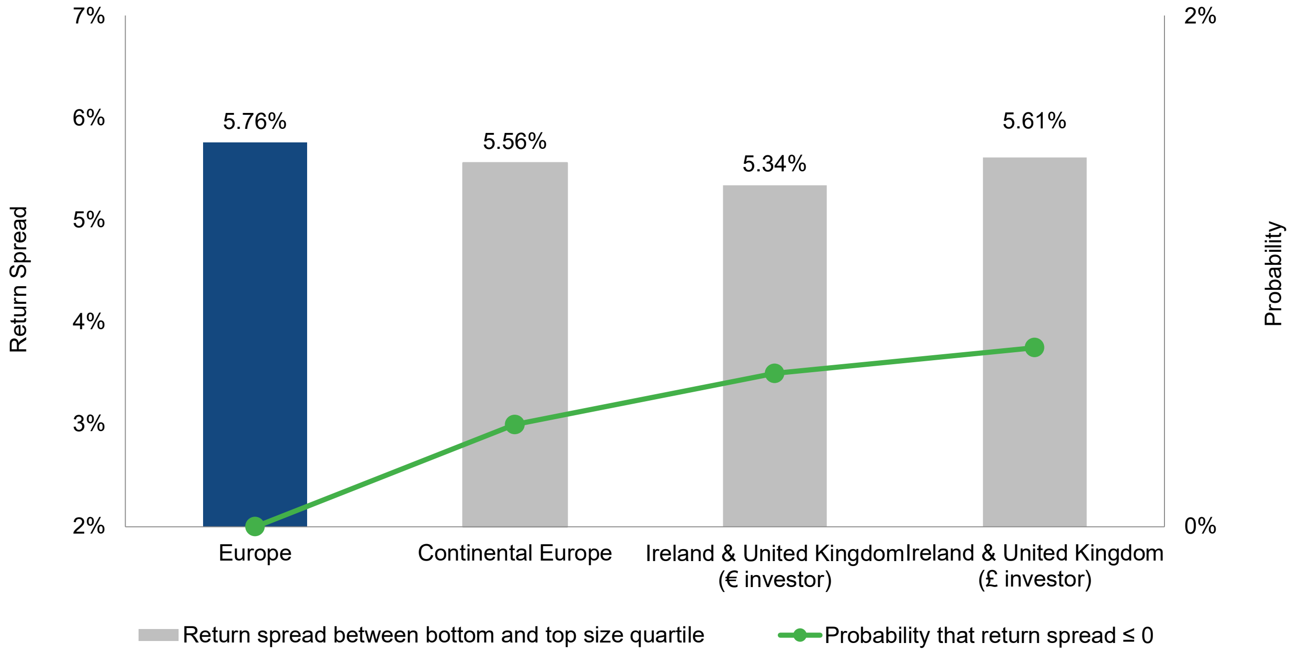
[7] The size factor is an aggregation of the other six measures of size analyzed in the Research Note: market capitalization, book equity, market value of invested capital, total assets, sales, and number of employees.

**Exhibit 7.3:** Average Annual Return Spreads between Top and Bottom Size Factor Quartiles by Region (December 2021)




## Two Types of Risk Premia Examined

The data exhibits in Professor Peek's Research Note summarize (and may aid in the examination of) the relationships between firm size and the cost of equity capital in European equity markets. These exhibits present different types of size-related risk premia data, including (i) "risk premia over the risk-free rate", and (ii) "risk premia over CAPM".

The main difference between "risk premia over the risk-free rate" and "risk premia over CAPM" is how size-related risks are being measured, which in turn determines the cost of equity capital models (i.e., build-up method or CAPM) in which they could be used.

Both the risk premia over the risk-free rate and the size premia herein were developed using six different measures of firm size, plus a seventh size measure that is a combination of the six different measures of size[8]

For further detail, refer to "European Size Study" under European Size Premium in the Resources Library of the Cost of Capital Navigator's International Cost of Capital Module.

8 The six measures of size analyzed in the Research Note are: market capitalization, book equity, market value of invested capital, total assets, sales, and number of employees. The seventh measure, the aggregation of the other six measures was determined as follows: Size Factor = −2.5160 + 0.0795 × ln(Market capitalization) + 0.0831 × ln(Market Value of invested capital) + 0.0842 × ln(Book equity) + 0.0820 × ln(Total assets) + 0.0713 × ln(Sales) + 0.0765 × ln(Employees).

**Risk Premia Over the Risk-free Rate**

"Risk premia over the risk-free rate" (i.e., excess returns) are a measure of the combined effect of *market* risk and *size* risk. These premia could be used within the context of a build-up method of estimating the cost of equity capital. These premia are simply added to a risk-free rate to determine a cost of equity capital estimate.

For example, a basic build-up model of cost of equity capital estimation could be written as:[9]

$$\boxed{E(R_i) = R_f + RP_{m+s}}$$

Where:

$E(R_i)$ = Expected rate of return on security *i*

$R_f$ = Risk-free rate

$RP_{m+s}$ = Market risk plus a risk premium for size

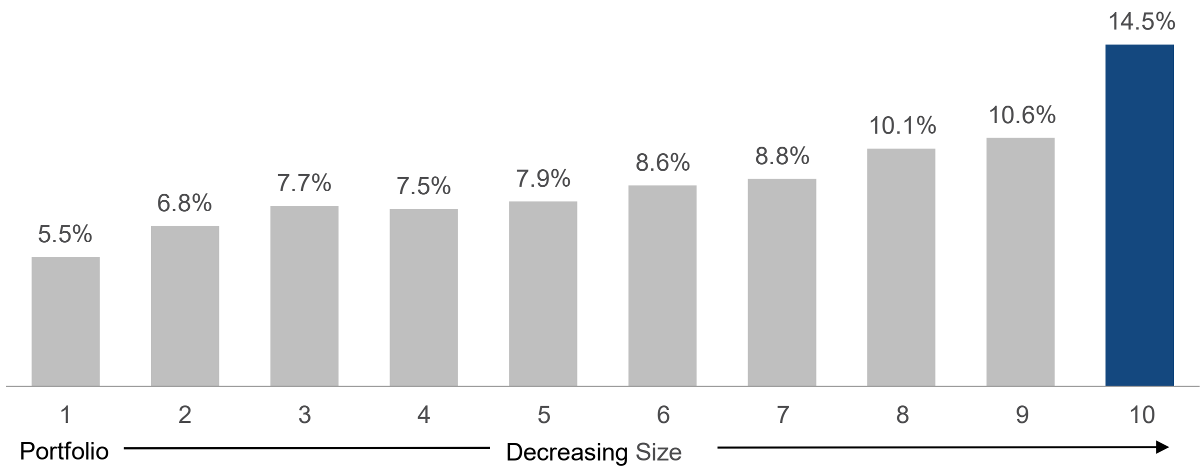
The risk premia over the risk-free rate were developed using six different measures of firm size, plus a seventh size measure that is a combination of the six different measures of size:

- Market Capitalization
- Book Equity
- Market Value of Invested Capital
- Total Assets
- Sales
- Number of Employees
- A seventh size measure that is a combination of the six different measures of size.

[9] The simple build-up equation shown represents cost of equity capital prior to any additional adjustments attributable to the specific company that the individual analyst may deem appropriate.

In Exhibit 7.4, the simple average of all arithmetic average “risk premia over the risk-free rate” for all seven measures of firm size from the Research Note are shown, updated through 2021.[10] Exhibit 7.4 suggests that “risk premia over the risk-free rate” generally increase as size decreases (and vice versa), albeit *non-monotonically.* Exhibit 7.4 also suggests that the firm “size effect” on the cost of equity may be present in the European sample, although it seems to be fairly concentrated in the smallest companies.

**Exhibit 7.4:** Composite Average of Arithmetic Average “Risk Premium Over the Risk-free Rate” (December 2021)




For detailed tables with premia and statistics about the 10 portfolios in Exhibit 7.4 for each of the seven size measures, refer to “European Size Study” under European Size Premium in the Resources Library of the Cost of Capital Navigator.

We recommend that analysts consider using the smoothed average risk premia in estimating the cost of equity capital when using the build-up method. We also recommend that analysts consider the range of results from using the data for all seven measures of size before concluding on a cost of equity capital.

We also recommend that the analyst examine the relationships described in “European Size Study” under International Supplementary Data in the Resources Library section of the Cost of Capital Navigator that summarizes fundamental risk measures (based on accounting data) of the companies comprising each size ranked portfolio:

- Average operating margin
- Standard deviation of operating margin

[10] This information is extracted from “European Size Study” under International Supplementary Data in the Resources Library section of the Cost of Capital Navigator at kroll.com/costofcapitalnavigator.

- Average z-score

Note, as size decreases, average operating margins also tend to decrease, standard deviation of operating margins tend to increase, and z-scores tend to increase.

If the risk characteristics of the subject company differ from the average of companies comprising the size ranked portfolios, use a risk premia that differs from the average published in the Resources Library of the Cost of Capital Navigator.

For example, if the average operating margin is *greater* and the average variability of operating margin of the subject company is *less* than that of the companies comprising the size ranked portfolios, the appropriate risk premia is likely *less* than that published in Europe Size Study under International Supplementary Data in the Resources Library section of the Cost of Capital Navigator. That is, the risk of the subject company more closely resembles that of a larger company and the risk premia should likely be more like that of larger companies with comparable average operating margins and comparable standard deviations of operating margin.

**Premia Over CAPM (Size Premia)**

Risk premia over CAPM (i.e., size premia) were also developed for each of the seven different measures of firm size. These premia could be applied when estimating the cost of equity capital using a modified CAPM.[11]

The following is an example of the "Modified" CAPM:[12,13]

$$\boxed{E(R_i) = R_f + (\beta \times RP_m) + RP_s}$$

Where:

| | | |
|---|---|---|
| $E(R_i)$ | = | Expected rate of return on security *i* |
| $R_f$ | = | Risk-free rate |
| $\beta$ | = | Beta estimate for security *i* |
| $RP_m$ | = | Market risk premium, or ERP |
| $RP_s$ | = | Risk premium for size |

11 The "textbook" CAPM is defined as $E(Ri) = Rf + (\beta \times RPm)$. A "modified" CAPM typically entails adding additional risk premium adjustments (in this case, the additional adjustment is for "size"). The individual analyst may conclude that additional risk factors are appropriate.

12 This information is extracted from the International Supplementary Data in the Resources Library section of the Cost of Capital Navigator.

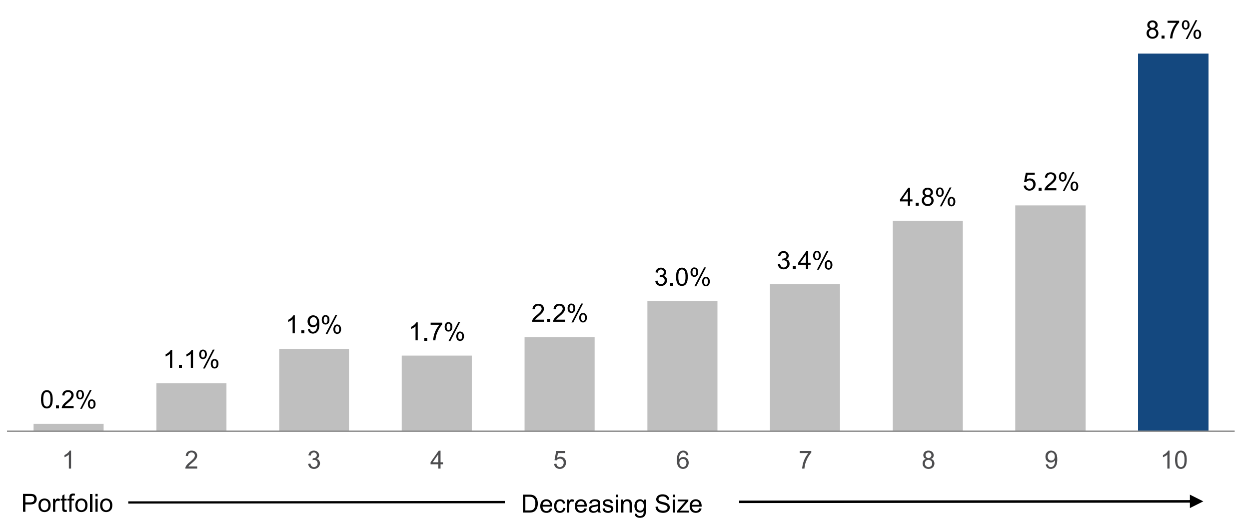
13 The modified CAPM equation shown represents cost of equity capital after a "size" adjustment and prior to any additional adjustments attributable to the specific company that the individual analyst may deem appropriate.

Like the previously discussed “risk premia over the risk-free rate”, the risk premia over CAPM were also developed using six different measures of firm size, plus a seventh size measure that is a combination of the six different measures of size:

- Market Capitalization
- Book Equity
- Market Value of Invested Capital
- Total Assets
- Sales
- Number of Employees
- A seventh size measure that is a combination of the six different measures of size.

In Exhibit 7.5, the simple average of all arithmetic average “risk premia over CAPM” for all seven measures of firm size from the Research Note are shown. Exhibit 7.5 suggests that "risk premia over CAPM" generally *increase* as size *decreases* (and vice versa), albeit *non-monotonically.* Again, this suggests that the firm “size effect” on the cost of equity may be present in the European sample, although it seems to be fairly concentrated in the smallest companies.

**Exhibit 7.5:** Composite Average of Arithmetic Average “Risk Premium Over CAPM” (i.e., Size Premia) (December 2021)



For detailed tables with premia and statistics about the 10 portfolios in Exhibit 7.5 for each of the seven size measures, refer to "European Size Study" under European Size Premium in the Resources Library of the Cost of Capital Navigator.

We recommend that analysts consider using the smoothed average premia over CAPM in estimating the cost of equity capital when using the modified CAPM. We also recommend that analysts consider the range of results from using the data for all seven measures of size before concluding on a cost of equity capital.

We also recommend that the analyst examine the relationships in the Resources Library of the Cost of Capital Navigator that summarizes fundamental risk measures (based on accounting data) of the companies comprising each size ranked portfolio:

- Average operating margin
- Standard deviation of operating margin
- Average z-score.

Note, as size decreases, unlevered beta estimates tend to increase, average operating margins tend to decrease, standard deviation of operating margin tend to increase, and z-scores tend to increase.

If the risk characteristics of the subject company differ from the average of companies comprising the size ranked portfolios, use a risk premium over CAPM that differs from the average published in "European Size Study" under International Supplementary Data in the Resources Library section of the Cost of Capital Navigator.

For example, if the average operating margin is *greater* and the average variability of operating margin of the subject company is *less* than that of the companies comprising the size ranked portfolios, the appropriate risk premia over CAPM is likely *less* than that published in the International Supplementary Data. That is, the risk of the subject company more closely resembles that of a larger company and the risk premia over CAPM should likely be more like that of larger companies with comparable average operating margins and comparable standard deviations of operating margin.

In addition, the data provides the analyst with the possibility of adjusting the unlevered beta (removing financial risk differences) estimates for a non-public company developed from guideline public companies. For example, if the average operating margin and the average variability of operating margin of the subject company are less than that of the guideline public companies being used to estimate the unlevered beta, one can use the data displayed to estimate an adjusted (lower) unlevered beta.

## Effects On Size Premia when Using OLS Betas and Sum Betas

Smaller companies generally trade less frequently and exhibit more of a lagged price reaction (relative to the market) than do larger companies. One of the ways of capturing this lag movement is called a “sum” beta.[14] Sum betas are designed to compensate for the less frequent trading of smaller company stocks. All of the size premia in the Research Note (and the updated analysis herein) are calculated using sum betas, which appear to correct for the lesser OLS beta estimates of smaller companies.

In Exhibit 7.6, OLS betas and sum betas are calculated for the portfolios comprised of low financial risk companies, ranked by their size factor, as examined in the Research Note (updated through 2021).[15,16] Sum betas tend to be *larger* than the OLS betas. The OLS betas and sum betas for the portfolios comprised of larger companies are approximately the same. The net result of the *larger* sum betas is *smaller* size premia.

For example, portfolio 1 (comprised of the *largest* companies) in Exhibit 7.6 has an OLS beta of 0.92, and a sum beta of 0.94. Alternatively, portfolio 10 (comprised of the *smallest* companies) has an OLS beta of 0.76, and a sum beta of 1.12. All things held the same, the *larger* sum beta of decile 10 results in a *smaller* size premia than would be calculated using its OLS beta counterpart.

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14 See Roger G. Ibbotson, Paul D. Kaplan, and James D. Peterson, “Estimates of Small-Stock Betas Are Much Too Low”, *Journal of Portfolio Management* (Summer 1997): 104–111. See also Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital: Applications and Examples* 5th ed. (Hoboken, NJ: Wiley & Sons, 2014), Chapter 11, Beta: “Differing Definitions and Estimates”, and Appendix 11A: “Examples of Computing OLS Beta, Sum Beta, and Full-information Beta Estimates”.

15 “Low-financial-risk” companies were the primary set of companies examined in the Research Note. A set of companies identified as “high-financial-risk” were also examined separately.

16 The size factor is an aggregation of the other six measures of size analyzed in the Research Note: market capitalization, book equity, market value of invested capital, total assets, sales, and number of employees.

**Exhibit 7.6:** Comparison of OLS Betas and Sum Betas by Equal-Weighted Market Capitalization Portfolio as Calculated Over the Time Horizon 1990–2021

| Size portfolio | Upper bound in 2021 | N in 2021 | Portfolio OLS Beta | Portfolio Sum Beta | Difference |
|---|---|---|---|---|---|
| 1 (big) | 292,832 | 171 | 0.92 | 0.94 | 0.02 |
| 2 | 11,007 | 171 | 0.93 | 1.02 | 0.09 |
| 3 | 4,613 | 171 | 0.96 | 1.10 | 0.14 |
| 4 | 2,122 | 172 | 0.91 | 1.09 | 0.18 |
| 5 | 1,093 | 171 | 0.86 | 1.04 | 0.18 |
| 6 | 622 | 171 | 0.83 | 1.05 | 0.22 |
| 7 | 350 | 172 | 0.82 | 1.01 | 0.19 |
| 8 | 181 | 171 | 0.79 | 0.99 | 0.20 |
| 9 | 88 | 171 | 0.78 | 1.02 | 0.24 |
| 10 (small) | 37 | 171 | 0.76 | 1.12 | 0.36 |
| | | | | | |
| Mid-Cap 3 - 5 | 4,613 | 514 | 0.87 | 1.06 | 0.19 |
| Low-Cap 6 - 8 | 622 | 514 | 0.80 | 1.01 | 0.21 |
| Micro-Cap 9-10 | 88 | 342 | 0.76 | 1.12 | 0.36 |

One can see in Exhibit 7.7 that using the sum beta method also results in greater betas for smaller companies across regions included in the Research Note (and the updated analysis herein).[17]

[17] Like Exhibit 7.6, Exhibit 7.7 is also comprised of the "low-financial-risk" set of companies examined in the Research Note.

**Exhibit 7.7:** Comparison of OLS Betas and Sum Betas for Different Regions (December 2021)

| Countries | | N in 2021 | Portfolio OLS Beta | Portfolio Sum Beta | Difference |
|---|---|---|---|---|---|
| Europe | All Companies | 1,671 | 0.86 | 1.04 | 0.17 |
| | Over € 1 Billion | 702 | 0.95 | 1.01 | 0.07 |
| | Under € 100 Million | 353 | 0.77 | 1.03 | 0.26 |
| Continental Europe | All Companies | 1,302 | 0.83 | 0.97 | 0.14 |
| | Over € 1 Billion | 546 | 0.94 | 1.00 | 0.06 |
| | Under € 100 Million | 283 | 0.69 | 0.90 | 0.21 |
| United Kingdom & Ireland (€ investor) | All Companies | 369 | 0.93 | 1.15 | 0.22 |
| | Over € 1 Billion | 156 | 0.95 | 1.04 | 0.09 |
| | Under € 100 Million | 70 | 0.90 | 1.23 | 0.33 |
| United Kingdom & Ireland (£ investor) | All Companies | 400 | 0.67 | 1.02 | 0.35 |
| | Over £ 1 Billion | 161 | 0.73 | 0.92 | 0.18 |
| | Under £ 100 Million | 89 | 0.60 | 1.06 | 0.47 |

In applying CAPM, one should be internally consistent between how the beta was estimated and how the size premium was calculated. Using a sum beta times the ERP estimate and adding a sum beta based size premium would arguably result in a better reflection of the cost of equity faced by a small company.

Having said that, regardless of which type of beta calculation method is ultimately employed (OLS vs. sum beta), one should match the source of the size premium (i.e., how it was computed), with the type of beta estimate chosen for the subject company. In other words, one should use a size premium derived using OLS betas in conjunction with a subject company beta estimated through OLS; similarly, one should use a size premium derived using sum betas when a sum beta was selected for the subject company. Therefore, if one is utilizing this study's results, one should properly estimate beta using the sum beta method.

## Conclusion

This chapter summarizes the findings of Professor Erik Peek's Research Note (and the updated analysis herein), which examines whether the realized share price returns of small European firms have exceeded those of large firms over the period 1990–2021. Using various measures of firm size, the Research Note finds that small company shares have likely outperformed large company shares, on average, suggesting that investors perceive small European firms as riskier, and thus demand a “size” premium to compensate for this additional risk. The evidence also indicates that the relationship between firm size and returns is strongly *non-linear*, and that the size premium is significant only for the *smallest* companies.

While the observed “size effect” is statistically significant only for those portfolios comprised of the *smallest* firms during the 1990–2021 period, this does not necessarily infer that the size effect is not present for larger companies in Europe. Studies of the size effect in countries with longer data availability, such as the United States, show that the size effect fluctuates over time. Given the short period of the current analysis of European markets (32 years, due to data constraints), a longer-term relationship could not be studied.

Breaking the European sample into regional and country subsamples, the Research Note’s findings suggest that the relationship between firm size and returns varies across regions, although in this most recent update, the observed differences across regions are smaller than they were in previous updates. In particular, Professor Peek finds in his original Research Note that the firm size effect may be strongest in the Anglo-Saxon and Nordic countries in the sample.

Again, while the size premium shown in the Research Note (and the updated analysis herein) is *not* significant in some European regions, the reader need not automatically conclude from it that firm size does not matter for cost of capital estimation in some countries. Splitting up the sample unavoidably affects the statistical power of the study’s tests and tends to reduce statistical significance in at least some of the subsamples, by default. Leaving aside statistical significance, Professor Peek’s research suggest that the average return spread between small and large firms is positive in each of the examined regional subsamples, and that size and liquidity distributions likely differ across regions. As Professor Peek posits, such differences may potentially explain why the size effect appears strong in some regions but weaker in others.

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