An Equity Risk Premium for Business Valuation of Dutch Companies

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KROESE WEVERS *ontcijfert*

Preface

For the past six months, I have been working on this thesis. Its completion will mark the end of my master Industrial Engineering and Management and therefore, my time as a student. Because of COVID-19, I had to downgrade the office of KroeseWevers to the office that is my home for the most part. However, I was still able to spend a significant amount of time at KroeseWevers and even if this was not possible, my colleagues were always willing to aid me. In this preface, I would like to take the opportunity to express my gratitude to the people who helped and supported me in conducting this research.

I would like to thank Berend for his contribution to the thesis in his role of lead supervisor of the University of Twente. During our several meetings, he always provided interesting insights into the several subjects that the thesis covered. Although we were never able to meet in person due to said reasons, the meetings were just as valuable as they would be under normal circumstances. Furthermore, I also thank Wouter for the insights he provided in his role as second reader of the University of Twente.

In addition, I would like to thank KroeseWevers for the opportunity of graduating at their firm. I thoroughly enjoyed the time I spent as an intern at the company. I would like to thank all the colleagues at the Corporate Finance department for their enthusiasm and willingness to aid me in my research. Specifically, I would like to thank Ferdi for his contribution to the research as supervisor from KroeseWevers. Due to his academic background and genuine interest in the research, he was able to help many times throughout the thesis. I am looking forward to continuing working at KroeseWevers as a junior corporate finance consultant after finishing my studies.

Finally, I would like to thank my friends and family for their support over the course of the research. Now all that remains is for me to express that I hope you enjoy reading the thesis.

Roman Berkel

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Management Summary

The equity risk premium (ERP) is one of the most important, but elusive parameters in finance. Although many academics and practitioners estimate the premium, there is a lack of consensus about its value. We attribute this lack of consensus to the ERP design, which includes the approach, the input parameters, and the market proxy used to estimate the premium. We set out to design an ERP for the Dutch market so that corporate finance firms appraising businesses active in this market can improve the quality of their valuations and inherently the services they provide. Although we conducted the research at KroeseWevers Corporate Finance (KWCF) which appraises Dutch SMEs, we can not only apply the research to this specific type of company as we can apply it in the valuation of any type of company active in a mature market.

First, we conducted a literature research into the ERP and the role it plays in valuation. The ERP is the incremental return over the forecasted yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks. The model underlying the ERP is the Capital Asset Pricing Model (CAPM). Investors use this model to decide on the expected returns they require for individual investments. It relates the expected return on an asset to its β, which measures the sensitivity of the return of the investment relative to return on the market portfolio. The ERP uses CAPM with β equal to 1 because the ERP is based on a diversified portfolio of common stocks which follows from its definition. The ERP plays an important role in every valuation that applies the income approach, which is the most used valuation approach. The income approach uses the cost of equity as the discount rate that reflects the riskiness of the expected cash flows to determine the present value of a future set of cash flows. The cost of equity consists out of the ERP, the risk-free rate, the company-specific premium and the size premium.

Second, based on literature and the application of the ERP in practice, we established the possible options for each design aspect, and we identified the most appropriate choices for the application of the premium for the Dutch market. Regarding the approach, we deem the use of a discount dividend model (DDM) based ERP through spreadsheet modelling as the most appropriate choice. With relation to the market proxy, we opt for a country-specific ERP based on the AEX Index. Concerning the input parameters, we find the yield on a 30-year Dutch government bond for the risk-free rate proxy. With respect to the expected return parameter, we prefer the use of dividends, buybacks, and issuance costs. In regard to the growth rate, we see the non-constant growth assumption as the most suitable choice. This design results in the Explicit Quotidian Dutch Equity Risk Premium, or EQD ERP. The ERP is explicit because both the design and the estimation are transparent, quotidian because the tool can estimate the premium daily and Dutch because we apply the ERP to the Dutch equity market.

Third, we implemented the EQD ERP design in an Excel tool. The user can either estimate the ERP through the Dashboard worksheet or the Manual input dashboard worksheet. The Dashboard sheet estimates the ERP daily by using data already stored in the tool itself. The Manual input dashboard sheet estimates the ERP based on the input data provided by the user. In both dashboards, the user must answer a few questions so that the tool configures the input parameters to the appropriate settings. Then, the only action for the user left to perform is clicking the estimation button which we linked to a Visual Basic (VBA) macro that estimates the ERP.

Fourth and finally, we validated the research by comparing the results to the KPMG ERP and conducting a sensitivity analysis. This ERP is a generally accepted estimate in the industry and often applied in business valuations. We retrieved the results by simulating the ERP for four historic years using VBA. Our results showed similar characteristics as the KPMG estimate. Both the minimum and maximum are 0.25% lower than the KPMG ERP, the range is the same and the average is 0.08% lower. Based on this comparison, we concluded that the results of the research are valid. In addition, we quantified the impact of the input on the ERP by means of a sensitivity analysis. The analysis acts as a sanity check for our research as we analyse whether the results are in line with the expectations according to theory. The ERP increases when the inflation rate increases, while the ERP decreases when the index price and the risk-free rate increase. We concluded that these results are in line with theory.

The contribution of the research is threefold:

1. The research contributes to the body of knowledge by giving a general overview of the ERP and providing insight into its estimation process by establishing the possible options and identifying the most appropriate choice for each step of the process.
2. The research contributes to the understanding of ERP estimation in practice by offering a high level of transparency in the estimation through the ERP tool.
3. The research contributes to existing applications of the ERP in practice as the tool offers advantages such as the ability to estimate the premium daily.

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List of Abbreviations

Abbreviation	Meaning
APV	Adjusted Present Value approach
CAPM	Capital Asset Pricing Model
CCAPM	Consumption-based Capital Asset Pricing Model
DCF	Discounted Cash Flow method
DDM	Dividend Discount Model
EPP	Equity Premium Puzzle
EQD ERP	Explicit Quotidian Dutch Equity Risk Premium
ERP	Equity Risk Premium
FCF	Free Cash Flow
FCFE	Free Cash Flow to Equity
FCFF	Free Cash Flow to the Firm
IPO	Initial Public Offering
KWCF	KroeseWevers Corporate Finance
M&A	Mergers and Acquisitions
MSMEs	Micro, Small, and Medium Enterprises
SMEs	Small and Medium Enterprises
SML	Security Market Line
VBA	Visual Basic

I

1. Research Introduction

Section 1 provides background information about the research. Section 1.1 introduces the research by providing some context. Section 1.2 discusses the problem that we tackle. Section 1.3 covers the research goals connected to solving the core problem. Section 1.4 examines the research questions related to the goals. Section 1.5 describes the deliverable of the research. Section 1.6 discusses the scope of the research. Section 1.7 covers the research approach and provides an overview of the research.

1.1. Context

The topic of this research, the equity risk premium (ERP), is one of the most important and discussed, but elusive parameters in finance (Fernandez et al., 2009). The ERP is the incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks (Duff & Phelps, 2013).

The ERP is a key component of every valuation (Damodaran A. , 2020). The most applied valuation approach for instance, the income approach, uses the ERP as one of the building stones of the discount rate to calculate the present value of the expected cash flows (Laitinen, 2019).

Although several academics and practitioners estimate the ERP among which institutions such as Deloitte and Credit Suisse, there is a lack of consensus about the value of the ERP. Research by both Dimson et al. (2003) and Jacobs and Shivdasani (2012) for example find that the ERP ranges between three and seven percent.

KroeseWevers Corporate Finance (KWCF), the company at which we conduct the research, appraises small to medium enterprises (SMES) in the Netherlands and therefore uses the ERP in their day-to-day operations. KWCF uses the ERP estimate provided by corporate finance expert Aswath Damodaran.

1.2. Problem

We identified conflicting views on three factors to cause the lack of consensus:

- **The approach**. This impacts the ERP as not every approach yields the same outcome. For example, an ERP estimate based on the past results in a different outcome than an estimate based on the future.
- **The input parameters**. Both the choice of input parameters and the characteristics of the parameters have far-reaching effects on the ERP. For example, a risk-free rate based on a 10-year treasury bond results in a different ERP estimate than a risk-free rate based on a 30-year treasury bond.
- **The market proxy**. Even if all else is equal, the ERP would still vary if a different proxy represents the market. For example, an ERP estimate based on the American S&P 500 will yield a different outcome than an estimate based on the Dutch AEX Index.

We refer to the approach, input parameters and market proxy as the design of the ERP. We must make the design choices in such a way that the ERP is representative for the companies that KWCF appraises, which are Dutch companies as discussed. We define the core problem as follows:

It is unknown which equity risk premium corporate finance firms should apply when appraising Dutch companies so that the premium represents the market that these firms are active in.

The meaning of represented in this context is that it should represent the expected yield on Dutch risk-free securities and should resemble a diversified portfolio of Dutch common stocks.

1.3. Goal

Based on the core problem, we define the research goal as follows:

To design an equity risk premium representative for the Dutch market and implement it in practice so that corporate finance firms appraising businesses active in this market can improve the quality of their valuations and inherently the services they provide.

We formulate the problems related to reaching the research goal in terms of smaller goals. Figure 1 visualizes these research goals and their relationships.

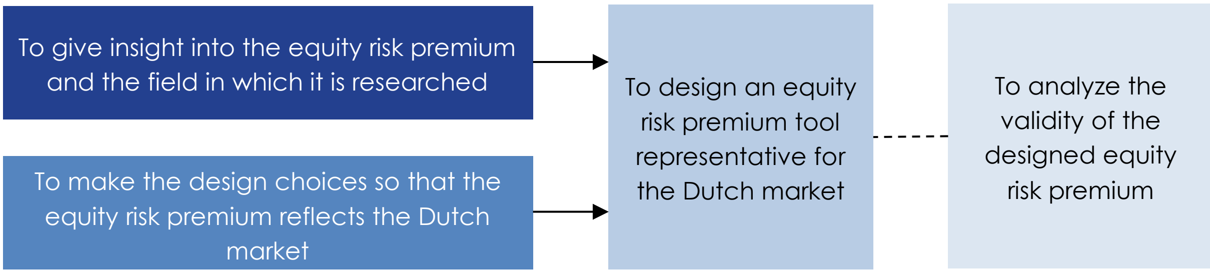

Figure 1: Research goals

1.4. Questions

Figure 2 introduces the research questions which all contribute to reaching their respective goals.

Research Phase	Research Question	Research Goal
Literature Research	What is the equity risk premium and what role does it play in valuation?	To give insight into the equity risk premium and the field in which we research it
Analysis	How should we design the equity risk premium for the Dutch market?	To make the design choices so that the equity risk premium reflects the Dutch market
Design	How can we implement the equity risk premium in a tool?	To design an equity risk premium tool representative for the Dutch market
Validation	To which extent does the designed equity risk premium differ from expert estimates?	To analyse the validity of the designed equity risk premium

Figure 2: Research questions

1.5. Deliverable

The research results in two deliverables. The first deliverable is this document which describes the research. This document mainly contributes by giving a general overview of the ERP and providing insight into its estimation process by establishing the possible options and identifying the most appropriate choice for each step of the process. In addition, the research discusses the Excel tool, which is the second deliverable. The tool estimates the ERP for the Dutch market based on the design as established in the research. It contributes to the application of the ERP in practice by offering a high level of transparency in the estimation through the ERP tool and the advantages of the tool such as the ability to estimate the premium daily.

1.6. Scope

We must make several scoping decisions to ensure that the project is manageable, valuable, and doable within the time constraints.

The first decision applies to the scope of the research itself. The research specifically focuses on the implementation of the ERP in the Dutch market. We see the implementation of the ERP in other markets as an entirely new research on its own. Consequently, the research is only relevant when applied to firms doing business in the Dutch market.

The second decision is about the level of detail in which we treat specific aspects of the ERP. The research covers certain topics such as the design of the premium in great depth, while we only examine other topics such as the relationship between the ERP and other financial constructs to a limited degree. We made this decision as these topics do not significantly affect the way in which we model the premium. However, we must discuss these topics in general terms to give more insight into the role of the ERP in valuation.

The third decision is related to the tool. The tool can reflect one or two design choices other than the recommended ones to give some degree of freedom to the user to incorporate his own views. However, the user cannot alter specific aspects of the design such as the approach used. Furthermore, we made the decision that the tool does not automatically retrieve updated data to continuously estimate the ERP. Although this is desirable because of the dynamic nature of the ERP, the value of such a feature would be insignificant in comparison to the time needed to apply it.

1.7. Approach

Figure 3 provides an overview of the research and acts as a reading guide.

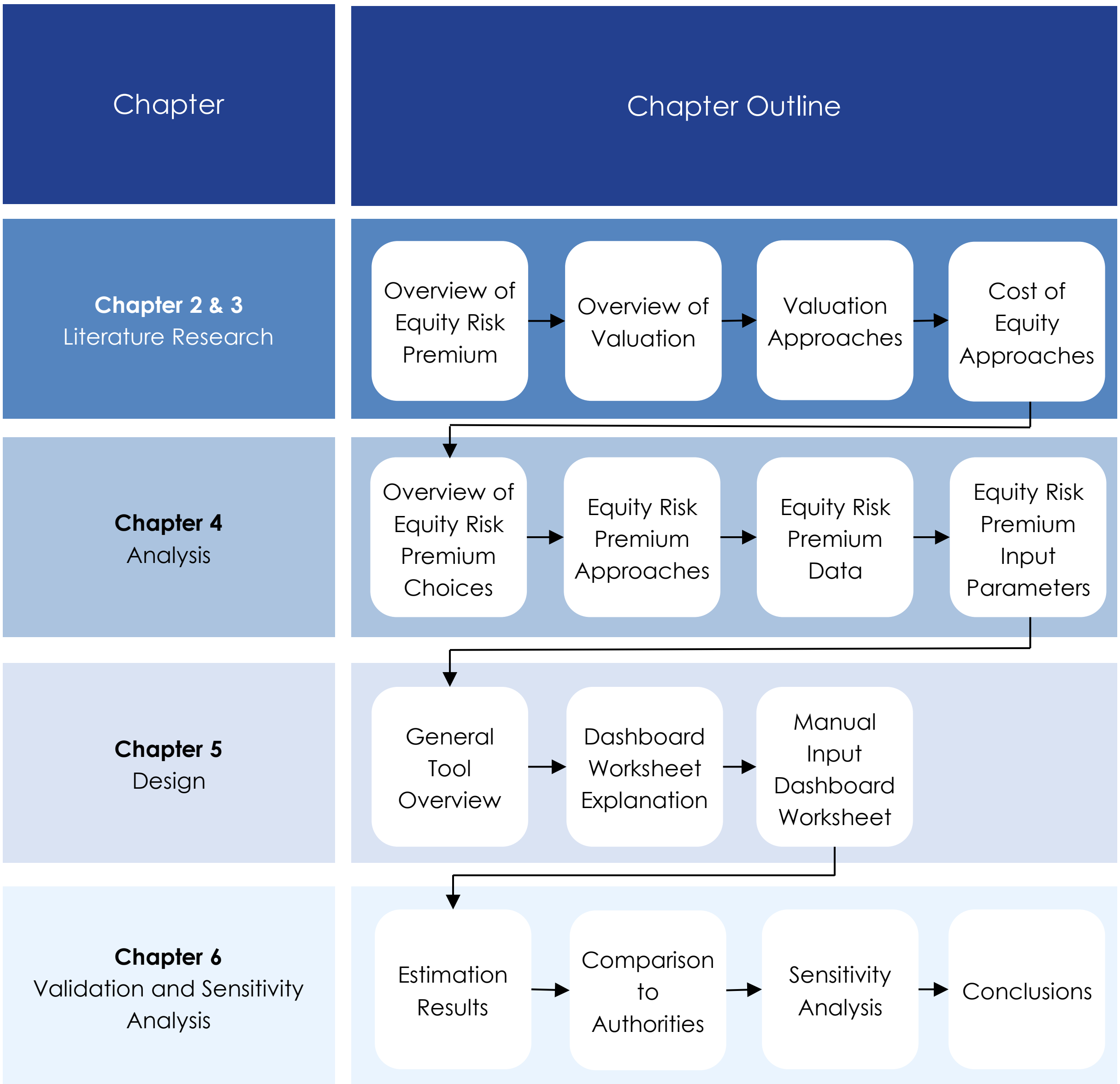

Figure 3: Overview of the research

We conduct both qualitative and quantitative research in this thesis. In Chapter 2 and 3, we apply qualitative research in the form of a literature research into the ERP and the role it plays in valuation. In Chapter 4, we create a theoretical framework based on literature which establishes the possible options for each design aspect. In addition, we present a practical framework based on applications of the ERP in altering contexts by academics and practitioners which identifies the most appropriate choices for the application of the premium for the Dutch market. In Chapter 5, we implement the ERP design in the Excel tool. We use FactSet to retrieve the data necessary to estimate the ERP in the tool. In Chapter 6, we validate the research by comparing the results to the KPMG ERP and conducting a sensitivity analysis. Finally, in Chapter 7, we discuss our findings by providing conclusions, limitations, recommendations, and topics for future research.

II

2. Equity Risk Premium Overview

Chapter 2 provides an overview of the ERP. The goal of the chapter is to provide a solid foundation by discussing essential aspects of the ERP such as the definition and its history. Section 2.1 covers the varying definitions of the ERP in literature and provides the definition used throughout the research. Section 2.2 discusses the history by providing the most prominent historical events of the ERP. Section 2.3 covers the determinants and the way in which each determinant effects the ERP. Section 2.4 examines the Capital Asset Pricing Model (CAPM) and its relationship with the ERP. Section 2.5 elaborates on the conflicting views about the ERP. Figure 4 provides an overview of Chapter 2 content.

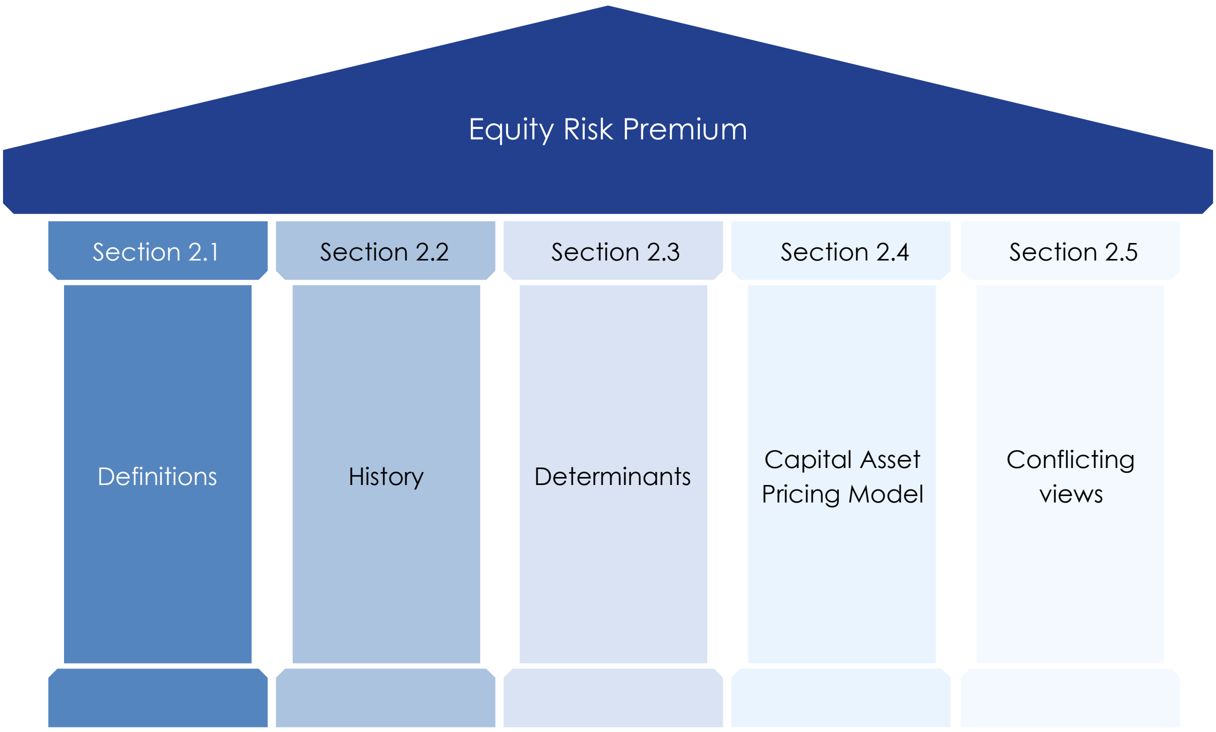

Figure 4: Chapter 2 outline

2.1. Definitions

"The ERP is one of the most important and discussed, but elusive parameters in finance." – (Fernandez et al., 2009)

Fernandez et al. (2009) is not the only source that acknowledges the importance of the ERP. NBIM (2016) states that the ERP "is arguably one of the most important quantities in all of asset pricing from both a theoretical and a practical standpoint". The Federal Reserve Bank of New York (2015) describes the premium as "a fundamental quantity in all of asset pricing, both from a theoretical and practical reasons". JP Morgan (2018) even argues that the ERP is "the most important parameter in the field of finance". Before showing why literature considers the ERP to be important and elusive as argued by the quote of Fernandez et al. (2009), we first distinguish and define the realized and expected ERP.

Appendix I provides an overview of the several definitions of the ERP found in literature. Duff & Phelps (2013) defines the ERP as "the incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks". This definition is very thorough as it explicitly discusses what we consider to be the risk-free rate and the market return. Therefore, this is the definition used throughout the research.

Literature makes a distinction between the realized ERP and the expected ERP (NBIM, 2016). The realized ERP determines the ERP from a historical point of view. Premium implies an expectation, while realized refers to the past. This combination is contradicting and may lead to confusion. A more appropriate name for the realized ERP would for example be the realized excess market return. However, since literature uses realized ERP, we do as well. Equation 1 defines the realized ERP.

$$ERP_{t,k} = Rm_{t,k} - Rf_{t,k} \; where: \quad (1)$$

- $ERP_{t,k}$ = Realized equity risk premium at time t over realized time horizon k
- $Rm_{t,k}$ = Realized nominal market return at time t over realized time horizon k
- $Rf_{t,k}$ = Realized nominal risk-free rate at time t over realized time horizon k

Equation 2 defines the expected ERP (NBIM, 2016).

$$E_t(ERP_{t,k}) = E_t(Rm_{t,k}) - E_t(Rf_{t,k}) \; where: \quad (2)$$

- $E_t(ERP_{t,k})$ = Expected equity risk premium at time t and thus only using information available at that point in time over future time horizon k
- $E_t(Rm_{t,k})$ = Expected nominal market return at time t and thus only using information available at that point in time over future time horizon k
- $E_t(Rf_{t,k})$ = Expected nominal risk-free rate at time t and thus only using information available at that point in time over future time horizon k

The difference between the realized and the expected ERP is, as evident, the expectation factor (NBIM, 2016). As the expected ERP is unobservable at time t, we can only forecast it with an error whose size depends on how well the market forecasted the equity returns. Because of the forecasting error, the realized ERP may under- or overestimate the expected ERP when used as a proxy. The realized ERP is a poor proxy for the expected ERP. There are four reasons that make it a poor proxy.

The first reason is that the ERP is time-varying (NBIM, 2016). The average realised ERP was particularly high in times of economic prosperity such as at the end of WWII and was particularly low during times of economic setback such as the Great Depression. The large variability of the realized ERP and the clusters in the data suggest that the expected ERP may be time varying as well. Because of the large variability of the realized ERP, the standard errors of the estimates are substantial.

The second reason is survivorship bias (NBIM, 2016). The realized ERP only includes firms that have survived during the period of measurement are the sample. In contrast, the expected ERP is on businesses which will possibly become bankrupt in the future. This discrepancy makes the realized ERP a poor proxy for the expected ERP.

The third reason is the possibility of extreme events that did not materialize (NBIM, 2016). Expected equity return forecasts take these possibilities into account. As the expected ERP uses the expected equity returns in its estimation, the extreme events affect the value of the premium. However, the events may not have place over the time horizon. Therefore, the realized ERP does not have to cope with extreme events as they did not materialize. This results in a discrepancy between the realized and the expected ERP.

The fourth and final reason is the changes in the economic conjuncture (NBIM, 2016). Several academics and practitioners attribute part of the large historical ERPs to unexpected gains and luck. This emphasises that equity markets have experienced upward repricing and unexpected capital gains during the second half of the 20th century which may not occur in the future.

2.2. History

Historical observations provide evidence that the ERP exists (NBIM, 2016). The market significantly rewarded investors for bearing market risk throughout history. According to historical data, an investment of one dollar bearing market risk between 1900 and 2014 generated a return 38 times larger than the return on long-term government bonds and more than 120 times larger than the return on short-term government bonds.

The concept of the ERP is not a recent finding but has a long history which many researchers contributed to. Figure 5 shows the major historical events of the ERP.

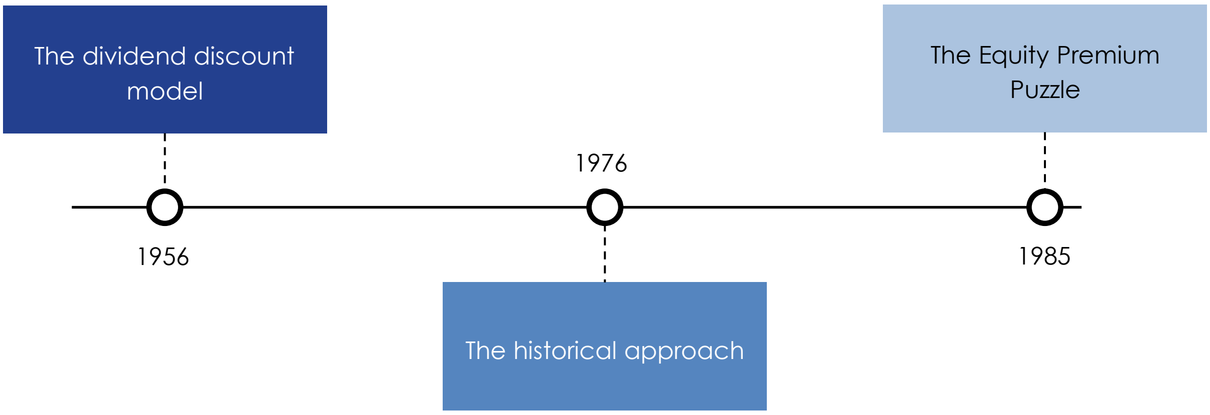

Figure 5: Major historical events of the ERP

Gordon & Shapiro (1956) first introduced the concept of the ERP by an article on the dividend discount model (DDM) to estimate the required return on capital. This article introduced the idea that we could calculate the ERP by subtracting the risk-free rate from the required return on capital.

The DDM was the prevalent approach for estimating the ERP up until an article by Ibbotson & Sinquefield (1976). This article introduced a new estimation approach based on historical returns. The approach calculated the ERP as the arithmetic mean of the historical returns of equity minus the risk-free rate.

The next important historical event was the criticism on the historical approach by Mehra & Prescott (1985) who introduced the Equity Premium Puzzle (EPP). The EPP refers to the discrepancy between the ERP observed in practice and the ERP according to theory. To explain the EPP, we first examine the consumption-based capital asset pricing model (CCAPM) as Mehra & Prescott used this model to explain the ERP according to theory.

The CCAPM is a generalisation of the capital asset pricing model (CAPM). Investors use CAPM to decide on the expected returns they require for individual investments (Hull, 2018). We discuss the model in more detail in Section 2.4. The key idea of CCAPM is that households smooth consumption over time. This means that the households reduce consumption from periods of high income to anticipate future periods of low income. Assets that pay off when consumption is low are more desirable than assets that pay off when consumption is high. The willingness to substitute between consumption today and future consumption along with the level of risk aversion determines the price of assets with uncertain future payoffs.

For commonly accepted risk aversion coefficients, the CCAPM predicted an expected ERP of 0.2 to 0.6% (NBIM, 2016). The actual realized ERP in that period was 6%. The volatility of consumption growth might explain the difference between the realized ERP and the expected ERP. Consumption is much smoother than market returns. This results in a low covariance of consumption growth and market returns. We must assume an implausibly large coefficient of risk aversion to reconcile this low covariance with the realised ERP.

2.3. Determinants

Although there is consensus on the existence of the ERP from a historical point of view as shown in Section 2.2, there is little consensus on how to explain the EPP (NBIM, 2016). Explanations of the EPP are determinants of the ERP as they provide an explanation of what factors drive the ERP. Many academics and practitioners have attempted to provide such explanations. Literature categorizes these explanations as risk-, behavioural- and market friction-based explanations.

The risk explanation is related to altering the assumptions of the CCAPM framework (NBIM, 2016). For example, some changed the utility function, while others altered the economic environment to solve the EPP. Some attempted to explain the large historical realised ERP by arguing that the priced-in catastrophic risk did not actually materialize during the sample period. They added a catastrophic risk scenario with a low probability, but a high utility of consumption to the CCAPM framework.

The behavioural explanation is that investors tend to depart from the assumed rational behaviour underlying the assumptions of the CCAPM (NBIM, 2016). This potentially leads to pricing abnormalities. An example of such an abnormality is myopic loss aversion. This refers to investors suffering from a loss aversion bias which means that investors dislike losses more than they like gains. If people are myopic loss averters and adjust their portfolios at least annually, they will require high risk premia to hold equities. The relatively high probability of the stock market underperforming risk-free assets over short time horizons causes this to occur.

The market friction explanation focuses on characteristics of equity and treasury markets not captured by the CCAPM such as liquidity constraints and transaction costs (NBIM, 2016). These may prevent investors from fully smoothing out consumption as assumed in the model. Trends such as globalization of financial markets and increased participation in global equity markets may also have contributed to the large implied ERP.

While literature has made much progress in understanding the determinants of the ERP, no single model has been able to fully capture the ERP's complex behaviour (NBIM, 2016). Economic risk, investor behaviour and market friction all appear to contribute to explaining the EPP and are therefore important determinants of the ERP.

2.4. Capital Asset Pricing Model

The ERP plays a large role in the Capital Asset Pricing Model. Investors use CAPM to decide on the expected returns they require for individual investments (Hull, 2018). The model assumes that the two reasons why investors stop diversifying are not present (Damodaran, 2012). These two reasons are that investors can obtain most benefits of diversification from a relatively small portfolio and that many investors believe they can find undervalued assets and do not hold assets they do not see as undervalued. This results in the assumption that there are no transaction costs and that there is no access to private information.

As a result, investors keep diversifying until they have every traded asset, the market portfolio, and will differ only in terms of how much of their wealth they invest in the portfolio and how much in a riskless asset (Damodaran, 2012). It then follows that the risk of any asset becomes the risk that it adds to this market portfolio.

CAPM relates the expected return on an asset to its β (Hull, 2018). The β measures the sensitivity of the return of the investment relative to return on the market portfolio. In the CAPM, the β which captures all the market risk. The β should include all traded assets in the marketplace held in proportion to their market value.

Literature categorizes risk into unsystematic and systematic risk (Röman, 2017). Unsystematic risk influences a single asset or a small group of assets. Literature also refers to it as unique or asset-specific risk. Diversification can essentially eliminate unsystematic risk. Because of this, the market does not reward unsystematic risk. Systematic risk influences many assets, each to a greater or lesser extent. Literature also refers to it as market risk. Diversification cannot eliminate this type of risk. Therefore, the market rewards an investor for bearing systematic risk.

The expected return on an investment solely depends on its systematic risk (Röman, 2017). No matter how much total risk an asset has, only the systematic portion is relevant in determining the expected return on that asset. As a result, the equity risk premium is solely dependent on the systematic risk involved.

According to CAPM theory, all investments must plot along the security market line (SML) (Brealey, Myers, & Allen, 2014). Figure 6 visualises the SML.

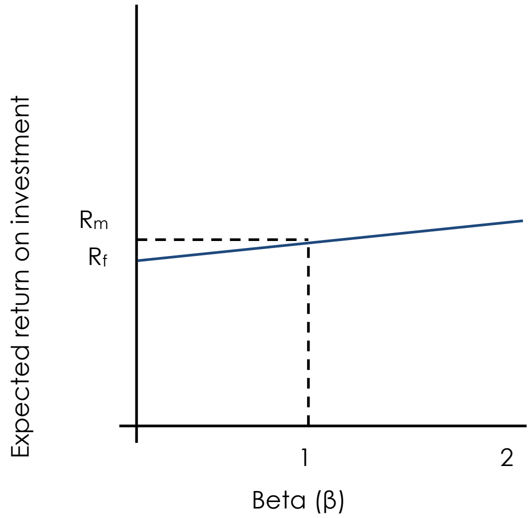

Figure 6: The security market line (Brealey, Myers, & Allen, 2014)

The expected ERP varies in direct proportion to β (Brealey, Myers, & Allen, 2014). The expected risk premium of an investment with a β of 0.5 is thus half the expected risk premium on the market. As stated in the definition of the ERP, the premium uses an investment in a diversified portfolio of common stocks. If this is the case, then the portfolio is representative of all the assets in the market and must therefore have average systematic risk. In other words, the β is equal to 1. Equation 3 expresses the slope of the SML.

$$SML\ Slope = E(Rm) - Rf\ where: \qquad (3)$$

- E(Rm) = expected return on the market
- Rf = risk-free rate

Conceptually, Equation 3 is equal to Equation 2 presented in Section 2.1. In other words, the slope of the SML is equal to the ERP. If K_e and β stand for the cost of equity and beta respectively on any asset in the market, then that asset must plot on the SML. As a result, we know that its reward-to-risk ratio is the same as that of the overall markets. Equation 4 shows this.

$$\frac{Ke - Rf}{\beta} = E(Rm) - Rf \qquad (4)$$

We find the famous CAPM formula by rearranging Equation 4 (Röman, 2017). Equation 5 shows this formula.

$$Ke = Rf + [E(Rm) - Rf] * \beta \qquad (5)$$

As discussed, the market return subtracted by the risk-free rate is equal to the SML slope, or the ERP. Therefore, we can rewrite Equation 5 into Equation 6. This equation shows the relationship between CAPM and the ERP.

$$Ke = Rf + ERP * \beta \qquad (6)$$

Damodaran (2012) states that the survival of the CAPM as the default model shows its intuitive appeal. Fernandez (2015) however, argues that the CAPM is an absurd model because its assumptions and its predictions have no basis in the real world.

2.5. Conflicting Views

Damodaran (2020) argues that every debate about market efficiency can be translated into a debate about the ERP. An efficient market is a market in which security prices reflect information instantaneously (Brealey, Myers, & Allen, 2014).

If an investor believes that markets are efficient, then he believes that the ERP built into the market prices today are correct (Damodaran A. , 2020). If an investor believes that the market is overvalued or in a bubble, then he believes that the ERP is too low relative to what it should be. If an investor believes that the market is underpriced, then he believes that the ERP is higher than it should be.

Academics and practitioners have come to rely on historical data, discounted cash flows and surveys to estimate the ERP (NBIM, 2016). These approaches, however, often produce diverging estimates of the premium with large standard errors. In addition, there has never been a consensus on how to estimate the ERP (McKinsey & Company, 2002).

Even with 100 years of data, the ERP cannot be exactly calculated nor is it known if investors today are demanding the same reward for risk as they did 50 or 100 years ago (Brealey, Myers, & Allen, 2014). Therefore, the ERP is referred to as an estimate. Figure 7 underlines the lack of consensus about the ERP by presenting an overview of a selection of estimation ranges according to literature.

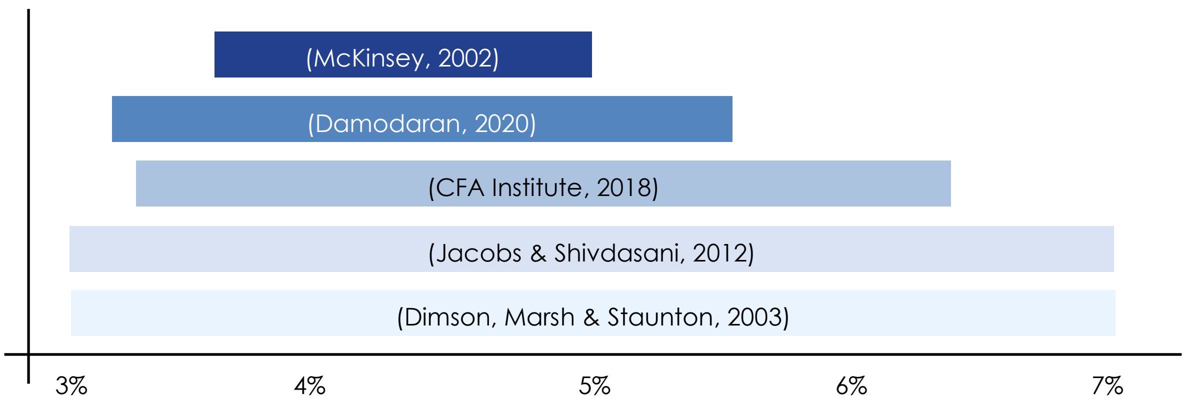

Figure 7: Estimation ranges according to literature

The estimation ranges between 3% and 7%. One might wonder to what extent a 4% difference affects practice. For this purpose, consider the following example. A company expects a cash flow of 1 million euros one year from now. Cash flow is the increase or decrease in the amount of money a business has. There are several types of cash flow, which we discuss in Section 3.2.5. The company wants to know the present value of the expected cash flow. The other components of the discount rate accrue to 10%. An ERP of 3% would add up to a discount rate of 13%, while an ERP of 7% would result in a discount rate of 17%. The discount rate results in discount factors of 0,88 and 0,85 respectively. If we discount the expected cash flow of 1 million euros one year from now to the present, an ERP of 3% would result in a value of 884,956 euros and an ERP of 7% would result in a value of 854,701 euros. This means that the 4% difference in the ERP estimate translated into a difference of approximately 30,000 euros. Thus, a matter of percentage (points) may seem insignificant but has far reaching consequences when applied to large cash flows.

III

3. Valuation Overview

Chapter 3 discusses the valuation process to show the role that the ERP plays in valuation. Section 3.1 describes the concept of value and valuation and provides an overview of the section. Section 3.2 studies the available valuation approaches. Section 3.3 examines the cost of equity approaches. Figure 8 provides an overview of the content in Chapter 3.

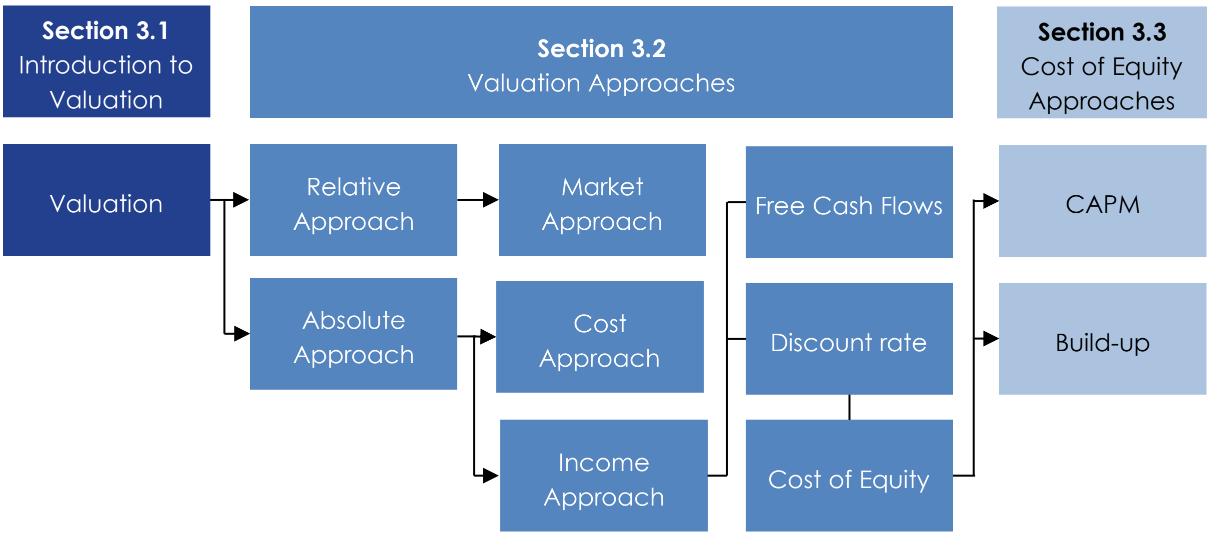

Figure 8: Chapter 3 outline

3.1. Introduction to Valuation

"Price is what you pay, value is what you get" - (Buffet, 2008)

This is a famous quote by Warren Buffet in the 2008 annual report of Berkshire Hathaway Inc. This quote implies a key concept of valuation. Buffet, a renowned investor, argues that price and value are not always one and the same. This holds true in practice as mismatches between the value from a valuation and the price paid by the market may occur. Although the field of valuation does not determine the price an investor pays, it does estimate the value an investor obtains.

3.1.1. Concept of Value

Valuators often represent value by the term intrinsic value. Intrinsic value is "the value of the asset given a hypothetically complete understanding of the asset's investment characteristics" (CFA Institute, 2019).

Companies create value for their owners by investing cash now to generate more cash in the future (McKinsey & Company, 2015). The amount of value they create is the difference between cash inflows and the cost of the investments made. Although not necessarily the case in times of economic downturn, tomorrow's cash flows are in general worth less than todays. The time value of money and the riskiness of future cash flows causes this to occur. Valuators must adjust the value of companies to reflect the disparity between the value of money today and the future.

The value of a business is subjective as it depends on the future (Matschke, Brösel, & Matschke, 2010). Thus, a valuation does not result in a value for every single buyer, but instead provides an estimation of the fair market value which is the value of the company under normal market conditions.

To elaborate on the quote by Buffet, the subjective nature of the perception of value results in significant differences between the value according to the valuation and the price paid (Denneboom, 2014). The price depends on the interest of the market and is a matter of what someone is willing to pay for it. A strategic buyer could for example consider the company as a missing link in a chain of businesses. This strategic value potentially results in a significantly higher price than the value according to the valuation. We refer to this concept of value to a specific buyer as investment value (CFA Institute, 2019).

3.1.2. Concept of Valuation

Valuation is "the process of determining the value of an asset or service on the basis of variables perceived to be related to future investment returns, or on the basis of comparisons with closely similar assets" (CFA Institute, 2019).

The need for valuation may arise from a variety of circumstances and these different circumstances call for different types of valuation (Anadol, Paradi, & Yang, 2014). Such reasons may include initial public offerings (IPOs), mergers and acquisitions (M&A), estate planning, taxation, and many other similar needs.

Valuators usually apply valuation to private companies because public companies have a share price (ACCA, 2012). The valuation of private companies is important as most companies are micro, small, and medium enterprises (MSMEs), representing about 99% of total businesses in the world (OECD, 2019).

Even public companies sometimes need to apply valuation for example when a company attempts to predict the effect of a takeover on the share price (ACCA, 2012). Valuation approaches for public companies are conceptually similar to those used for private companies (CFA Institute, 2019). However, some issues specifically apply to appraising private companies:

- Earnings normalization. Valuators should adjust or "normalize" valuations of private companies to represent "normal circumstances" (CFA Institute, 2019).
- Future cash flow estimation. Estimation of cash flows for private companies raises challenges related to the nature of the interest, future uncertainties, and managerial involvement in forecasting (CFA Institute, 2019).
- Lack of information. The information available for valuation tends to be more limited, since the strict accounting and reporting standards of public firms do not apply to private firms (Damodaran, 2012).

The valuation process consists of the following steps (CFA Institute, 2019);

1. Understanding the business. Industry and competitive analysis, together with an analysis of financial statements and other company disclosures, provides a basis for forecasting company performance.
2. Forecasting company performance. Forecasts of sales, earnings, dividends, and the financial position provide the inputs for most valuation models.
3. Selecting the appropriate valuation model. Depending on the characteristics of the company and the context of valuation, some valuation models may be more appropriate than others.
4. Converting forecasts to a valuation. Beyond mechanically obtaining the "output" of valuation models, estimating value involves judgment.
5. Applying the valuation conclusions. Depending on the purpose, an analyst may use the valuation conclusions to make an investment recommendation about a particular stock, provide an opinion about the price of a transaction, or evaluate the economic merits of a potential strategic investment.

3.2. Valuation Approaches

Literally thousands of valuation approaches exist (Damodaran, 2012). It would be too time-consuming to cover each approach. Therefore, we only discuss the approaches relevant for the ERP. The goal is to establish the role that the ERP plays in the main valuation approaches and to determine which corporate finance companies may benefit from this research as a result. To be complete however, we present a general overview of the valuation approaches. We did not find such an overview in literature. Therefore, we created it ourselves in this research. We assessed several sources on the level of authority and the extent in which the sources treat the approaches. Based on this assessment, we selected Damodaran (2012), IMF (2020) and CFA Institute (2019) as our sources and combined these to create the overview. Figure 9 presents the results.

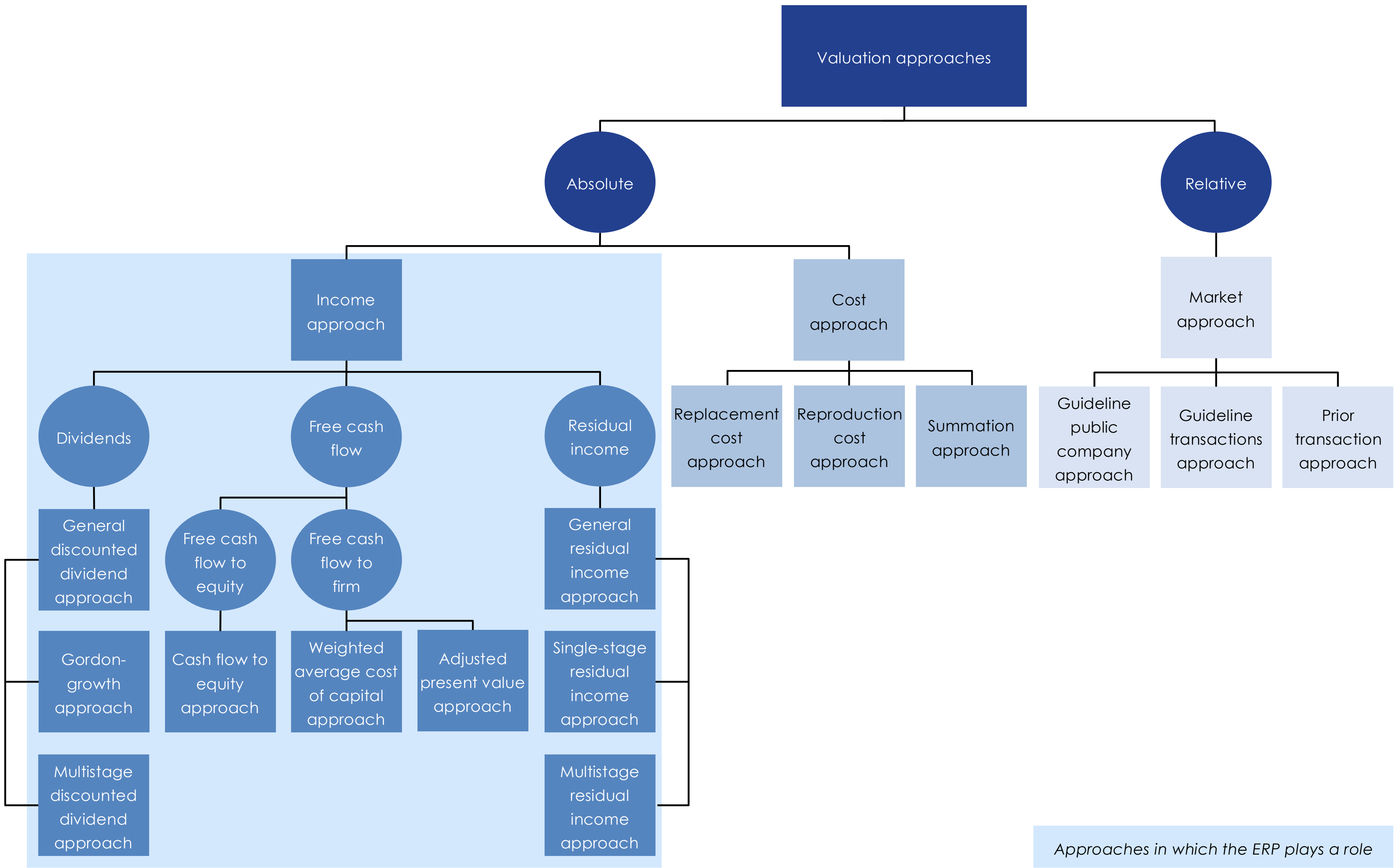

Figure 9: Overview of valuation approaches

Figure 9 shows that literature makes the first distinction in valuation between absolute and relative approaches. An absolute valuation approach is a model that specifies an asset's intrinsic value, while a relative valuation approach estimates an asset's value relative to that of another asset (CFA Institute, 2019). The income and cost approach are absolute approaches, while the market approach is a relative one. The choice of appropriate approach depends on the characteristics of the subject asset, the purpose of the valuation and the availability of reliable data (Deloitte, 2017). In this section, we discuss the market, cost, and income approach after which we explain the role of the equity risk premium in these approaches.

3.2.1. Market Approach

The market approach "provides an indication of value by comparing the asset with identical or comparable (that is similar) assets for which price information is available" (IVSC, 2019).

The idea underlying the market approach is that the value of a business can be determined by reference to reasonably comparable guideline companies for which transaction values are known (Twain, 2012). The capitalization factor used in the market approach is often a multiple (SRB, 2019). These multiples include price to book, price to sales, price to earnings, and enterprise value to EBITA ratios (Lee, 2003). The analyst does not forecast the cash flows of the target company, but instead estimates the value of the market multiple of other similar companies.

The market approach offers the most pragmatic route to valuation (Bann, 2002). The approach is relatively quick and easy to work with (Damodaran, 2012) However, the approach is also easy to misuse and manipulate because the definition of a comparable firm is subjective and consequently, a biased analyst can alter the outcome. Furthermore, the whole sector may be over or undervalued which leads to incorrect results as well (Anadol, Paradi, & Yang, 2014).

The market approach is particularly useful when may comparable firms are available on the market and the market is, on average, pricing these firms correctly (Damodaran, 2012). Valuators should not use the approach if there are too few comparable similar companies or if there are insufficient recent transactions (Anadol, Paradi, & Yang, 2014).

3.2.2. Cost Approach

The cost approach "provides an indication of value by calculating the current replacement or reproduction cost of an asset and making deductions for physical deterioration and all other relevant forms of obsolescence" (IVSC, 2019). Literature also refers to the cost approach as the asset-based approach (CFA Institute, 2019).

The principle underlying the asset-based approach is that the value of ownership of an enterprise is equivalent to the fair value of its assets less the fair value of its liabilities (CFA Institute, 2019). The approach values a company based on the market value of the assets or resources it controls (CFA Institute, 2018). Fazzini (2018) views it as a snapshot of the value of the firm by adjusting the book value of assets and liabilities to identify the current value.

According to Deloitte (2017), the advantages of the asset-based approach are that it is less complex and easier to apply, provides an indication of the downside risk, and will take the impact of the underlying tangible assets on the overall business into account. The disadvantages are that it may ignore the income generation capacity, it may not appropriately encompass the goodwill or the economic obsolescence, it is usually time-consuming, and is often costly to perform.

Valuators rarely use the approach the valuation of going concerns (CFA Institute, 2019). Valuators may find the usefulness of the approach when valuing income-generating limited as it does not capture the future income-generating potential of the business or the value of its goodwill and other intangible assets (Deloitte, 2017).

3.2.3. Income Approach

The income approach "provides an indication of value by converting future cash flow to a single current value" (IVSC, 2019). Approaches under the income approach are effectively based on discounting future amounts of cash flow to present value. Literature also refers to the income approach as the discounted cash flow (DCF) approach. The approach can be based on three types of future cash flow (CFA Institute, 2019). These are dividends (earnings distributed to shareholders), free cash flows (FCFs) (the cash a company produces through its operations, less the CAPEX), and residual income (amount of earnings that exceeds the investors' required return).

The underlying assumption of the income approach is that value is based on expectations of future income and cash flows (CFA Institute, 2019). The value of an asset is the present value of the expected cash flows on the asset, discounted back at a rate that reflects the riskiness of these cash flows (Damodaran, 2012).

The income approach gets the most play in academia and comes with the best theoretical credentials (Damodaran, 2012). However, the approach requires accurate forecasts because minor changes can result in large differences in value (Steiger, 2008). In addition, it requires extensive work (Arumuam, 2007).

The income approach is the most used valuation approach (Laitinen, 2019). Valuators should apply the approach when they deal with firms whose cash flows are positive, and the forecasts for future periods are quite reliable (Damodaran, 2012).

3.2.4. Role of the Equity Risk Premium

To recap, the market approach uses market multiples of similar companies to determine the value of the business, the cost approach values a company based on the market value of the assets or resources it controls, and the income approach appraises business by discounting future cash flows.

The ERP affects valuation approaches because it is a part of the discount rate. Both the market and cost approach do not apply a discount rate. Therefore, the ERP does not affect either of these approaches. As a result, the research is not relevant for corporate finance firms that solely apply the market and income approach. In contrast, the ERP plays a significant role in the income approach as this approach uses the discount rate.

3.2.5. APV Approach

KWCF usually applies the income approach to appraise businesses. More specifically, it uses a sub approach of the income approach called the adjusted present value (APV) approach. Figure 9 presents the relationship between the income approach and the APV approach. The figure also shows that the approach uses FCFs instead of dividends or residual income to appraise a firm. To be exact, the approach uses future cash flows to the firm (FCFFs). These are cash flows generated by the firm's operations that are in excess of the capital investment required to sustain the firm's current productive capacity (CFA Institute, 2019).

The APV approach separates the value of operations into the value of operations as if the company were all-equity financed and the value of tax shields that arise from debt financing (McKinsey & Company, 2015). Equation 7 presents the calculation of the firm value.

$$Value\ of\ Firm = Value\ of\ all - equity\ financed\ firm + PV\ of\ tax\ shield \quad (7)$$

The approach thus calculates the firm value as the sum of the value of the company under the assumption that the company does not use debt and the net present value of any effects of debt on firm value (CFA Institute, 2019). Figure 10 shows the relationship between the profit & loss statement and the balance sheet, and the components of Equation 7.

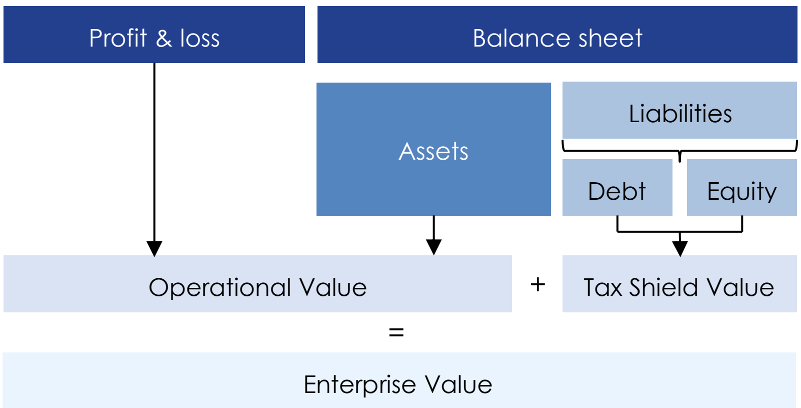

Figure 10: Overview of the APV approach

The first step in the APV approach is to estimate the value of the unlevered firm, that is, the value of the firm before the firm has met its financial obligations (Damodaran, 2012). The approach estimates this by valuing the firm as if it has no debt. It calculates the value of a firm with no debt by discounting the FCFFs at the unlevered cost of equity. Equation 8 shows how the calculation of the value of the unlevered firm.

$$Value\ of\ Unlevered\ Firm = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+r)^t}\ where: \quad (8)$$

- $FCFF_t$ = FCFF in period t
- r = discount rate

Figure 11 visualizes how the calculation of the value of the unlevered firm.

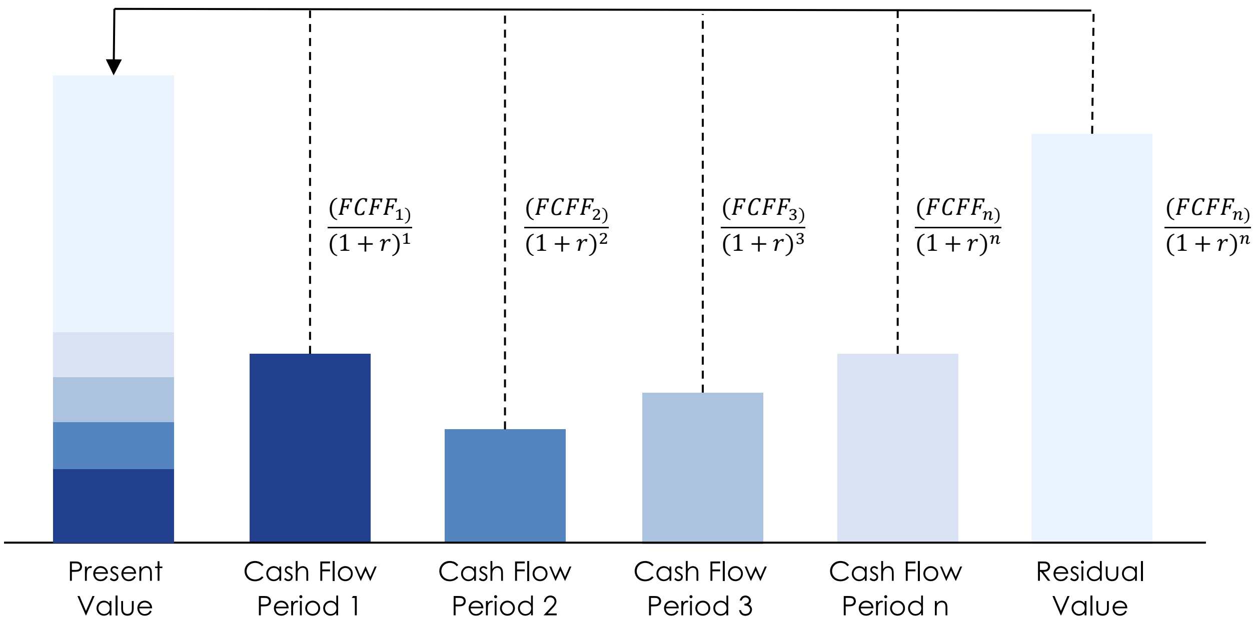

Figure 11: Process of discounting future cash flows

The FCFFs follow a similar trend to the usual expectations when acquiring a company. At the start, investments are necessary which result in a decrease in cash flow. The investments pay off in the future which lead to a higher level of cash flows. The residual value usually accounts for approximately 40%-60% of the present value. Note that the expected cash flows of period 2, 3 and 4 approximately have the same present value. Although the cash flows are higher in the future, the discount factors are higher as well.

The second step is to consider the present value of the interest tax savings generated by borrowing a given amount of money (Damodaran, 2012). This is known as interest tax shields and they arise because of the deductibility of interest payments on the corporate tax return (Luehrman, 1997). The assumption of the firm having no debt causes this side effect to occur. The tax payments are too high because an all-equity-financed company pays no interest and therefore receives no tax deduction. Equation 9 shows the calculation of the tax shield value if we assume the tax benefits to follow perpetual growth.

$$Value\ of\ Tax\ Benefits = Tr * D\ where: \quad (9)$$

- T_r = Tax rate
- D = Debt

The third and final step is to compute the value of the firm as stated in Equation 7 by using the outcomes of Equation 8 and Equation 9 (Damodaran, 2012).

3.3. Cost of Equity Approaches

The cost of equity is the discount rate used in the APV approach to obtain the present value of the expected FCFFs (Damodaran, 2012). Academics and practitioners have proposed numerous models to estimate the cost of equity, but literature has not universally accepted one approach (McKinsey & Company, 2015). For public companies, investors use CAPM as discussed in Section 2.4 most often (CFA Institute, 2019). For private companies, the main approaches for the cost of equity are the expanded CAPM approach and the build-up approach. We discussed these approaches to show that the ERP does not only affect the valuation of public companies, but also the valuation of private companies. In addition, we want to show whether the ERP impacts the different approaches in altering ways. Before discussing the approaches and showing their differences, we first examine the similarities. Figure 12 shows the building stones that both approaches use.

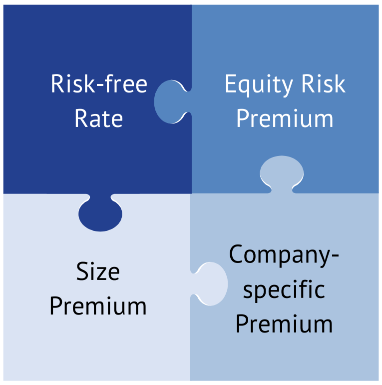

Figure 12: Visual representation of the build-up approach

The risk-free rate is the interest rate that an investor can earn without assuming any risks (Hull, 2018). It accounts for the return related to a risk-free asset. Usually, valuators use a long-term government bond as a proxy for the rate (Jacobs & Shivdasani, 2012).

As discussed, the ERP is the incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks (Duff & Phelps, 2013). The ERP accounts for the market risk, which is also known as systematic risk.

The size premium is based on the size of the company where a smaller company would have a larger premium (CFA Institute, 2019). Valuators use this premium for various reasons related to the differences between small and large firms (Winn, 2018). This includes reasons such as liquidity and governance risks. As the size premium accounts for the premium related to the risk related to being a relatively small company, we can apply the ERP in any business valuation instead of SME valuation only.

The company-specific premium is the risk that applies to firms specifically instead of the whole market (Butler & Pinkerton, 2006). This premium accounts for the unsystematic risk. The owner of a private business is likely not to achieve the same degree of diversification as an owner of a public company (Highland Global, 2004). We therefore categorize the unsystematic risk as not diversified. Valuators use the firm specific premium to cope with this lack of diversification.

3.3.1. Expanded Capital Asset Pricing Model Approach

We already discussed CAPM in Section 2.4. Recall that in the CAPM, the β captures all the market risk. The β should include all traded assets in the marketplace held in proportion to their market value (Hull, 2018). The extended CAPM is a version of the CAPM that includes additional premiums for size and firm-specific risk (CFA Institute, 2019). Equation 10 shows how the cost of capital calculation based on the extended CAPM.

$$Cost\ of\ Capital = R_f + \beta * ERP + RP_s + RP_u \text{ where:} \quad (10)$$

- R_f = risk-free rate
- β = beta
- ERP = equity risk premium
- RP_s = size premium
- RP_U = company-specific premium

3.3.2. Build-up Approach

The build-up approach is the approach used by KWCF to determine the cost of capital. The approach compounds the cost of capital by adding different risk premiums to the risk-free rate (Sorin, 2009). The build-up approach has the important advantage of eliminating the β with all inconveniences that come with it (CFA Institute, 2019). Valuators usually apply the approach to companies where the β is hard to obtain. Equation 11 shows the cost of capital calculation through the build-up approach.

$$Cost\ of\ Capital = R_f + ERP + RP_i + RP_s + RP_u \text{ where:} \quad (11)$$

- RP_i = industry premium

The build-up approach replaces the β by the industry premium. This premium is the amount investors expect the future return of the industry to exceed the return on the market.

3.3.3. Role of the Equity Risk Premium

The ERP is both part of the (expanded) CAPM and the build-up approach. The role of the ERP however differs between the approaches. In the (expanded) CAPM, the weight given to the ERP depends on the β. The higher the β, the more weight the ERP has. This makes sense as the β resembles the sensitivity of the return on the market portfolio. The more sensitive the return, the more the ERP affects the return.

The build-up approach implicitly assumes the β to be equal to 1. Consequently, no other input parameter affects the weight of the ERP in the approach.

If the company-specific premium equals 0, the cost of capital is fully determined by the market. Although the weight of the ERP is different between the approaches, the calculation of the ERP is similar. Therefore, both corporate finance firms applying the (expanded) CAPM and the build-up approach can use this research to estimate the ERP.

3.4. Valuation summary

There are several important takeaways from Section 3 to keep in mind over the remainder of the research.

The first takeaway is that corporate finance firms use the ERP in the valuation process. Valuators often represent value by intrinsic value, which is "the value of the asset given a hypothetically complete understanding of the asset's investment characteristics" (CFA Institute, 2019). Price does not equal value as it depends on the interest of the market and is a matter of what someone is willing to pay for it.

The second takeaway is that although not all valuation approaches apply the ERP, it does affect the income approach. Valuators apply this approach most often out of all valuation approaches. The income approach uses the ERP when applying the cost of equity. This is the rate used as the discount rate that reflects the riskiness of the expected cash flows to determine the present value of a future set of cash flows. The ERP is one of the four elements that the cost of equity consists of.

The third takeaway is the relationship of the ERP with the other elements of the cost of equity. In addition to the ERP, the cost of equity consists out of the risk-free rate, the size premium and the company-specific premium. CAPM approach is the most often used approach to determine the cost of equity for public companies, while valuators most often use the expanded CAPM or the build-up approach to determine the cost of equity for private companies. The role of the ERP differs between the approaches. In the (expanded) CAPM, the weight given to the ERP depends on the β. The higher the β, the more weight the ERP has. In the build-up approach, no other parameter affects the weight of the ERP as the approach implicitly assumes the β to be equal to 1.

IV

4. Equity Risk Premium Design

In Chapter 4, we present the ERP design. Section 4.1 describes the design and on which basis we make the decisions. Section 4.2 covers the ERP approach. Section 4.3 examines the implied ERP approach. Section 4.4 elaborates on the input parameters used to estimate the ERP. Section 4.5 discusses the proxy used to resemble the market of the ERP. Section 4.6 summarizes the results of Chapter 4. Figure 13 provides an overview of Chapter 4 content.

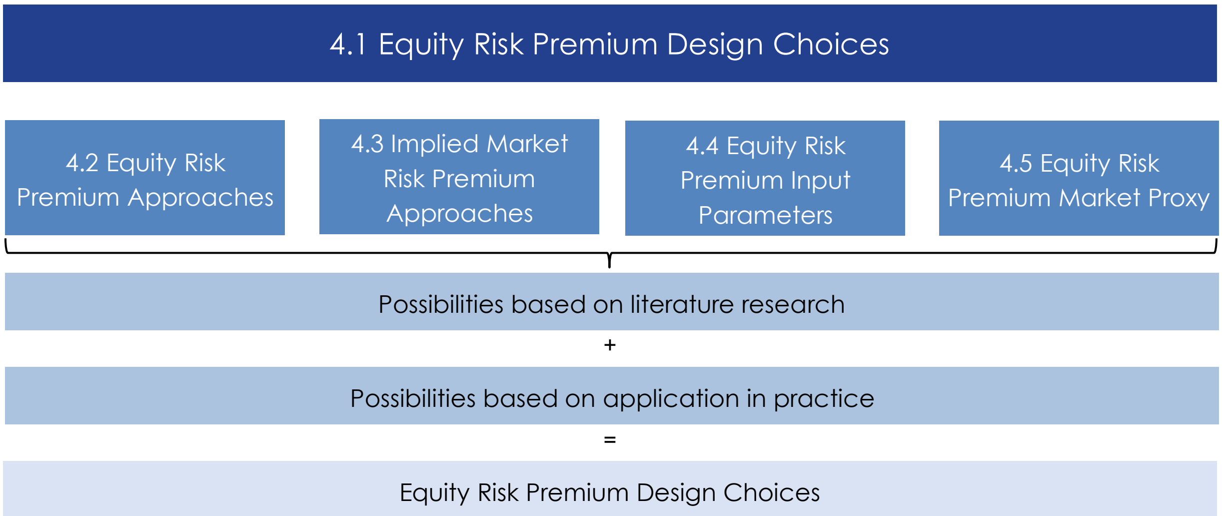

Figure 13: Chapter 4 outline

4.1. Design Choices

"No matter the equity risk premium used, there is back-up evidence offered that the premium is appropriate. While this may suffice as a legal defence, it does not pass muster on common sense grounds since not all premiums are equally justifiable" – (Damodaran, 2020)

This quote by corporate finance expert Aswath Damodaran addresses a critical aspect of estimating the ERP. We can justify any choice for the ERP using the large quantity of (conflicting) literature available. However, not all premiums are equally justifiable. Due to the lack of consensus on the topic of the ERP, its design is debatable as well. The goal of Chapter 4 is to determine the most justifiable way in which we should design the ERP. It does so by providing an overview of choices related to the design of the ERP not found in literature. Then, we perform several steps to make well-informed decisions concerning the design.

4.1.1. Design Factors

We already treated the design choices in Section 1.2, but we now elaborate on these choices by providing an example from practice for each choice.

The first factor is the approach. The ERP necessarily depends on the choice of approach used for the ERP forecast and the input of the model (NBIM, 2016). Damodaran (2020) estimated the ERP for the United States in January 2020 using different approaches. The approaches resulted in ERP estimates ranging from 3.2% to 5.6%. For example, the current implied approach resulted in an ERP of 5.2%, while a survey among CFO's resulted in an ERP of 4.4%.

The second factor is the market proxy used. The market proxy is a broad representation of the overall stock market (NBIM, 2016). Input parameters such as the risk-free rate are determined in reference to the market proxy. Damodaran (2020) presents an overview of ERP estimates for major non-US markets between 1976 and 2001. The different countries resulted in ERP estimates ranging from 1.7% to 15.3%. In addition, the standard error ranged between 3.9% and 10.7%.

The third and final factor is the input parameters. Some examples of input parameters are the risk-free rate and the dividend yield (NBIM, 2016) Consider the following time horizon example related to the real return (Dimson, Marsh, & Staunton, 2003). The real return between 1990 – 1999 was relatively high because of substantial economic growth. In contrast, the real return between 2000 – 2002 was relatively low because of the technology bubble burst. As a result, a six-year time horizon for the real return in 2002 resulted in an annualized return of -2%, while a three-year time horizon resulted in an annualized return of -22%.

4.1.2. Design Decision-making Approach

In addition to presenting the design choices related to the ERP, Figure 13 also presents the way in which we make the choices. The goal is to create a framework of ERP design choices which we can use to make the appropriate decision. Figure 14 visualizes the framework. We already filled the framework so that the research is easier to read, but this is in fact running ahead of things.

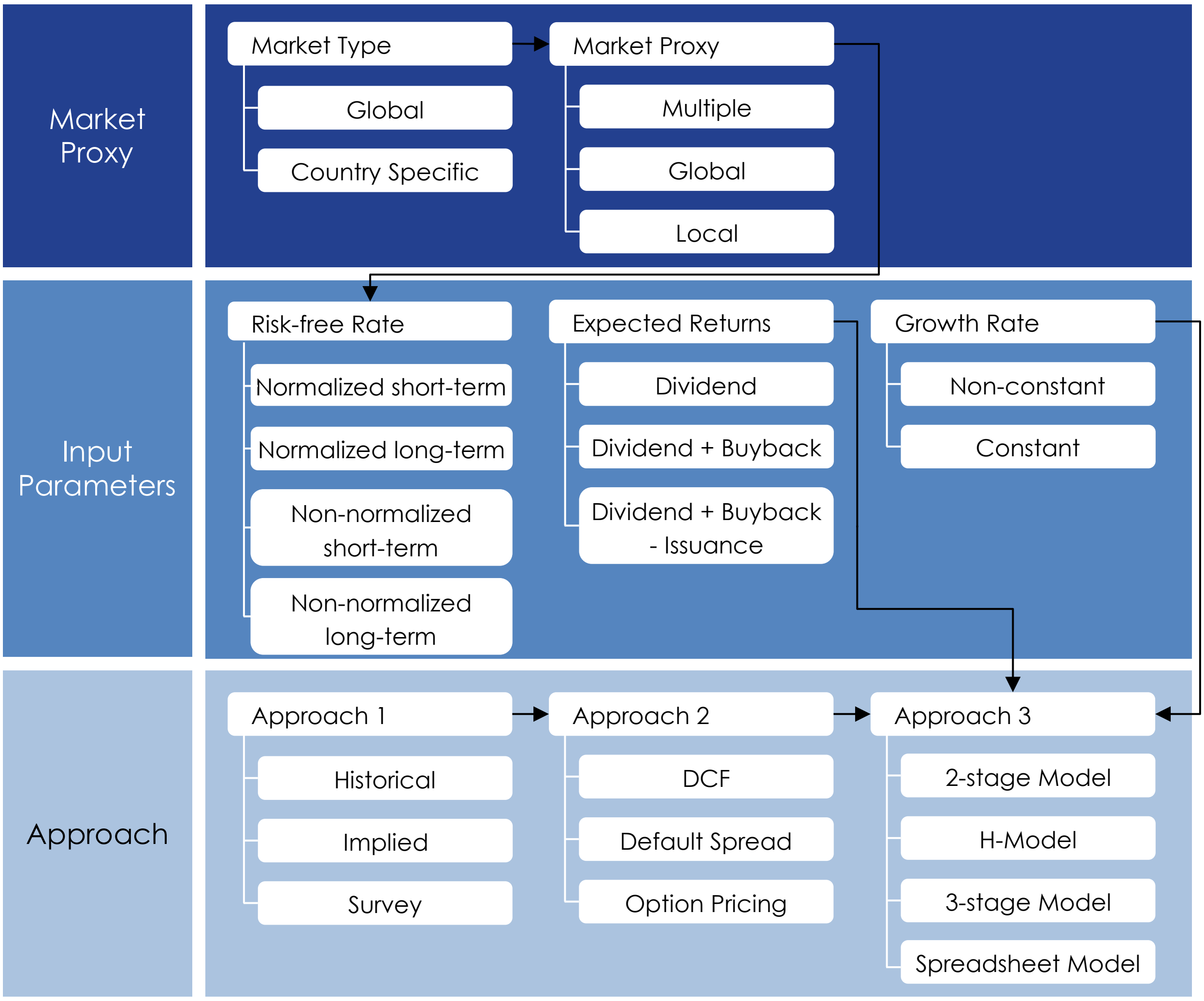

Figure 14: Visual representation of the ERP design choices

Each design aspect consists of several choices. For example, the input parameter design aspect consists out of the risk-free rate, expected returns and growth rate parameters. An arrow shows that a choice has an impact on another choice. If there is no outgoing arrow, the choice does not affect another choice, but instead impacts the ERP directly. For example, the risk-free rate has a direct impact on the ERP design, while the expected return only directly impacts the choice of "Approach 3". For each choice, several possibilities are available to choose from. We further elaborate upon these possibilities are further in the upcoming subsections. We found these possibilities through literature. Then, we make the appropriate decisions based on several requirements found in literature. We assess to which extent the choices comply with said requirements. For the assessment purpose, we use literature and dissect researches by experts who apply ERP estimates in practice.

There are many academics and practitioners that estimate the ERP. Due to time constraints, it is impossible to dissect every ERP estimate. Therefore, we initially focus on the estimates that we know that the industry applies. KWCF has information about the ERP source used by ten corporate finance firms. These ten firms are unlikely to represent all ERP sources used in the industry. However, it does give some indication of what the industry uses in practice. Since this is sensitive information, we present the data anonymously. Figure 15 shows how many corporate finance firms appraising Dutch companies use a specific ERP source.

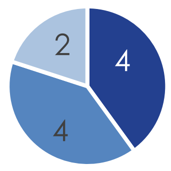

Figure 15: ERP sources used in the industry

Based on the information of KWCF, we know that industry at least applies the ERP estimates by Credit Suisse, KPMG and Damodaran. Therefore, we analyse these estimates. Credit Suisse is a leading global wealth manager. Each year, the company issues the "Global Investment Returns Yearbook" (Credit Suisse, 2020). The authors are leading authorities on the analysis of the long-run performance and trends of financial metrics. A summary of the yearbook is publicly available. It shortly discusses their ERP estimates for several countries without discussing the details.

KPMG is one of the Big Four accounting organizations. Each quarter, the company releases a summary of their ERP estimate for the Netherlands (KPMG, 2020). The summary discusses some of the design choices, but not all choices. In addition, the argumentation for each decision is either short or missing.

Damodaran is a corporate finance and valuation professor at the Stern School of Business at New York University who wrote several books on corporate finance and valuation. Each year, he provides an update on his article about the ERP (Damodaran A. , 2020). It discusses the ERP in depth and estimates it for several countries. In addition, ERP calculation spreadsheets are available.

Both the research by Credit Suisse and KPMG are brief summaries. As such, they provide little insight into the choices they make. Therefore, we analyse several other sources. Additionally, we make this choice because the dataset is unlikely to include all the sources used in the industry. We identified the sources based on their level of authority and the degree of openness in which they discuss the choices made. The sources are the Authority for Consumers and Markets (ACM) and Duff & Phelps.

The Dutch ACM is an independent supervisor of the Dutch market. The ACM published a research about how they implemented a discount rate in one of their cases and as such estimated an ERP for the Netherlands (ACM, 2010). The research describes the choices made in depth.

Duff & Phelps is a multinational financial consultancy firm based in New York. Since 2005, Duff & Phelps publishes the Risk Premium Report each year. Although they only published the summary in recent years, the report of 2013 is fully available (Duff & Phelps, 2013). The research discusses the ERP for the United States in detail.

4.2. Equity Risk Premium Approach

The main approaches used by researchers and practitioners follow very different logics, which in turn lead to large discrepancies of results (Moscato, 2019). In general, literature differentiates between three types of ERP estimates (Damodaran A. , 2020) (New Zealand Treasury, 2005). The first is the historical ERP which is based on what equity investors have earned in the past (McKinsey & Company, 2002). The second is the implied ERP which is based on projections implied by current stock prices relative to earnings, cash flows, and expected future growth. The third is the survey-based approach in which valuators survey subsets of investors and managers to get a sense of their expectations about equity returns in the future (Damodaran A. , 2020). We discuss all estimation approaches in this section.

In addition, we assess the ERP approaches to choose the most appropriate approach. Damodaran (2020) argues that the choice of ERP approach can be based on the predictive power, believes about the market and the purpose of the research. Based on these factors, we draw up several requirements. The approach must:

- have a relatively high level of predictive power;
- be in line with our believes about the market; and
- correspond to the purpose of the research.

4.2.1. Historical Equity Risk Premium estimate

Although the goal is to estimate an ERP in the future, a large part of the data used to make the estimates is in the past (Damodaran A. , 2020). The historical approach to estimating ERPs is the most widely used approach.

The approach estimates the actual returns earned on stocks over a long period and compares it to the actual returns earned on a risk-free security (Damodaran A. , 2020). The historical ERP consists of the difference between the historical mean return for a broad-based equity-market index and a risk-free rate over a given period (CFA Institute, 2019). The historical ERP exists out of the (Ibbotson & Chen, 2019):

- Income return (the return earned by stockholders from dividends and stock buybacks);
- Inflation rate during the estimation period;
- Growth rate in real earnings (earnings cleansed of inflation) during the estimation period; and
- Change in PE ratio over the period, since an increase or decrease in the PE ratio will raise or lower the realized return on stocks during an estimation period.

If investors do not make systematic errors in forming expectations, average returns in the long-term should be an unbiased estimate of what investors expect (CFA Institute, 2019). In addition, historical estimates are based on data which gives them a high degree of objectivity.

The problem with any historical premium approach however, even with substantial modifications, is that it is backward looking (Damodaran A. , 2020). Given that the objective is to estimate an updated, forward-looking premium, this is not intuitive.

Furthermore, the assumption that the mean and variance of the returns are constant over time often does not hold (CFA Institute, 2019). In other words, it assumes that the future will behave like the past which does not necessarily have to be the case (Federal Reserve Bank of New York, 2015).

4.2.2. Implied Equity Risk Premium estimate

Implied or forward-looking ERP estimates use current information and expectations concerning economic and financial variables (CFA Institute, 2019). Because the ERP is based only on expectations for economic and financial variables from the present going forward, it is intuitive to estimate the premium directly based on current information and expectations concerning such variables.

The current implied premium and average implied premium are two variants of the implied premiums (Damodaran A. , 2020). The approach estimates the current implied premium from the current level of the index used. It estimates the average implied premium as the average levels of the implied premiums over several years in history.

In general, the valuator first derives the implied required rate of return on equity from the current share prices and the market participant's expectations of future cash flows (Officer & Bishop, 2008). This execution of this process is quite complex. As the goal is to provide a general overview of the approach, we will not go into detail in this regard. The valuator repeats this process for all stocks. Then, the valuator aggregates it across all stocks to provide an expected market return. Finally, the valuator estimates the ERP by deducting the risk-free rate.

One of the strengths of the approach is that it does not rely on the assumption of stationarity (CFA Institute, 2019). Furthermore, the approach is not backward looking, but forward-looking. A forward-looking ERP is conceptually preferable. After all, the ERP should reflect the return expected by investors (McKinsey & Company, 2002).

An issue related to the estimation of an implied ERP is the difficulty of estimating future dividends or earnings growth. Implied ERP estimates are often subject to other potential errors related to financial and economic models and potential behavioural biases in forecasting (CFA Institute, 2019).

4.2.3. Survey-based Equity Risk Premium estimate

If the ERP is what investors demand for investing in risky assets today, the most logical way to estimate might be to ask these investors what they require as expected returns (Damodaran A. , 2020). Naturally, the valuator cannot survey all investors. Therefore, he surveys subsets of investors that reflect the aggregate market. In practice, he questions investors, managers, and academics.

The main strength of the approach is that its concept is attractive in that it attempts to directly elicit the variables of interest (New Zealand Treasury, 2005). Additionally, the results are relatively easy to obtain (CFA Institute, 2019).

A drawback of the approach is that even with a carefully specified question, it is impossible to know whether the person survey interprets the question as intended (New Zealand Treasury, 2005). In addition, bias may affect survey respondents Furthermore, respondents sometimes do not put great effort in their answers.

4.2.4. Choice of Equity Risk Premium Approach by Experts

Table 1 presents the choices of the academics and practitioners.

Source	Historical approach	Implied approach	Multiple approaches	Argumentation?
Credit Suisse	X			No
Damodaran		X		No
KPMG		X		Yes
ACM			X	Yes
Duff & Phelps			X	Yes

Table 1: Choice of ERP approach by experts

Credit Suisse (2020) is the only source that solely uses the historical ERP approach. It does not argue why it makes this choice. Both Damodaran (2020) and KPMG (2020) use the implied ERP approach. KPMG states that this is the most appropriate methodology to derive changes in the ERP because of the financial crisis because it incorporates recent market developments, expectations, and the company can deduce it from observable market data. Both ACM (2010) and Duff & Phelps (2020) use multiple approaches to determine the ERP. As a result, the value of the ERP is not a single value, but a range of values. ACM uses a combination of the historical and implied ERP approach. They argue that both approaches have their advantages and disadvantages and that by combining the approaches, they can make a good estimation of the ERP. Duff & Phelps uses multiple models. The company states that there is no single universally accepted methodology for estimating the ERP and relying on any single model can be problematic.

4.2.5. Choice of Equity Risk Premium Approach

We use the implied ERP approach to estimate the ERP in this research. This choice is based on the predictive power, beliefs about the market and the purpose of the analysis.

As discussed, Damodaran (2020) argues that the decision can be based on the predictive power, beliefs about the market and the purpose of the analysis. In corporate finance and valuation, the valuator cares most about the predictive power when estimating the ERP (Damodaran A. , 2020). The approach with the best predictive power yields forecasts of the ERP that are closest to realized premiums. The predictive power of several estimate approaches is determined by Damodaran. The current implied premium has the best predictive power while the historical risk premium has the worst predictive power.

Implicit in the use of each approach are assumptions about market efficiency (Damodaran A. , 2020). The current implied equity premium is the most logical choice if you believe that markets are efficient in the aggregate. If you believe that valuators significantly overvalue or undervalue the market in the aggregate, the historical ERP is the best choice. Valuators should use the survey premium if he has absolutely no faith in markets whatsoever. We believe that markets are efficient and therefore, the current implied equity premium is the logical choice.

The choice should consider the purpose of the ERP as well (Damodaran A. , 2020). In acquisition valuations and equity research, the current implied ERP is the best fit as any other approach will bring your market views into the valuation. For corporate finance purposes, it may be more prudent to build in a long-term average (historical or implied) premium. Since the goal is to use the ERP for corporate finance purposes, we prefer a long-term average premium.

Although the historical ERP is objective and simple to estimate and the survey-based ERP is conceptually drawing, the benefits of these approaches do not weigh up to the advantages of the implied ERP. Although the sources do not always solely use the implied approach, they do acknowledge that this approach is useful in estimating the ERP. The implied ERP has the best predictive power, lines up with our beliefs about the market and is suited for the purpose of the analysis.

4.3. Implied Equity Risk Premium Approaches

The three main approaches to estimating the implied ERP are the discounted cash flow (DCF) model, the default spread based model and the option pricing model (Damodaran A. , 2020). We treat all these approaches in this section.

Additionally, we assess the approaches on the:

- advantages of the approach;
- disadvantages of the approach; and
- extent in which the approach fits the purpose of the research.

4.3.1. Discounted Cash Flow Model Based Premium

The DCF model based premium builds on the intuition that when investors price assets, they implicitly tell what they require as an expected return on an asset (Damodaran A. , 2020). It argues that the current market prices for equity, in conjunction with expected cash flows, should yield an estimate on the ERP. Section 3.1.2 provides more information on forecasting expected cash flows.

A valuator can alter the DCF model approach in several ways to align with his market views. A variant of the premium, which we already treated in Section 2.2, is the dividend discount model (DDM) for instance (Damodaran A. , 2020). According to the model, the value of equity is the present value of expected dividends from an investment. Under the assumption that dividends grow at a constant rate forever, we arrive at a stable (Gordon) growth model. Equation 12 shows the calculation of the value of equity.

$$Value\ of\ Equity = \frac{Expected\ Dividends\ Next\ Period}{(Required\ Return\ on\ Equity - Expected\ Growth\ Rate)} \quad (12)$$

This is essentially the present value of dividends growing at a constant rate (Damodaran A. , 2020). Although difficult, it is possible to find or estimate all parameters except for the required return on equity. Therefore, solving the equation results in the value of the required return. The approach estimates the ERP by subtracting the risk-free rate from the required return.

4.3.2. Default Spread Based Premium

Although corporate bonds, stocks and real estate are inherently different, they all share the same characteristic that they are risky assets (Damodaran A. , 2020). Therefore, we can argue that the pricing should be consistently.

In the corporate bond market, people use the default spread as the ERP (Damodaran A. , 2020). This is the spread between the interest rate on corporate bonds and the treasury bond rate. The default spread is the least complex and most widely accessible premium available in these assets. If we translate the ERP in terms of a default spread on corporate bonds, the ERP estimation would become easier.

The noise in the ratios of the ERP to a default spread is too high to develop a reliable rule of thumb (Damodaran A. , 2020). However, valuators use this approach as a secondary one to test to see whether the ERP used in practice make sense, given how other markets price risky assets.

4.3.3. Option Pricing Model Based Premium

The option pricing approach draws on information in the option market (Damodaran A. , 2020). Valuators can use option prices to back out implied volatility in the equity market. There should be a relationship between the ERP and the risk of future stock price volatility.

The simplest measure of volatility from the options market is the volatility index (VIX), which is a measure of 30-day volatility constructed using the implied volatilities in traded S&P 500 index options (Damodaran A. , 2020). To estimate the ex-ante risk, the valuator can use both continuous and discontinuous (or jump) risk in stocks. The valuator uses option prices to estimate the probabilities of both types of risk. Then, he applies the assumption that investors share a specific utility function (power utility) to back out a risk premium that would compensate for this risk.

4.3.4. Choice of Implied Equity Risk Premium Approach by Experts

Table 2 presents the choices of the academics and practitioners.

Source	DCF model	Default spread	Option pricing	Argumentation?
Damodaran	X			No
KPMG				No

Table 2: Choice of implied ERP by experts

Since Damodaran and KPMG are the only two experts of our selection that use the implied ERP approach, these are the only sources treated in this section. Damodaran is the only one of these sources that specifies its implied ERP approach. However, he does not give arguments as to why he made this choice. As a result, the research by experts provides little useful information for our choice of implied ERP approach.

4.3.5. Choice of Implied Equity Risk Premium Approach

We use the DCF model-based approach to estimate the ERP in this research. This choice is based on the disadvantages of the other approaches, advantages of the DCF approach, and the flexibility of the approach.

The first reason is the disadvantages of the default spread based approach. For example, valuators should only use this approach as a secondary test to see whether the ERP used in practice makes sense (Damodaran A. , 2020). Therefore, it should not act as an implied ERP approach on its own but instead, valuators should see it as a check. Consequently, we reject the default spread based approach as a possibility.

The second reason is the general advantages of the discounted cash flow approach over the option pricing model-based approach. For instance, the approach is intuitively drawing as it builds on the intuition behind the DCF approach (Damodaran A. , 2020). Earlier in the research, we already established that we see this as the most appropriate approach to valuation.

The third reason is that we can alter the DCF model-based approach in several ways to represent different assumptions about the future. For example, if we assume the growth rate to be constant over time, we can apply the Gordon growth model (Damodaran A. , 2020). If we instead do not think this is the case, we can opt for different models such as the two-stage or three-stage model.

4.4. Discounted Cash Flow Equity Risk Premium Approach

The DCF ERP approach is simple and flexible, but there is wide disagreement about what inputs to use in calculating the equity premium (Ilamanen, 2011). Even the observable inputs are lacking consensus. The dividend yield should for example maybe include share repurchases in addition to the dividend yield itself. In this section, we discuss the choices for the expected returns and the growth rate. Based on these choices, we present the DCF ERP approach. We cannot use the choices of experts in this section because no source specifies the DCF ERP approach.

4.4.1. Expected returns

As discussed in section 3.2.3., DCF models are effectively based on discounting future amounts of cash flow to the present value (CFA Institute, 2019). To do this, we first need to determine what we see as the expected cash flows to investors. The approach can be based on three types of future cash flow. These are dividends FCFs, and residual income. Since the ERP is related to what investors expect to receive from an investment, the relevant question in determining the appropriate expected return is what reward investors receive for bearing risk.

When dealing with dividend-paying companies, defining cash flows as dividends is most appropriate (CFA Institute, 2019). By using dividends, we arrive at the DDM ERP variant of the DCF model ERP. The main argument for using dividends as the cash flow is that investors usually receive cash returns in the form of dividends. One may wonder if this definition of a cash flow ignores earnings not distributed to investors as dividends. However, reinvested earnings drive increased future dividends. Therefore, the cash flow considers the earnings.

Damodaran (2020) shows that the dividend yield is an accurate proxy for the implied ERP up until the late 1980s. It was the prevalent parameter until the yield declined in the 1980s and the 1990s because of many firms replacing dividends with repurchases such as stock buybacks (Ilamanen, 2011). A stock buyback, or a share repurchase, occurs when a firm decides to buy back its shares from the market. The company then owns the repurchased shares, and the number of shares outstanding reduces. As a result, the relative ownership stake of each investor increases. These repurchases were more tax efficient, more flexible, and had a more positive impact on share price. If companies compensate top executives based on share price, they naturally prefer buybacks over divided payments as a means of distributing cash to investors. As a result, broader payout yields that include share buybacks have replaced the dividend yield as the preferred measure.

However, only adding share buybacks but not subtracting share issuance would overstate the effect of buybacks (Ilamanen, 2011). In addition to firms repurchasing shares or pay dividends when there is an excess in cash, firms may issue equity when they need more capital from investors.

The expected return parameter should thus consist out of the dividend yield and the buyback – issuance yield, or net buyback yield. Ilamanen (2011) shows that the net-buyback-adjusted dividend yield has the highest correlation with the next-quarter market returns, predicting annual equity returns and the measure is less persistent than other alternatives.

4.4.2. Growth rate

We can either assume the growth rate to be constant over time or not (CFA Institute, 2019). If we assume a constant growth rate, we arrive at the Gordon model. This model assumes that dividends grow indefinitely at a constant rate. If we apply this assumption the general DDM formula, we find a simple valuation formula. Equation 13 shows this formula.

$$V_0 = \frac{D_1}{r-g} \; where: \tag{13}$$

- V_0 = value of a share of stock today at t = 0
- D_1 = expected dividend payable at t = 1
- r = required rate of return on the stock
- g = expected constant dividend growth

The assumption of a constant growth rate is unrealistic for most companies. For example, many companies experience growth rates higher than the required rate of return for short time periods when they temporarily develop a competitive advantage. Additionally, analysts apply different growth rates in the analyst consensus reports depending on the market conditions. Therefore, we cannot assume the growth rate to be constant over time. We thus assume that the growth rate is not constant.

4.4.3. Choice of Discounted Cash Flow Equity Risk Premium Approach

To summarize, the total yield represents the expected return, and we assume that the growth rate is not constant. We can translate these design choices in four specifications of the DCF model-based ERP. These are the two-stage DDM, the H-model, the three-stage DDM and spreadsheet modelling (CFA Institute, 2019). The choice of approach is based on which one represents the several phases that most companies go through the best.

The two-stage DDM is the most basic DDM model (CFA Institute, 2019). The model assumes that the company grows at a high rate for a relatively short period in the first stage, and then follows a lower long-run growth rate in the second stage. The first stage usually consists of five years (Schroder, n.a.).

Equation 14 gives the two-stage DDM.

$$P_0 = \sum_{t=1}^{5} \frac{E(D_t)}{(1+k)^t} + \frac{E(D_5)(1+g)}{(k-g)(1+k)^5} \; where: \qquad (14)$$

- P_0 = current share price at the end of year 0
- $E(D_t)$ = expected dividends per share at the end of year t
- k = cost of capital
- g = growth rate

The most prominent issue in the two-stage DDM is that the first stage immediately changes into the second stage (CFA Institute, 2019). This is quite unrealistic, as the growth rate of a company does not change that drastically suddenly. The H-Model solves this issue as the growth rate starts out high and then declines linearly over the high-growth rate stage until it reaches the long-run average growth rate.

The three-stage DDM reflects three stages of earnings growth (CFA Institute, 2019). The first stage of high growth and the third stage of long-run growth are like the two-stage DDM and the H-Model. The second stage could for example be a period with a growth rate between the rate of the first and third stage. The second stage usually consists of fifteen years (Schroder, n.a.). Equation 15 gives the three-stage DDM.

$$P_0 = \sum_{t=1}^{5} \frac{E(D_t)}{(1+k)^t} + \sum_{t=6}^{20} \frac{E(D_t)}{(1+k)^t} + \frac{E(D_{20})(1+g)}{(k-g)(1+k)^{20}} \qquad (15)$$

The final possibility is to use spreadsheet modelling (CFA Institute, 2019). This enables the appraiser to use a wide variety of growth rates throughout the years that are not possible in the other models.

The choice of model is based on the data available for the computation of the ERP and the used software. The data uses a different growth rate for each forecast year. In addition, the model uses another growth rate for the long-term growth. This calls for the use of spreadsheet modelling. We can apply this model because we use the spreadsheet software Excel for the ERP estimation. Therefore, we apply spreadsheet modelling.

4.5. Market Proxy

We treat three design choices related to the ERP proxy in this section. The first choice is whether to use a global or country specific ERP. The second choice is to determine the proxy market for the ERP. The third and final choice is the risk-free rate which depends on the market proxy used.

4.5.1. Global or Country specific ERP

An ERP can either be global or country specific. In other words, should we use a global ERP for investments all over the world or should we use a higher ERP in some markets than in others (Damodaran A. , 2020)? For example, should an investor putting his money in Indian stocks demand a higher risk premium for investing in equities than one investing in German stocks? We make the choice for a global or a country specific ERP by assessing the three arguments offered against demanding a higher ERP in some markets than others and the definition of the ERP.

The answer to this question seems to be evident. Investments in emerging markets are riskier than in developed markets (Naumoski, 2011). In general, higher risk should provide higher return. Therefore, investments in emerging markets should result in higher returns. As returns depend on the type of market invested in, the ERP also depends on the market. Thus, we should use a country-specific instead of a global ERP. However, there are three arguments offered against demanding a higher ERP in some markets than in others (Damodaran A. , 2020).

The first argument is that country risk is diversifiable (Damodaran A. , 2020). This is true to some extent, but an investor can only diversify away portions of country risk. Investor portfolios tend to contain more investments from the home country and therefore disproportionately exposes the investors to this risk. In addition, the increase in correlation across markets has made a portion of country risk into market risk.

The second argument is that the traditional CAPM can be adapted easily to the global market (Damodaran A. , 2020). This argument seems reasonable from a theoretical point of view, but not from a practical one. The β's cannot carry the burden of capturing country risk in addition to all other macro risk exposures.

The third argument is that cash flows better reflect country risk than the discount rate (Damodaran A. , 2020). They argue that bringing in the likelihood of negative events such as national political chaos into the expected cash flow effectively risk adjusts the cash flows, thus eliminating the need for adjusting the discount rate. This argument is alluring, but wrong as the expected cash flows, computed by considering the possibility of poor outcomes, is not risk adjusted.

Table 3 presents the choices of experts and academics

Source	Global ERP	Country specific ERP	Argumentation?
Credit Suisse		X	No
Damodaran	X		Yes
KPMG		X	Yes
ACM		X	No
Duff & Phelps		X	No

Table 3: Choice of global or country specific ERP by experts

KPMG (2020) deems a global ERP to be more appropriate based on their research and their professional judgment. Credit Suisse (2020), ACM (2010), Duff & Phelps (2020) and Damodaran (2020) use a country specific ERP. Damodaran (2020) argues that the question of whether country risk matters and should affect the equity risk premium is an empirical one, not a theoretical one, and for the moment, at least, the evidence seems to suggest that you should incorporate country risk into your discount rates. This could change as we continue to move towards a global economy, but we are not there yet.

We think that a country specific ERP is more appropriate than a global one. Although globalization increasingly affects the worldwide economy, a global ERP would overstate the effect of globalization. Furthermore, a global ERP would not reflect the definition of the ERP. Remember that the ERP is the incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks (Duff & Phelps, 2013). In our opinion, country risk affects the risk of a diversified portfolio and thus the premium required by an investor. Next to the country specific ERP being more intuitive, we have shown that the arguments for a global ERP do not hold.

4.5.2. Market portfolio proxy

Now that we have chosen to use a country specific ERP, we must determine the equity market portfolio proxy for the ERP. From the definition of the ERP by Duff & Phelps (2013), it follows that the proxy should represent a diversified portfolio of common stocks. There are no hard and fast rules for determining the proxy market. Therefore, we reached out to Mr. Damodaran to help us with this issue and then assessed the proxies on requirements we drawn up ourselves based on literature.

Commonly used proxies are imperfect measures of the theoretical concepts (NBIM, 2016). Proxies are usually broad-based equity indices such as the S&P 500 in the United States. It is very difficult to determine the proxy as there are no hard and fast rules for constructing the equity market proxy. Table 4 presents the choices of experts and academics

Source	S&P 500	Combination	Argumentation?
Damodaran	X		No
KPMG		X	No
Duff & Phelps	X		No

Table 4: Choice of market proxy by experts

ACM (2010) and Credit Suisse (2020) do not specify which proxy they use for the ERP. Both Damodaran (2020) and Duff & Phelps (2020) use the S&P 500. Damodaran translates the ERP to each individual country by using the countries credit rating. Duff & Phelps does not have to translate the ERP as the purpose of the research is to estimate an ERP for the United States. KPMG uses a weighted average of the AEX, S&P 500, FTSE and STOXX 600. They do not provide arguments for their choice apart from the notion that these Dutch, English, German, and American markets are highly developed.

Based on the choices made by the experts, we consider three possibilities. The first possibility is to use the Dutch stock market. We use the AEX-index as the market proxy to resemble the Dutch economy. The AEX-index consists of shares issued by the 25 most traded companies listed on Euronext Amsterdam in such a way that it is suitable to serve as they are underlying value for index-linked products such as derivatives (NYSE Euronext, 2020). The second possibility is to use multiple stock markets. When we apply this possibility, we use a weighted average of several proxy stock markets to resemble the Dutch economy. The third possibility is to use a general stock market. This market resembles the global economy, and we should then translate it to the Dutch economy.

As discussed, there are no hard and fast rules for constructing the equity market proxy (NBIM, 2016). Therefore, we sent an e-mail to Mr. Damodaran who is one of the authorities in the field of valuation to enquire about his view on which criteria a proxy market should meet to estimate the implied ERP. He stated that "if you are estimating a forward looking premium, you need forecasts of long-term growth in earnings for the stocks in an index". He later added that "this is the only requirement".

Thanks to Mr. Damodaran's answer, we know that the only requirement is the availability of long-term earnings growth forecasts. However, this does not specify which index we should use as a market proxy for the goal of this research. In addition, we do not want to base our choice on just one source. Therefore, we have drawn up several additional requirements based on the arguments given by experts and literature that the proxy market should meet.

The first requirement is that the market should accurately represent the average returns earned by equity investors in the market at hand (CFA Institute, 2019). We use this requirement to ensure that the equity market fits the research goal. It would for example not make sense to use a third-world market to resemble a highly developed one.

In this respect, the possibility of using the Dutch market is the most appropriate. After all, there is no better market available to use as a proxy than the Dutch market itself. The other two options would require us to take several extra steps to represent the Dutch economy. If we take these steps, it is unknown to which extent it represents the Dutch economy relative to using the Dutch market itself.

In the case of using multiple stock markets, it first must be determined what characteristics an equity market must have to resemble the Dutch economy. Once these characteristics are determined, we must assess the equity markets to choose the ones that are the most appropriate. Finally, the weight in which each market contributes must be determined.

When applying one general market to resemble the Dutch economy, we must select the market that represents the global economy. Then, we must translate the global market in such a way that it represents the Dutch one.

The second requirement is that the market must exist for a long time, be relatively non-volatile and experience little changes over time (JP Morgan, 2008), (Damodaran A. , 2020). In other words, the market should be a developed market instead of an emerging or frontier market. A developed market is a country which has a high standard of living, a well-run stock market, and (mostly) free trade (MSCI, 2020). An emerging market is a country which is at the early stages of development. The economic growth is fast, the debt is low, and the consumer bases and vast resources are large. A frontier market is a country that because of demographics, developments, politics, and liquidity is less mature than emerging markets.

It is unknown which markets we would use when applying several ones or one global market to resemble the Dutch market. However, we can examine whether we can characterize the AEX as based on a developed market. Each year, Morgan Stanley Capital International (MSCI) publishes the MSCI Global Market Accessibility Review in which they categorize markets into either developed, emerging or frontier markets (MSCI, 2020). According to this research, the Netherlands is a developed market. There are no issues regarding the ease of capital inflows/outflows, market entry or the availability of investment instruments.

The third requirement is that the market must be broad-based (JP Morgan, 2008), (Damodaran A. , 2020), (CFA Institute, 2019) (NBIM, 2016). A broad-based market is a market not dominated by large companies or over-weighted in some sectors. A broad-based index means that the index reflects the movement of the entire market. There is no research available that categorizes indices as either broad-based or narrow-based. Therefore, we use the agreement between the CFTC and the SEC to categorize the AEX-index as broad-based or narrow-based (CFTC, n.a.). The market must meet four requirements according to the agreement.

The first requirement is that the index must have ten or more securities (CFTC, n.a.). Since the AEX has 25 securities, the index fulfils the first requirement.

The second requirement is that no single component should constitute more than 30% of the weighting (CFTC, n.a.). The company with the largest weighting is ASML with a weight of 15.43%. Therefore, the index also fulfils second requirement.

The third requirement is that the five largest components by weight must collectively constitute of no more than 60% of the weighting (CFTC, n.a.). In the case of the AEX, the five largest components add up to 51.28% and thus fulfils the third requirement.

The fourth and final requirement is that the bottom quartile of component stocks has a combined average daily dollar trading volume of more than $30 million (CFTC, n.a.). The bottom quartile of component stocks for the AEX Index comprises 16 stocks. The combined average daily dollar trading volume of these stocks is $72,4 million. The index thus fulfils the fourth requirement as well.

In addition to the AEX Index accurately representing the average returns earned by equity investors in the Dutch market and it being a mature market, it also meets all the requirements so that we can classify it as a broad-based stock index. As a result, we use the AEX Index as the proxy for the market portfolio.

4.5.3. Risk-free rate

Proxies for the risk-free rate are imperfect measures of the theoretical concept (NBIM, 2016). There is no such thing as a risk-free return (Officer & Bishop, 2008). There are hence several issues that we must address to decide on the appropriate rate. To make the appropriate choice, we:

1. apply the two basic conditions of no default risk and no reinvestment;
2. determine which types of rates adhere to the consistency principle;
3. assess whether we must use a normalized or non-normalized rate;
4. determine the appropriate period; and
5. summarize the choices that the experts make on the risk-free rate.

According to Damodaran (2020), we can view an asset as risk free if it meets two basic conditions. The first condition is that there can be no default risk. There is always a risk of default present in an asset, but the goal is to use an asset whose risk is far below average. As a result, we cannot use any security issued by a private firm as a proxy for the risk-free rate as a firm always has some probability of default. The second condition is that there can be no reinvestment risk. This risk refers to the possibility that an investor will be unable to reinvest cash flows at a rate comparable to their current rate of return. In other words, the asset must have a relatively low level of volatility.

The consistency principle states that the risk-free rate must be consistent with the discounted cash flows (Damodaran A. , 2020). This means that if we estimate the cash flows in euros, we must express the risk-free rate in euros as well. The consistency principle also applies to whether we use real or nominal cash flows. If we use real cash flows, we must use a real risk-free rate and vice versa.

As interest rates on government bonds have decreased, some experts and practitioners created a normalized risk-free rate (Fernandez P. , 2020). This is the rate that should exist in a world under what they call "normal conditions". However, is the world that we live in not the normal world? Fernandez (2020) rejects the normalized risk-free rate as he observes three inconsistencies. Investors cannot invest in any financial instrument to attain the rate, it is higher than the cost of debt and the required return to debt in several cases, and most valuations do not adjust the value of debt accordingly to the normalized risk-free rate they use.

The choice of period depends on the assumptions underlying the approach. The assumption underlying the DCF method is that cash flows are "infinite". This implies that a business will never go bankrupt and is therefore able to produce an infinite amount of cash in the future. This does not hold in practice, but we can use the assumption in theory because of the discount rate. The later in time the cash flow materializes, the less present value it represents because of the high discount rate used in the calculations. The proxy used for the risk-free rate should represent the same assumption as the ERP approach is based on the DCF method. Therefore, we must use the proxy with the longest period that investors still actively trade in the market.

Table 5 presents the choices of the academics and practitioners.

Source	10 years	20 years	30 years	Combination	Argumentation?
Damodaran	X				No
KPMG				X	No
ACM	X				Yes
Duff & Phelps		X			No

Table 5: Choice of risk-free rate period by experts

Credit Suisse (2020) does not specify which proxy it uses for the risk-free rate. Damodaran (2020) uses an US ten-year treasury bond and ACM (2008) uses a Dutch ten-year treasury bond. ACM discusses that a relatively short-term government bill would be the best option as we can explain the positive relationship between the maturity and the reward demanded by the higher level of inflation and probability of default of long-term relative to short-term bonds. However, short-term bonds are more sensitive to changes in the economic forecast and inflation. Therefore, ACM deems a long-term bond to be the appropriate proxy. KPMG (2020) uses a combination of the 30-year Dutch government yield, the 30-year UK government yield, the 20-year US treasury yield and the 30-year German government yield. They do not discuss why they use these yields. Duff & Phelps (2013) uses a normalized 20-year US treasury bond.

Considering the above, we choose to use the 30-year Dutch government bond as the proxy for the risk-free rate. We made this choice because it:

- meets the two conditions of a risk-free asset;
- adheres to the consistency principle as the cash flows are also nominal and in euros;
- is a non-normalized risk-free rate;
- represents the assumption underlying the DCF method that cash flows are "infinite" the most as the 30-year bond is the longest actively traded bond; and
- is in line with the views of the experts.

4.6. Equity Risk Premium Design Overview

To summarize the results of Chapter 4, Figure 16 provides an updated version of the design choices framework depicted in Figure 14. It shows the design possibilities and choices made for each aspect of the ERP.

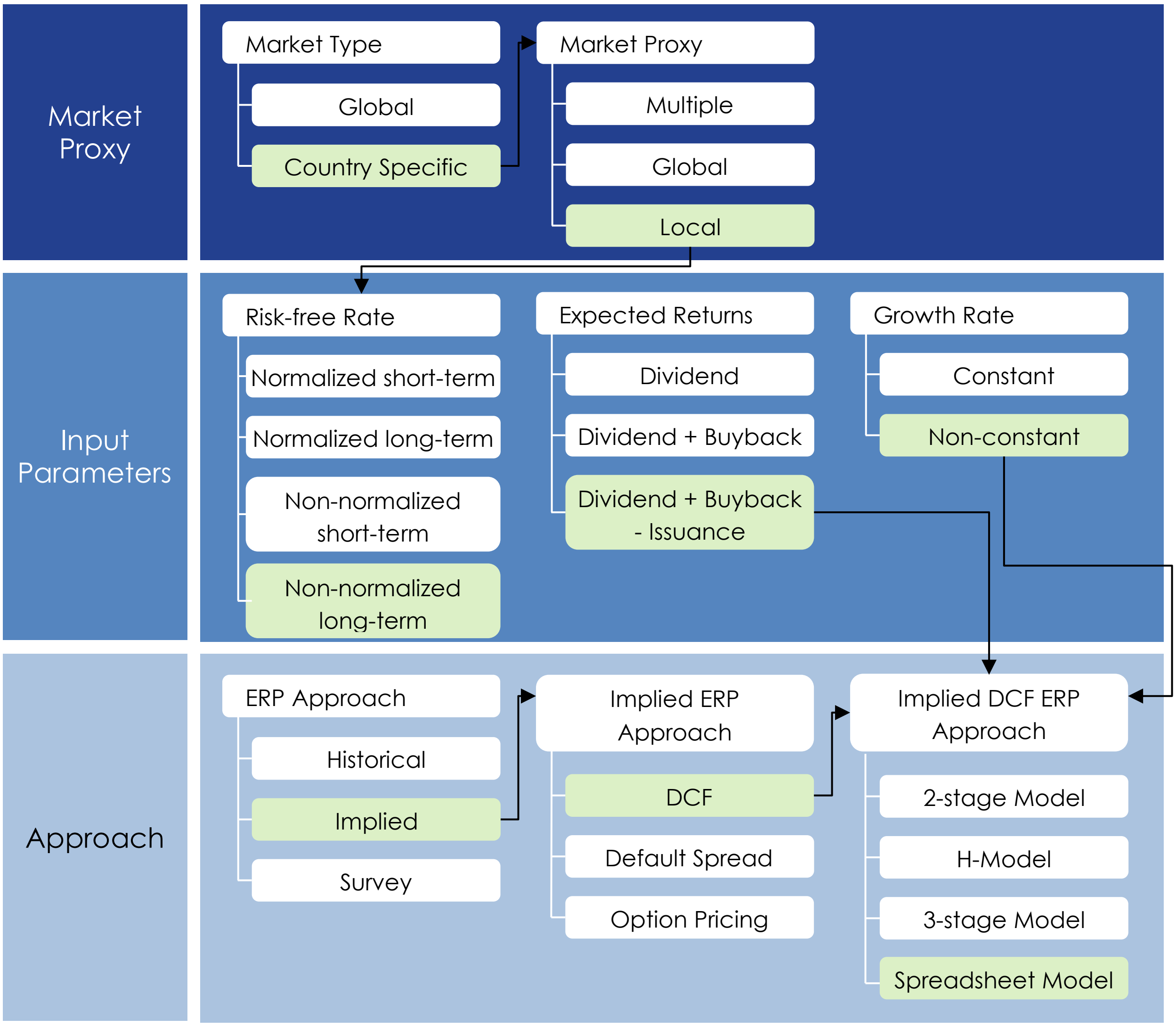

Figure 16: Updated ERP design framework

The design results in the Explicit Quotidian Dutch Equity Risk Premium, or EQD ERP. This is the name of the premium that results from the research. Explicit refers to the level of transparency that the premium provides both in terms of argumentation and in terms of computation. Quotidian refers to the fact that the tool can estimate the premium daily which contrasts with alternative premia. Dutch refers to the equity market.

V

5. Equity Risk Premium Tool

Chapter 5 discusses the implementation of the EQD ERP in the tool. Section 5.1 describes the translation of the choices made in Chapter 4 into the ERP tool. Section 5.2 examines the data sources used to collect the input of the tool. Section 5.3 covers the implementation of the ERP tool. Figure 17 provides an overview of Chapter 5 content.

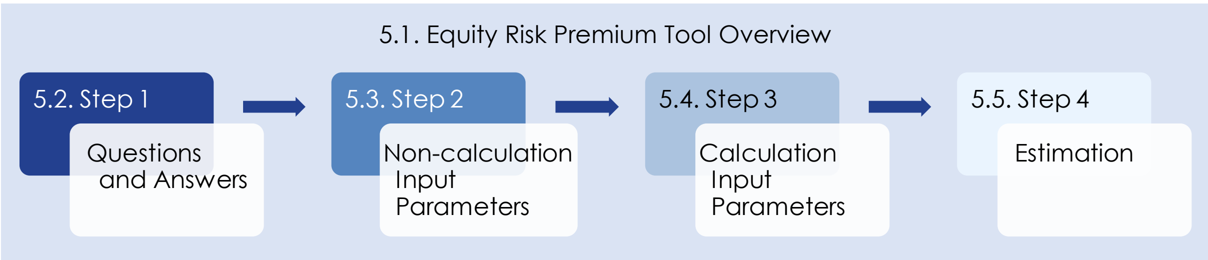

Figure 17: Chapter 5 outline

5.1. Equity Risk Premium Tool Overview

Now that we established the EQD ERP design, we translate the choices into the tool. We can in theory build the tool in any type of spreadsheet software. We choose to use Excel because of its widespread use and as it provides all the functionalities necessary. The EQD ERP tool consists out of eight worksheets. These are the Manual input dashboard, Dashboard, Results, Analysis, Data, Dividends + net buybacks, Buyback yield, and Simulation worksheets. We discuss all these worksheets extensively except for the Analysis and Simulation sheets. We treat these sheets in Chapter 6.

The main worksheets are the Manual input dashboard and the Dashboard worksheet. Both worksheets estimate the ERP, but its usage depends on the preferences of the user and the purpose. If the user wants to determine the ERP between 31-12-2015 and 31-12-2019 and does not have own data available, the user must apply the Dashboard worksheet. If the user wants to determine the ERP for a different date or wishes to use his own data, the user must apply the Manual input dashboard sheet.

First, we explain the Manual input dashboard sheet as this sheet is the easiest to comprehend. In Appendices II to IV, we give additional information about the tool. In Appendix II, we discuss the cell references and their meanings. In Appendix III, we explain the Excel functions. In Appendix IV, we treat the Visual Basic (VBA) code.

5.2. Manual Input Dashboard Worksheet

Figure 18 is a screenshot of the Manual input dashboard worksheet.

Step 1

Question	Answer
What is the valuation date?	30-09-2016
What is the index price at valuation date?	452,33
What is the risk-free rate at valuation date?	0,52%
What is the inflation rate at valuation date?	0,10%
How many years do you want to forecast?	3

Step 2

Year	Expected dividends + net buybacks	Present value dividends + net buybacks
Dec 2016	24,69	24,29
Dec 2017	26,14	24,09
Dec 2018	27,42	23,67
Term year	27,45	380,29
Total	105,70	452,33

Step 3

Calculate Equity Risk Premium		
	Market return	**6,75%**
	EQD ERP	**6,23%**

Figure 18: Manual input dashboard worksheet

The figure shows that the EQD ERP estimation consists out of three steps. These steps are the:

- questions and answers;
- present value of expected returns calculation; and
- EQD ERP estimation.

In this section, we discuss all the steps extensively. We use an example to illustrate the use of the tool.

5.2.1. Step 1: Questions and Answers

The first step when using the Manual input dashboard sheet is the questions and answers table. Figure 19 shows the questions that the valuator must answer.

Question	Answer
What is the valuation date?	30-09-2016
What is the index price at valuation date?	452,33
What is the risk-free rate at valuation date?	0,52%
What is the inflation rate at valuation date?	0,10%
How many years do you want to forecast?	3

Figure 19: Questions and answers

The user must answer some questions related to the input parameters. The answers determine the values for the input parameters of the ERP estimation. The question about the number of forecast years is an exception to this. It determines the number of years for which the user must report the expected dividends + net buybacks. The answer depends on the number of years for which the user has data available. Depending on the answer, specific rows in Step 2 are either hidden or shown. For this purpose, we use VBA. Appendix IV, Code 1 shows the VBA code. Figure 23 shows all the values for the example used to illustrate the usage of the tool.

5.2.2. Step 2: Present Value of Expected Returns Calculation

The second step is the calculation of the present value of the expected returns. Figure 20 depicts this calculation.

Year	Expected dividends + net buybacks	Present value dividends + net buybacks
Dec 2016	24,69	24,29
Dec 2017	26,14	24,09
Dec 2018	27,42	23,67
Term year	27,45	380,29
Total	105,70	452,33

Figure 20: Present value of expected returns calculation

The user must insert the data on the expected dividends + net buybacks in the table. Equation 16 shows the formula used to calculate the expected dividends + net buybacks in the term year.

$$E(D_N + B_N) = D_{N-1} + B_{N-1} * (1 + g) \; where: \quad (16)$$

- $E(D_N + B_N)$ = expected dividends + net buybacks per share in the term year n
- g = growth rate

Appendix III, Formula 1 shows the calculation of the expected dividends + net buybacks in the term year in Excel. Instead of using an infinite constant growth, we assume that this is not sustainable. Therefore, we equal the growth rate to the inflation rate. We consider this rate as a sustainable level. When we apply this to Equation 16 and the example, we obtain:

$$27{,}42 * (1 + 0{,}01) = 27{,}45$$

With the expected dividends + net buybacks for the coming years determined, we can calculate the present values of the dividends and net buybacks. As determined in Section 4.4.3, we use spreadsheet modelling DDM.

The next step is to determine the cost of capital. Normally, we can apply Equation 15 to determine the cost of capital. However, since we forecast the next three years and use dividends + net buybacks instead of dividends only, we can rewrite Equation 15 as Equation 17.

$$P_0 = \sum_{t=1}^{N} \frac{E(D_1 + B_1)}{(1 + k_e)^1} + \frac{E(D_2 + B_2)}{(1 + k_e)^2} + \frac{E(D_N + B_N)}{(1 + k_e)^N} + \frac{E(D_N + B_N)(1 + g)}{(k_e - g)(1 + k_e)^N} \ where: \quad (17)$$

- P_0 = current share price at the end of year 0
- E(D+B) = expected dividends + net buybacks per share at the end of year t
- Ke = cost of capital
- g = growth rate

The input parameters described in Section 5.2.1. in combination with the expected dividends + net buybacks give the necessary input to determine three out of the four variables used in Equation 16. As discussed, we already know that P_0 in the example equals 452,33. The growth rate, or inflation rate in this case, is known as well at 0.10%. The expected dividends + net buybacks have been determined already as well. In Appendix III, Formula 2 and 3, we explain the calculation of the present value of the expected dividends + net buybacks in Excel.

We calculate the final variable, the cost of capital, by solving the equation by applying the three variables already identified. For this purpose, we apply Equation 18.

$$P_0 = \sum_{t=1}^{t=N} \frac{E(D_t + B_t)}{(1 + k_e)^t} + \frac{E(D_{N+1} + B_{N+1})}{(k_e - g)(1 + k_e)^N} \ where: \quad (18)$$

- P_0 = current share price at the end of year 0
- $E(D_t + B_t)$ = expected dividends + net buybacks per share at the end of year t
- $E(D_{N+1} + B_{N+1})$ = expected dividends + net buybacks per share at the end of year n+1
- K_e = cost of equity
- g = growth rate

Equation 18 is based on the logic of the DCF method, which we extensively treated in Section 3.2.3. Remember that in the DCF method, the value of an asset is the present value of the expected cash flows on the asset, discounted back at a rate that reflects the riskiness of these cash flows.

When we apply this logic to the estimation of the ERP, we must discount the expected cash flows by the cost of capital to reflect the riskiness of the investment. By applying Equation 18 to our example, we obtain the following:

$$452{,}33 = \frac{24{,}96}{(1+K_e)^1} + \frac{26{,}14}{(1+K_e)^2} + \frac{27{,}42}{(1+K_e)^{2{,}25}} + \frac{27{,}45}{(K_e - 0{,}01)(1+K_e)^3}$$

5.2.3. Step 3: Estimation

The third and final step is to estimate the ERP. Figure 21 shows the ERP estimation in the Manual input dashboard worksheet.

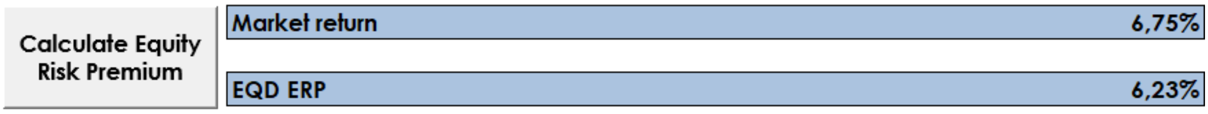

Figure 21: ERP estimation

Equation 18 is difficult to solve by hand. For this purpose, we use the Excel Solver tool to solve the equation for K_e. The Solver tool is an add-in in Excel that can solve an equation for some unknown parameter. Appendix III, Formula 4 we explain the tool.

As it takes some time for users to apply the Solver tool and it might not be clear how the user should apply it, we use VBA to automate this process. In VBA, we have written a code which automatically applies the Solver tool. In Appendix IV, Code 2, we show the code and explain it. We connected the code to the button on the Dashboard sheet. Because of this, the tool calculates the ERP by the click of just one button instead of having to perform multiple actions. When we apply this to our example, we achieve a cost of equity of 6.75%.

Remember that Equation 5 gives the CAPM formula as discussed in Section 2.4.

$$Ke = Rf + [E(Rm) - Rf] * \beta \qquad (5)$$

From Section 2.4, it is known that $E(R_m) - R_f$ is equal to the ERP. In addition, since we assume that we have a market portfolio representative of all assets in the market, it must have average systematic risk. In other words, β equals 1. Using this information, we can rewrite Equation 5 into Equation 19.

$$ERP = Ke - Rf \qquad (19)$$

As we obtained the cost of equity through the Solver tool and the risk-free rate was already known, we can fill in Equation 19 to find the ERP.

$$6.75\% - 0.52\% = 6.23\%$$

The ERP on 30-09-2016 according to the EQD ERP tool equals 6.23%.

5.3. Dashboard Worksheet

Now that we explained the Manual input dashboard sheet, we move on to the Dashboard sheet. Figure 22 provides a screenshot of the Dashboard sheet.

Step 1

Question	Answer
What is the valuation date?	30-09-2016
What time period should be used for the risk-free rate proxy?	30 years

Step 2

Parameter	Value
Index price	452,33
Risk-free rate	0,52%
Inflation rate	0,10%

Step 3

Year	Expected dividends + net buybacks	Present value dividends + net buybacks
Year 1	24,96	23,39
Year 2	26,14	22,95
Year 3	27,42	23,69
Term year	27,45	382,30
Total	105,98	452,33

Step 4

Calculate Market Risk Premium

Market return	**6,72%**
Implied MRP	**6,20%**

Figure 22: Screenshot of the Dashboard worksheet

Instead of three steps, the Dashboard worksheet consists of four steps. The additional step is the determination of the non-calculation input parameters. This step is necessary because the user does not insert his own data, but the data already stored in the Excel file. The Data worksheet contains the data needed to perform the estimation. Most of the data originates from FactSet. FactSet is a financial data and software company that provides research for Wall Street professionals and individual investors against a fee.

5.3.1. Step 1: Questions and Answers

Like the Manual input dashboard sheet, the first step is the questions and answers table. Figure 23 shows the questions that the valuator must answer.

Question	Answer
What is the valuation date?	30-09-2016
What time period should be used for the risk-free rate proxy?	30 years

Figure 23: Questions and answers

The table is less extensive than the one in the Manual input dashboard sheet because information about the valuation date and the proxy for the risk-free rate is enough to determine the right input values from the Data worksheet.

5.3.2. Step 2: Non-calculation Input Parameters

The answers to the questions in combination with the choices made in this research result in the calibration of the input parameters. Figure 24 depicts the input parameters of the tool that do not require any calculations.

Parameter	Value
Index price	452,33
Risk-free rate	0,52%
Inflation rate	0,10%

Figure 24: Input parameters

As these parameters do not require any calculations, we can use relatively simple functions to determine the correct values. In Appendix III, Formula 5, we explain the functions. However, there are some issues related to the data that we must solve. These issues related to the index price, risk-free rate and the inflation are all discussed in this section.

Index price
The market does not report the index price every day. As a result, the tool cannot calculate the ERP daily. To solve this problem, we use the most recent historic value if there is no value available at the valuation date. FactSet reports the index price.

Risk-free rate
This risk-free rate parameter depends on the valuation date and the period chosen to use as a proxy. The valuator can either choose a 10-year or a 30-year government bond as we determined that the proxy for the risk-free rate must be long-term. The same problem that occurs with the risk-free rate applies to the index price. We use the same solution to cope with the problem. FactSet reports the risk-free rate.

Inflation rate
The market either reports the data once per year or once per month. We opt to use the data per month as this incorporates more recent data. Because of the one-month period between data points, the data shows some large leaps in value. For example, the inflation rate as per April 2018 is 1.1%, while the rate per May 2018 equals 1.8%. If we do not perform some type of alteration, this would lead to similar leaps in ERP estimations.

As a solution, we apply linear interpolation to smoothen the data. Linear interpolation is a type of estimation method for constructing new data points within the range of a discrete set of known data points. We forecast the expected values of inflation based on the monthly data available. As a result, we can apply the inflation rate per day. Equation 20 shows the formula for linear interpolation.

$$y = y_1 + (x - x_1)\frac{(y_2 - y_1)}{(x_2 - x_1)} \; where: \tag{20}$$

- y = unknown variable
- x = independent variable
- x_1 = 1st independent variable
- x_2 = 2nd independent variable
- y_1 = value of the function at value x_1
- y_2 = value of the function at value x_2

By applying linear interpolation, we solved the problem. CBS reports the inflation rate.

5.3.3. Step 3: Calculation Input Parameters

Like the Manual input dashboard sheet, the calculation input parameters are the expected dividends per share and the expected net buybacks per share. Figure 25 shows the calculation input parameters in the Dashboard worksheet.

Year	Expected dividends + net buybacks	Present value dividends + net buybacks
Year 1	24,96	23,39
Year 2	26,14	22,95
Year 3	27,42	23,69
Term year	27,45	382,30
Total	105,98	452,33

Figure 25: Calculation input parameters

In this section, we discuss both calculation input parameters. As the Excel formulas are conceptually similar to the non-calculation input parameters, we refer to Appendix III, Formula 1 to 3 for more information about the mechanics in Excel.

Dividends per share

FactSet reports the expected dividends per share. These expectations are based on analyst consensus reports. Analysts who follow all the developments concerning the different constituents of the AEX Index make these reports. Based on their findings, they report several financial items such as the expected dividends per share. Of course, the longer the period, the more difficult it is to predict the dividends. The analyst consensus reports cover the expectation of the dividends per share over the coming three years. The frequency with which the analyst consensus reports are issued and the forecasting period both pose a problem for the dividends per share data.

Problem 1

Analysts make the reports several times a month. However, it is not possible to use all these reports in the model as this would be too time-consuming. Therefore, we use the reports available on 31 December of the year at hand. This data is available in the sheet Dividends + net buybacks. We then repeat the same process of linear interpolation as conducted for the inflation rate in the Data sheet.

Problem 2

Usually, investors use a period of five years when determining the value of investments after which they calculate the term year. There is no analyst consensus later than the three coming years. We must accept this limitation. We prefer the use of less, but reliable data than more, but possibly unreliable data.

Net buybacks per share

The net buybacks per share are the buybacks per share minus the issuance per share. Both historical calculated data and expected data related to the net buybacks per share are unavailable and thus pose significant problems.

Problem 1

FactSet does not report the net buybacks per share. However, it does report the repurchase of common & preferred stock (buybacks) and the equity issuance/options exercise proceeds (issuance) per year following the company reports.

For the last five years, we determined the market capitalization, the adjusted buybacks, and the adjusted issuance for each of the 25 constituents of the AEX Index constituents. The Buyback yield worksheet in Excel show this. Then, we summed all the constituents each year to determine the total market capitalization, total adjusted buybacks, and total adjusted issuance. We then calculate the net buyback yield by subtracting the adjusted issuance from the adjusted buybacks and dividing by the market capitalization. Finally, the net buybacks per share are determined by multiplying the buyback yield by the share price.

Problem 2
Logically, since analysts do not report historical data, the analysts do not report the expected net buybacks in the future. This makes sense because this is extremely difficult to predict. The calculations in problem 1 show that the net buyback yield over 2015-2019 for the AEX Index ranges from 0.30% and 1.93%. In other words, the value is very volatile.

Although the data is not available, we do need data over the next three years for the estimation. We create the data by making two assumptions. The first assumption is that we can use the average net buybacks per share over the calculated five years as the net buybacks per share over the last year. We made this choice because the results do not show a trend. If this is the case, then the best indicator for the future is the average of the data.

The second assumption applies is that the buybacks over the coming years shows the same growth as the dividends per share. This is the best proxy that we can use because data about the growth of the index price for example is missing.

These assumptions lead to the expected net buybacks per share over the coming three years. The Dividends + net buybacks sheet shows the data. Similarly to the dividends per share, we once again use linear interpolation to attain data points for each possible valuation date.

Calculation
With the data problems solved, we can calculate the present values of the dividends and net buybacks. We perform the calculation in the same manor as described in Section 5.2.2. However, there is an inconsistency between the valuation data and the report issuance date, and the forecasting period both pose problems that we must solve.

Problem 1:
There is a significant leap in time between the valuation date and the data on which the report is issued. Let us explain this problem by using our example. The valuation date is 30-09-2016. On this date, we can use the data available to us at 31-12-2015 for the dividends per share over the coming three years. These are the dividends per share on 30-09-2017, 30-09-2018, and 30-09-2019. If we solely use the data reported on 31-12-2015, the data would be inconsistent as there is a 9-month difference between the report date and the valuation date.

We solve this by applying data reported on 31-12-2016 in addition to the data of 31-12-2016. This seems counterintuitive, because one of the key principles of valuation is that you should not use data unavailable to you at the valuation date. This principle is still relevant but does not hold in this case as the ERP tool is a simplification of reality. In practice, a consensus valuation report about the dividend yield was issued on 30-09-2016, the exact valuation date. This report incorporated all the realized dividends in the past and therefore gives a much more accurate expectation than the expected dividends on 31-12-2015. We do not use this report in the tool, as adding all reports available would be too time-consuming. The tool must replicate the fact that the market has more information available at the valuation date than at the date of the analyst consensus report issue.

We do this by incorporating a weighted average between the analyst consensus report per 31-12-2015 and the report per 31-12-2016. At the valuation date in our example, exactly 75% of the year has already passed while 25% remains. Consequently, we already know 75% of the realized dividends over 2016, while 25% is still a matter of expectations. Therefore, the expected dividends at 30-09-2017 is a weighted average of the data of 31-12-2016 with weighting 0,25 and the data of 31-12-2017 with weighting 0,75. We use Equation 21 to apply the solution.

$$E(D_t + B_t) = \frac{DY_N - CD_N}{DY_N} * E(D_n + B_n) + \frac{CD_N}{DY_N} E(D_{n+1} + B_{n+1}) \; where: \qquad (21)$$

- $E(D_t+B_t)$ = expected dividends + net buybacks per share at the time t
- DY_N = number of days in year n
- CD_N = current day of year n
- $E(D_n+B_n)$ = expected dividends + net buybacks per share at time n
- $E(D_{n+1}+B_{n+1})$ = expected dividends + net buybacks per share at time n+1

In Appendix III, Function 6, we explain the application of Equation 21 in Excel.

Problem 2:
The number of times that we can use the expected dividends + net buybacks depend on the valuation date if we do not alter the model. We use an example to illustrate this. If the valuation date equals 31/12/2015, we can use three years as our period because the valuation date equals the report issuance date. However, for any date other than 31 December, such as 30-09-2016, we cannot use three years because there is no expectation on the expected dividend on 30-09-2019 as the last value is the expectation on 31-12-2018.

To ensure that we constantly have three dividend expectations, we apply partial-year discounting. Normally, we use the difference in years between the valuation date and the dividend issuance date when calculating the present value of dividends. For example, we calculate the present value of the dividends for year 2 by discounting for $(1+COE)^2$. Partial-year discounting enables the use of fractions of a year instead of whole years.

In our example, the valuation date of 30-09-2016 would imply that we should apply the latest expected dividend reported at 30-09-2020. However, the analyst consensus report only reaches as far as 31-12-2019. Therefore, we use the value reported at this date as our expected dividend. Then, instead of raising the term to the power three, we use the difference between the valuation date and the data issuance date. Therefore, we do not raise the term by the power three, but to the power 2,25 as a quarter of a year remains.

The calculation of the expected dividends + net buybacks in the term year and the calculation of the present value of the expected dividends + net buybacks are conceptually similar to the calculation in the Manual input dashboard worksheet and we therefore do not treat it in this section.

5.3.4. Step 4: Equity Risk Premium Estimation

Figure 26 shows the ERP estimation in the Dashboard worksheet.

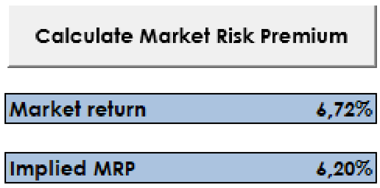

Figure 26: ERP estimation

Conceptually, the mechanics of the solver tool is similar to the calculations in the Manual input dashboard sheet and we therefore do not discuss it in this section.

VI

6. Validation and Sensitivity Analysis

Chapter 6 acts as the validation and the sensitivity analysis of the research. Section 6.1 computes the EQD ERP for five historic years, compares the values to the premium estimates of several authorities, and draws conclusions based on the results of the validation. Section 6.2 presents the sensitivity analysis in which we quantify the impact of the input parameters.

6.1. Validation

Users can apply the EQD ERP tool to calculate EQD ERP at valuation date through the Manual Input Dashboard sheet by providing the correct input. In addition, the tool is also able to determine the ERP from a historical point of view from the Dashboard sheet. We use this sheet by comparing the results of the tool to the results of the ERP estimates used in the industry. Before we can compare the estimates, we must first compute our own results.

6.1.1. Simulation Results

In theory, we can estimate the EQD ERP for the past five years by constantly changing the valuation date manually. We would have to repeat this process almost 1500 times, however. Naturally, we want to avoid this time-consuming process. For this purpose, we have built a simulation model. The Simulation worksheet shows this model. Appendix IV, Code 3 examines the VBA code used for the simulation model. Figure 27 shows the results of the simulation.

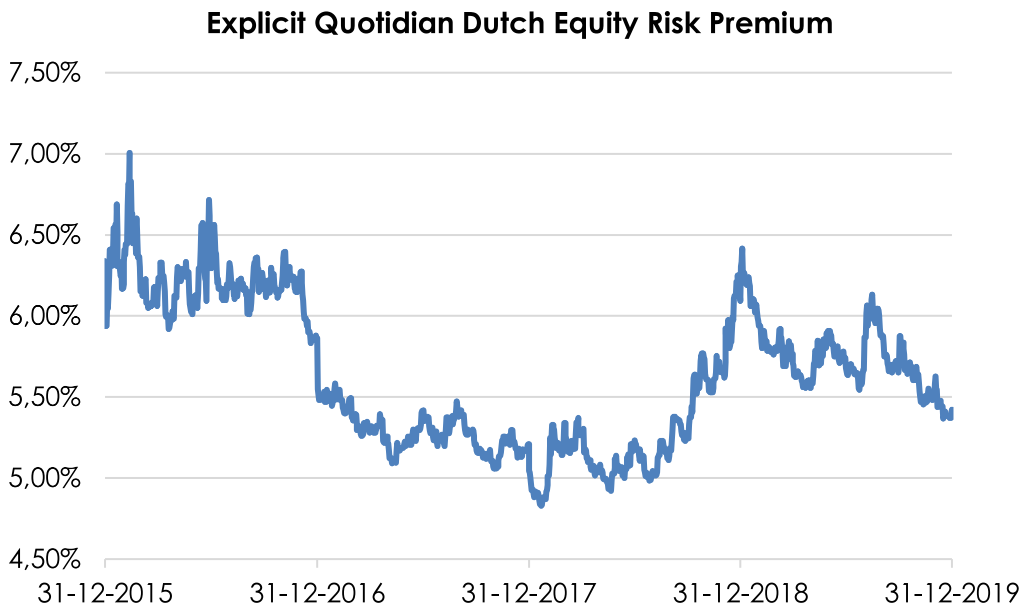

Figure 27: Simulation results

In this section, we restrict ourselves to descriptive statistics. We discuss the interpretation and explanation of the results in Section 6.1.3. The simulation estimated the EQD ERP 1462 times over the period reaching from 31-12-2015 to 31-12-2019. The minimum premium is 4.83% reached on 22-01-2018 and the maximum premium is 7.01% reached on 11-02-16. The difference between the minimum and maximum equals 2.14%. The average ERP is equal to 5.63%.

6.1.2. Comparison to Authorities

Now that we simulated the results, we can compare the results to those of the experts used in the industry. As discussed in Section 4.1, these experts are Damodaran, KPMG, and Credit Suisse. In our opinion, the ERP by KPMG produces the best ERP estimate for the Dutch market out of the three experts.

KPMG makes logical choices for the different design aspect. First, the firm applies the implied approach which is in line with our choice of method. Second, the company uses equity markets comparable to the Dutch one in my opinion. Third, KPMG uses appropriate choices for input parameters such as the risk-free rate. Because we see the ERP estimate by KPMG as the best estimate in the industry, we compare our results to this estimate. Figure 28 shows the ERP estimate of KPMG over the same period as our simulation.

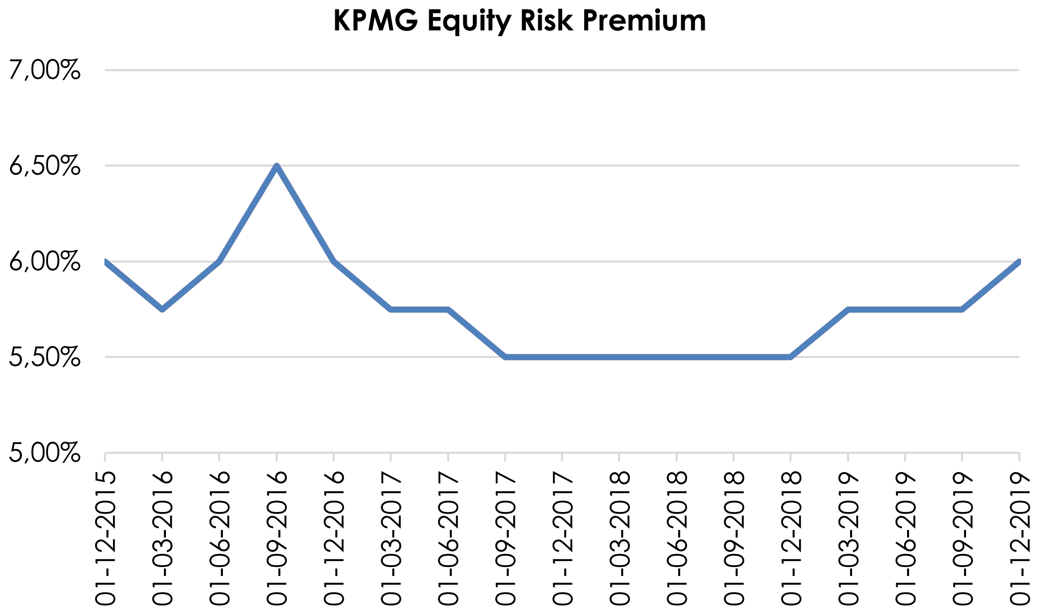

Figure 28: Historical KPMG ERP

To make the comparison with the EQD ERP, we must alter the data a bit. First, KPMG only reports the ERP once every quarter. This contrasts with the EQD ERP which determines the premium every single day. Therefore, we only use the estimates of the dates corresponding to the dates of KPMG. Second, KPMG rounds the estimates off to the nearest 0,25. Therefore, we apply the same principle to our data. Figure 29 shows the altered results of the EQD ERP.

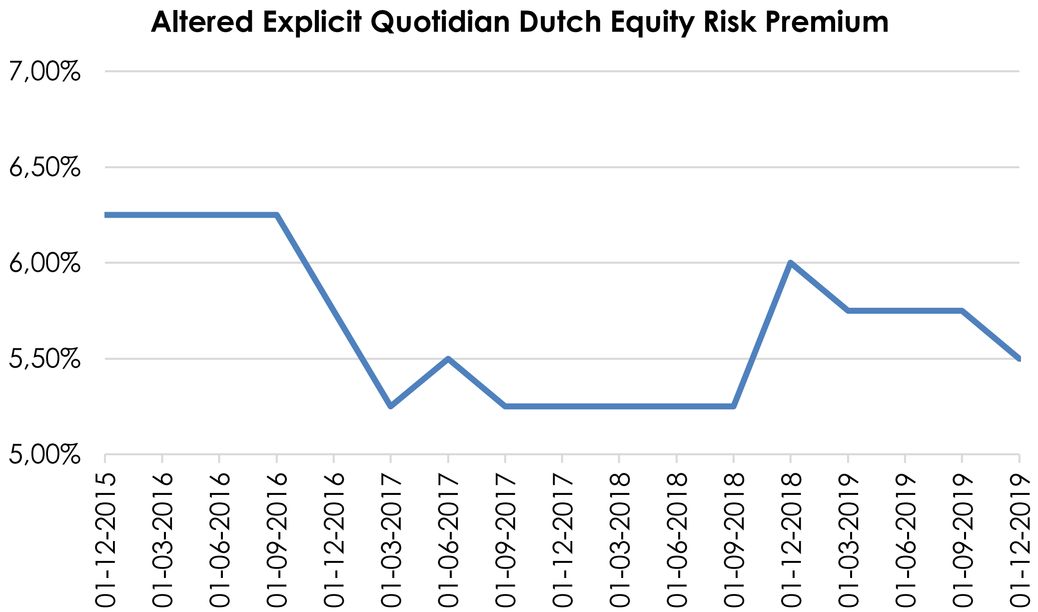

Figure 29: Altered simulation results

Now that we put the results in similar terms, we can compare them. Table 6 shows the summary of the descriptive statistics for both datasets.

Source	EQD ERP	KPMG ERP
Minimum	5.25%	5.50%
Maximum	6.25%	6.50%
Range	1.00%	1.00%
Average	5.68%	5.76%

Table 6: Descriptive statistics of ERP estimates

Both the minimum and maximum are 0.25% lower in the EQD ERP, the range is the same and the average is 0.08% lower. Figure 30 shows the difference between the EQD ERP estimates and the KPMG estimates.

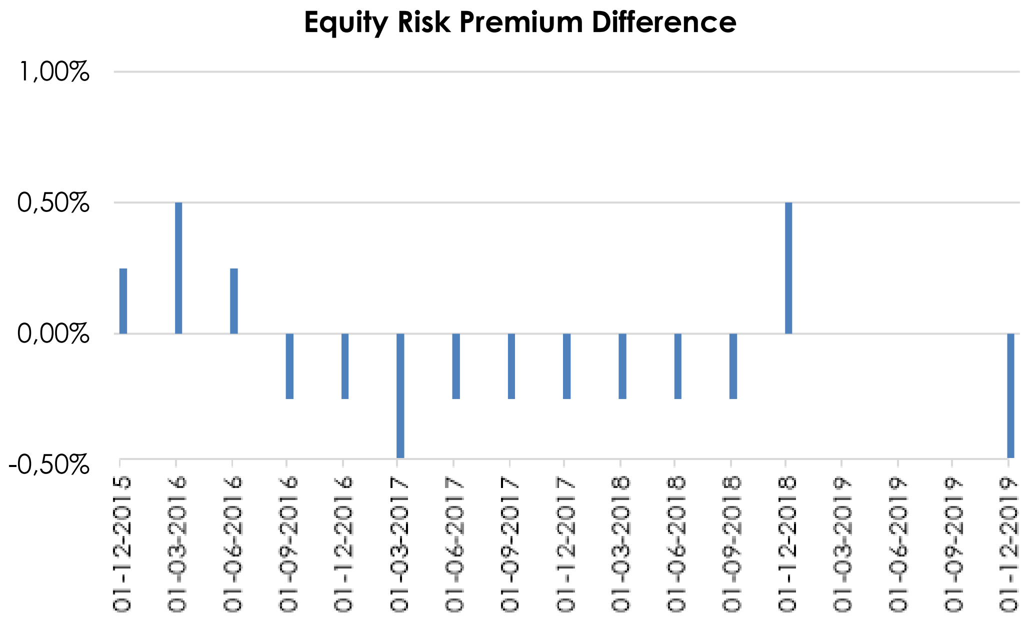

Figure 30: Difference between EQD ERP estimates and KPMG ERP estimates

The difference between the ERP estimates fluctuates through time. The maximum difference in estimates equals 0.50%.

6.1.3. Validation Conclusions

We compare the ERP estimates on three levels. First, we discuss the values of the estimates. Then, we analyse the trend year-on-year. Finally, we look at the trend quarter-on-quarter.

The values of both estimates are very similar. Both the minimum and maximum are 0.25% lower in the EQD ERP, the range is the same and the average is 0.08% lower. This validates the estimate in the sense that the values are in line with what one might expect when computing an ERP estimate. Table 7 shows how the ERP changes year-on-year.

Date	EQD ERP	KPMG ERP	Same?
2017	Lower	Lower	Same
2018	Lower	Lower	Same
2019	Higher	Higher	Same

Table 7: Comparison of trend year-on-year

The table shows that both ERP estimates follow the same trend when it comes to the trend year-on-year. Table 8 shows how the ERP changes quarter-on-quarter and whether we find the same trend in both estimates.

Date	EQD ERP	KPMG ERP	Same?
31-03-2016	Same	Higher	Different
30-06-2016	Same	Lower	Different
30-09-2016	Same	Lower	Different
31-12-2016	Higher	Higher	Same
31-03-2017	Higher	Higher	Same
30-06-2017	Lower	Same	Different
30-09-2017	Higher	Higher	Same
31-12-2017	Same	Same	Same
31-03-2018	Same	Same	Same
30-06-2018	Same	Same	Same
30-09-2018	Same	Same	Same
31-12-2018	Lower	Same	Different
31-03-2019	Higher	Lower	Different
30-06-2019	Same	Same	Same
30-09-2019	Same	Same	Same
31-12-2019	Higher	Lower	Different

Table 8: Comparison of trend quarter-on-quarter

The table shows a different result than the comparison year-on-year. The trend is the same 9 times, while it differs 7 times. There are several explanations why this occurs which we will discuss extensively in Chapter 7. All in all, the EQD ERP is quite in line with the expectations.

6.2. Sensitivity Analysis

In this section, we quantify the impact that the input parameters have by means of a sensitivity analysis. The analysis acts as a validity/sanity check to determine whether the effect of the input parameters on the ERP according to the tool is in line with the expectations according to theory.

For each input parameter, we simulated the value of the ERP 100 times between the minimum and the maximum found in the dataset used for the Dashboard worksheet. We reset all other input data to the average value so that the results are comparable. Table 9 shows the minimum and maximum found for each input parameter.

Statistic	Index Price	Risk-free Rate	Inflation Rate
Maximum	611,01	1,59%	2,90%
Minimum	382,61	-0,25%	-0,20%

Table 9: Descriptive statics input parameters

Appendix IV, Code 4, shows and explains the VBA code for the sensitivity analysis Figure 31 shows the results of the analysis.

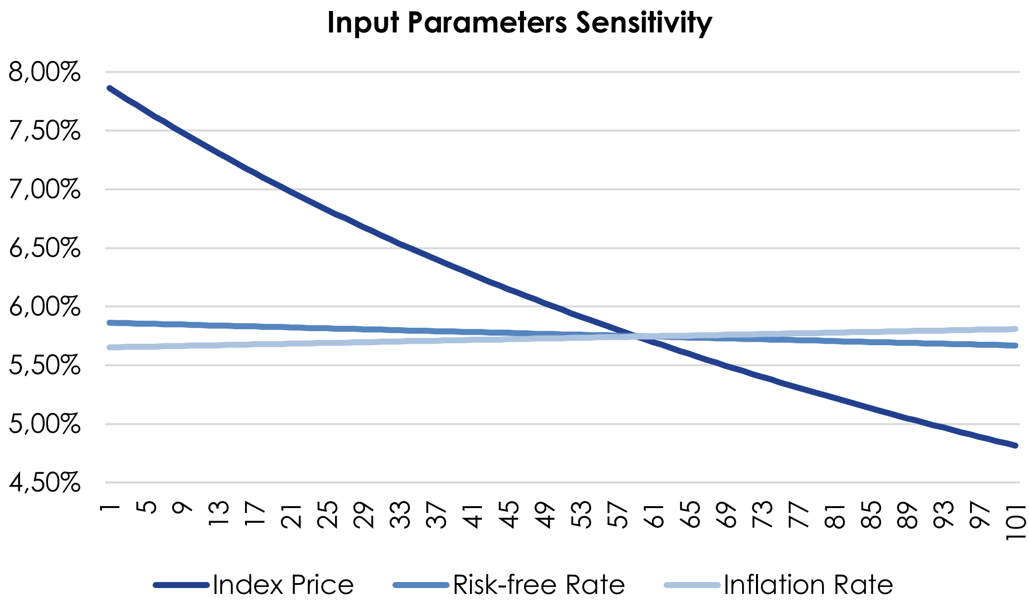

Figure 31: Sensitivity Analysis Input Parameters

The figure shows that the input parameters affect the ERP in varying ways. In the remainder of this section, we analyse the results for each input parameter.

When the index price increases, the ERP decreases. The index price affects the ERP calculation as the present value of the dividends + net buybacks must equal the index price. An increase in the index price results in a decrease in the cost of equity as we must use a lower discount rate to ensure that the present value of the dividends + net buybacks still equal the index price.

When the risk-free rate increases, the ERP decreases. The risk-free rate affects the ERP estimation in two ways. First, it affects the calculation of the present value of the dividends + net buybacks in the term year. An increase in the risk-free rate results in a higher ERP in this regard as the cost of equity must decrease to ensure that the present value still equals the index price. Second, it affects the calculation of the ERP from the cost of equity. An increase in the risk-free rate results in a lower ERP in this regard since the ERP is equal to the cost of equity subtracted by the risk-free rate (Equation 19). From the analysis, we conclude that the effect of the risk-free rate on the calculation of the ERP from the cost of equity is higher than the effect it has on the calculation of the present value in the term year as the ERP decreases when the risk-free rate increases.

When the inflation rate increases, the ERP increases. The inflation rate affects the ERP estimation in the calculation of the expected dividends + net buybacks in the term year. An increase in the inflation rate results in an increase in this expectation and consequently in its present value. As a result, the cost of equity increases as well to ensure that the total present value equals the index price at valuation date. Since the ERP is equal to the cost of equity subtracted by the risk-free rate, this explains the increase in the ERP as the inflation rate increases.

Table 10 gives the ERP values related to the minimum and maximum of each input parameter.

Input Parameter	Maximum	Minimum	Difference
Inflation Rate	5.81%	5.65%	0.16%
Risk-free Rate	5.86%	5.67%	-0.19%
Index Price	7.86%	4.81%	-3.05%

Table 10: Difference in ERP value for input parameter ranges

The table shows that the impact on the ERP varies significantly between the different input parameters. While the inflation rate and the risk-free rate have little impact on the ERP, the index price significantly impacts the premium. These results however only show how the index parameters individually affect the ERP. In practice, the parameters vary in relation to one another. For example, a decrease in the index price is likely to occur in combination with a decrease in the inflation rate due to lower demand and a decrease in the risk-free rate as demand for liquidity increases while the supply of credit decreases. Therefore, the results may be a bit more nuanced in reality.

We conclude that the results of the sensitivity analysis are in line with the expectations that arise from theory. The validity/sanity check of the tool is thus successful. Additionally, the analysis showed to which extent the different input parameters affect the ERP. The index price has a significant effect on the ERP, while both the inflation rate and the risk-free rate have much smaller effect on the premium.

VII

7. Conclusions and Recommendations

Chapter 7 discusses the research as a whole. The purpose is to explain the central results and the potential implications of the research. Section 7.1 summarizes the answers to the questions posed in Chapter 1 and checks whether we reached the intended goal. Section 7.2 addresses the limitations and weaknesses of the research and comments on these. Section 7.3 provides an overview of the recommendations related to the research. Section 7.4 examines the possibilities for future research that build on the foundation of our research.

7.1. Conclusions

As described in Section 1.3, the main research goal of the thesis was to reach the following:

To design an equity risk premium representative for the Dutch market so that corporate finance firms appraising businesses active in this market can improve the quality of their valuations and inherently the services they provide.

To achieve this goal, we answered several knowledge questions. In this section, we recap the answers to these knowledge questions after which we evaluate whether we reached the research goal or not.

What is the equity risk premium and what role does it play in valuation?
We established the definition of the equity risk premium (ERP) by identifying the most complete definition out of the list of definitions shown in Appendix I. We used the definition by Duff & Phelps (2013) throughout the research. They define the ERP as "the incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks".

The equity premium puzzle (EPP) is exemplary for the lack of consensus surrounding the premium. It is the discrepancy between the ERP observed in practice and the ERP according to theory. Literature has yet to find a satisfying answer that solves the puzzle, but risk-, behavioural- and market friction-based explanations exist. The estimation ranges according to literature are between 3% and 7%. This underlines the lack of consensus on the subject.

Literature makes a distinction between the realized ERP and the expected ERP. The realized ERP determines the premium from a historical point of view, while the expected ERP does so from a prospective point of view. The realized ERP is a poor proxy for the expected ERP because the ERP is time-varying, survivorship bias, the possibility of extreme events might not materialize and the possibility of changes in the economic conjuncture.

The model underlying the ERP is the Capital Asset Pricing Model (CAPM). Investors use this model to decide on the expected returns they require for individual investments. CAPM relates the expected return on an asset to its β. The β measures the sensitivity of the return of the investment relative to return on the market portfolio. The expected ERP varies in direct proportion to β. The expected ERP of an investment with a β of 0.5 is thus half the expected ERP on the market. As stated in the definition of the ERP, the premium uses an investment in a diversified portfolio of common stocks. If this is the case, then the portfolio is representative of all the assets in the market and must therefore have average systematic risk. In other words, the ERP uses CAPM with β equal to 1.

Valuation is the process of determining the value of an asset or service based on variables perceived to be related to future investment returns or based on comparisons with closely similar assets. Literally thousands of valuation approaches exist. There are however only a limited number of approaches that apply the ERP in their calculations. These are the approaches that fall under the income approach. Valuators most often use the income approach as the valuation approach.

The income approach uses the cost of equity as the discount rate that reflects the riskiness of the expected cash flows to determine the present value of a future set of cash flows. The ERP is part of the cost of equity. In addition to the ERP, the cost of equity consists out of the risk-free rate, the size premium, and the company-specific premium. The income approach uses the cost of equity as the discount rate to determine the present value of a future set of cash flows. The discount rate reflects the riskiness of the expected cash flows.

The main approach for the calculation of the cost of equity for public companies is the CAPM approach. The main approaches to determining the cost of equity for private companies are the expanded CAPM and the build-up approach. The extended CAPM is a version of CAPM that includes additional premiums for size and firm-specific risk, while the build-up approach compounds the cost of capital by adding different risk premiums to the risk-free rate. The biggest implication that the choice of approach has on the ERP is whether its weight depends on β or not. The β affects the ERP when we apply the (expanded) CAPM, but it does not when we use the build-up approach.

How should we design the equity risk premium for the Dutch market?
The design of the ERP affects the results of the estimation significantly. We classify the choices related to the design as the approach, the market proxy, and the input parameters. For each choice, we identified several sub choices. For each of these choices, we determined the options and chose the most appropriate option for the Dutch market based on literature and the application of the ERP in practice. Table 11 provides an overview of the choices and the argumentation for each choice.

Design choice	Chosen option	Argumentation
Market type	Country specific	The arguments for a global ERP do not hold, only a local ERP reflects the definition of the premium and a local ERP is more intuitive
Market proxy	AEX Index	It represents the Dutch market, is based on a developed market, classifies as broad-based, and it allows for ERP estimation usage
Risk-free rate	30-year Dutch government bond	It is a risk-free asset proxy, adheres to the consistency principle, is non-normalized, represents the DCF method assumption and is in line with the expert views
Expected returns	Net-buyback-adjusted dividend yield	It has the highest correlation with the next-quarter market returns, predicting annual equity returns and it is less persistent than other alternatives
Growth rate	Non-constant	The constant growth assumption is unrealistic for most companies, while the non-constant growth assumption is not
ERP approach	Implied	It has a high level of predictive power, it is in line with our beliefs about the market and it corresponds to the purpose of the research
Implied ERP approach	DCF	The advantages of the approach, the disadvantages of the other approaches and it corresponds to the purpose of the research
DCF ERP approach	Spreadsheet model	The data uses several different growth rates throughout the forecasted years and the used software allows for the use of spreadsheet modelling

Table 11: Overview of the design choices

This design results in the Explicit Quotidian Dutch Equity Risk Premium, or EQD ERP. The ERP is explicit because both the design and the estimation are transparent, quotidian because the tool can calculate it on a daily basis and Dutch because we apply the ERP to the Dutch equity market.

How can we implement the equity risk premium in a tool?
We implemented the ERP design in a tool by using Excel. The tool can estimate the ERP either through the Dashboard worksheet or the Manual input dashboard worksheet. The Dashboard sheet calculates the ERP on a daily basis by using data already stored in the tool. The data ranges between 31-12-2015 and 31-12-2019. The user must only answer the questions on the Dashboard worksheet. Then, the tool determines all the correct input data based on the answers to the questions. Finally, the user clicks the estimation button to compute the ERP estimate. The tool uses a VBA code to determine the estimate.

The user may apply the Manual input dashboard sheet if he prefers to use his own data. Due to a lack of data, the estimation performed in the Dashboard sheet contains some simplifications and assumptions concerning the data. The Manual input dashboard sheet does not apply such simplifications and assumptions as the user can apply his own data to estimate the ERP. Instead of only answering the questions posed in the Dashboard worksheet, the user must also fill in the correct input data. The estimation itself still takes place through the same click of the estimation as in the Dashboard sheet.

To which extent does the designed equity risk premium differ from expert estimates?
For validation purposes, we conducted a validation research by comparing our results to the KPMG ERP. We used VBA in Excel using the Dashboard sheet to find the ERP estimate for each date between 31-12-2015 and 31-12-2019. We altered the data for comparison reasons to only cover estimates once every quarter and we rounded the estimates off to the nearest quartile for comparison purposes.

Then, we compared the data to the ERP estimates of KPMG over the same period. The values of both estimates were quite similar. Both the minimum and maximum are 0.25% lower in our estimate, the range is the same and the average is 0.08% lower in our estimate. The year-on-year trend was the same. The quarter-on-quarter trend was the same most of the time, but it was also different several times. We however still draw the conclusion that the research shows similar results as one of the authorities when it comes to the ERP.

Additionally, we performed a sensitivity analysis. The analysis acts as a sanity check. We simulated all input parameters from their minimum to their maximum value found over the data used in the Dashboard sheet. The ERP increases when the inflation rate increases, while the ERP decreases when the index price and the risk-free rate increase. From the results, we concluded that the results of the sensitivity analysis are in line with the expectations that arise from theory. Additionally, the analysis showed to which extent the different input parameters affect the ERP. The index price has a significant effect on the ERP, while both the inflation rate and the risk-free rate have a much smaller effect on the premium.

Now that we answered all knowledge questions, we can check whether we reached the main goal. Remember, we defined the main goal of the research as follows:

To design an equity risk premium representative for the Dutch market so that corporate finance firms appraising businesses active in this market can improve the quality of their valuations and inherently the services they provide.

We designed an ERP representative for the Dutch market that corporate finance firms appraising business active in the Dutch market can use in the day-to-day operations of. Therefore, we reached the main goal of the research. In fact, we can apply the research in a much wider context than initially anticipated. The wider context refers to the users of the research, the size of the companies and the market that the companies are active in.

Wider context 1: Users
Instead of corporate finance firms and therefore valuators, also investors may use the research in their day-to-day operations. During the research, we did not have to make any choices that restrict the usage to valuators only. As a result, investors are also able to apply the research when determining whether an investment is worth pursuing or not.

Wider context 2: Size of the companies
The same applies to the businesses that may profit from the research in their valuations. Instead of restricting this to Dutch SMEs, the research shows that we can apply it to any company. As discussed in Section 3.3, the size premium accounts for the added risk that SMEs imply. As a result, the ERP is totally based on the stock market. Therefore, we can apply it in both the CAPM approach when appraising public companies and in the expanded CAPM or build-up approach when appraising private companies.

Wider context 3: Market of the companies
Additionally, we can easily apply the research to other mature equity markets. All design choices, except for the market proxy, do not depend on the market in which we implement the ERP. Therefore, we may also apply the research to other similar markets. For example, if we want to determine the ERP for the American equity market, we only have to determine whether it is a mature market and which market proxy we should use. For this purpose, we may use the same procedure as we did during the research. As a result, we can easily alter the research for implementation in any other similar mature market than the Dutch one.

In addition to the research exceeding the research context, it also exceeds the main research goal through some specific contributions to the field. The research contributes to the body of knowledge, the understanding of ERP estimation in practice, and to existing ERP estimations in practice.

Contribution 1: The body of knowledge
The research contributes to the body of knowledge by giving a general overview of the ERP and providing insight into its estimation process by establishing the possible options and identifying the most appropriate choice for each step of the process.

The main contribution is the level of explicitness and the extensiveness of the research. In literature, we did not find any sources that collected all the information on the ERP as discussed above. Furthermore, all experts except for Damodaran do not extensively describe the choices made. This is especially the case for the argumentation behind the choices. On the one hand, the transparency of the research gives the user a sense of what the ERP entails and enables the user to determine whether he agrees with the ERP estimate. On the other hand, the research contributes to the body of knowledge by providing a detailed overview of the ERP and its design process.

Contribution 2: The understanding of ERP estimation in practice
The research contributes to the understanding of ERP estimation in practice by offering a high level of transparency in the estimation through the ERP tool.

Similarly to the explicitness of the research, we find the same level of transparency in the estimation of the ERP in the Excel tool. Once again, all experts except for Damodaran give little to no insight into the exact estimation of the premium. The user can fully see how we estimate the ERP. This advantage goes beyond the openness of the estimation because it also shows which problems you might run into when determining an ERP estimate.

Contribution 3: The added value to ERP estimations in practice.
The research contributes to existing applications of the ERP in practice as the tool offers advantages such as the ability to estimate the premium daily.

Experts such as KPMG reporting the ERP estimate once every so often. The company publishes the premium once every three months. Such a leap of three months poses significant problems. For example, at the start of 2020, the Netherlands showed no fear for a COVID-19 outbreak. However, at the end of March, the government had to issue a lockdown. In a period of three months, the period between the KPMG ERP estimates, the market anticipation changed from the virus being no threat to the virus significantly affecting society. Such a development has a drastic effect on the economy and therefore, on the ERP. In this case, corporate finance firms had to work with an outdated ERP which did not incorporate the consequences of the virus outbreak for several months.

On the other hand, our research enables the user to compute the premium daily. The main advantage is that the tool can directly translate recent market developments into the estimation. Once the valuation consensus reports reported several times per week are issued, the tool can estimate the ERP using the recent market developments.

7.2. Limitations

The main limitations of the research are related the Manual input dashboard worksheet, the use of the AEX Index and the validation of the research.

Limitation 1: The Manual input dashboard worksheet is a simplification of reality
We had to use several assumptions and simplifications to ensure that we could estimate the premium. The main reason why this was necessary was the lack of data. For example, we did not have data about the expected buybacks for the forecasted years. The data is available, but paid databases such as CapIQ and Bloomberg store it. If the appropriate data would be available, then we could avoid assumptions such as the expected growth rate of the buybacks and we could extend the forecast period. These changes would make the sheet more reliable.

In addition, we still see that the estimate significantly changes in some point in time. Although we partially take care of the leaps in time between data reports by interpolation, this still occurs. Figure 27 illustrates these changes in estimates. In practice, the ERP should not change significantly at certain specific dates. This would give the valuator an opportunity to alter the valuation date in such a way that the ERP estimate is convenient for him.

Limitation 2: The use of the AEX Index is debatable from a practical point of view
From the definition of the ERP, it follows that we must use a "market portfolio representative of all assets". However, it is uncertain whether the AEX is a market portfolio representative of all assets. Although it fulfils the requirements drawn up from a theoretical point of view, it does have some drawbacks in practice. For example, the index consists out of 25 companies. This is a limited number in comparison to indices such as the S&P 500 which consists of 500 companies.

In addition, the index might overweight some sectors. For example, ASML has 16.81% of the weight of the total index. The company is active in the Production Technology Equipment sector. The Dutch market does not consist for such a large part out of Production Technology Equipment companies. As a result, the AEX might overweight some sectors relative to the overall Dutch market.

Limitation 3: The limited research validation
The validation shows that the results are quite in line with an ERP estimate that many valuators use, and the sensitivity analysis shows that the effect of the input parameters on the ERP is in line with theory. However, it is rather quick and dirty at the moment. In Section 7.4, we address how we might improve the research validation.

7.3. Recommendations

The main recommendations of the research are to apply the research, and to use a different risk-free rate in the valuation process.

Recommendation 1: Apply the research
We would recommend KWCF to apply the EQD ERP in their day-to-day operations. The company can easily apply the ERP for any firm they have to appraise by applying the Manual input dashboard worksheet.

However, we understand that the company might prefer the use of an established name in the market. In practice, we often see that people do not spend to much time on the details of financial parameters as long as an established name estimates it. An ERP estimate established by a student would need some more explanation. In this scenario, the research still adds value to the company in three ways.

First, we argued in Section 6.1 that the ERP estimate by KPMG is the most appropriate option for the Dutch market out of the premia used in the industry. I therefore recommend the company to apply the KPMG ERP estimate instead of the Damodaran ERP if the company prefers to use an established name.

Second, the research provides the company with valuable insights into the ERP and its estimation process. I thus recommend each employee of KWCF to read the research for their understanding of the premium.

Third, the company may still apply the tool in specific situations. For example, the company can use the tool to act as an extra check on the ERP estimate already used. In addition, the company can use the tool to give some sense of the market when the valuation date does not align with the report date of the used ERP. I therefore recommend the company to apply the tool in these specific situations.

Recommendation 2: Risk-free rate
Even if the company decides not to implement the first recommendation, I still recommend assessing the risk-free rate used as part of the cost of equity. We recommend the use of the same risk-free rate as the rate applied in the calculation of the ERP. Currently, Damodaran uses a risk-free proxy based on the American economy, while the cost of equity of KWCF uses a Dutch government bond. No matter the ERP used, the risk-free rate used in the cost of equity should be the same to the risk-free rate used in the estimation of the ERP.

7.4. Future Research

The possibilities for future research not performed due to a lack of time are related to updating the tool data, the validation of the research, a scenario analysis, and the data availability.

Future research 1: Ensure that the data in the tool updates automatically
Currently, we must perform maintenance to the Dashboard worksheet once in a while to ensure that the data remains relevant. In addition, we must manually insert the data in the Manual input dashboard worksheet. Future research could focus on how we can link the tool to a database so that it automatically updates the data.

Future research 2: Improve the validation of the research
As discussed in Section 7.2, the validation is quite limited. Future research could improve the validation by using other valuation techniques. We could for example schedule interviews with industry experts on the validity of the research.

Future research 3: Conduct a scenario analysis
As discussed in Section 6.2, the input parameters affect the ERP in varying ways. However, these input parameters do not act on their own. Instead, they interact with each other. Future research could apply a scenario analysis to quantify how the ERP behaves in times of economic crisis or economic growth.

Future research 4: Use more data available in the Dashboard worksheet
We can make the tool a bit more reliable when it comes to the data. For example, future research could be on storing all the analyst consensus reports in the Data sheet instead of the sample currently used. Although this takes a significant amount of time, it would improve the reliability of the ERP estimates.

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Appendix I: Definitions of the Equity Risk Premium

- The incremental return over the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks (Duff & Phelps, 2013).
- The return over the risk-free rate that investors required for holding market securities (CFA Institute, 2019).
- The premium demanded by investors for investing in the market portfolio, which includes all risky assets in the market, instead of investing in a riskless asset (Damodaran A. , 2020).
- The expected additional return for making a risky investment rather than a safe one (Brealey, Myers, & Allen, 2014).
- The compensation investors require to make them indifferent at the margin between holding the risky market portfolio and a risk-free bond (Federal Reserve Bank of New York, 2015).
- The (expected or realized) return of a broad equity index in excess over some non-equity alternative (Ilamanen, 2011).

Appendix II: EQD ERP Cell References

Cell reference	Meaning
COE(_Man)	Cost of Equity
Data_2016 … 2020	Table containing the data for the expected dividends + net buybacks for year 2016 … 2020
Date_10	Table column containing the dates for which a 10-year government bond yield is reported
Date_2015 … 2020	31 December 2015 … 2020
Date_30	Table column containing the dates for which a30-year government bond yield is reported
Day(_Man)1 … 5	Number of days passed at valuation date for year 1 … 5
Div_Buy(_Man)1 … 5	Expected dividends + net buybacks for year 1 … 5
Div_Buy_Term(_Man)	Expected dividends + net buybacks for term year
Div_Buy_Tot	Sum of the expected dividends + net buybacks
For_Yea	Number of years to be forecasted
Ind_Par(_Man)	Index price at valuation date
Index_Date	Table column containing the dates for which an index price is reported
Index_Price	Table containing the data for the index price
Inf_Par	Inflation rate at valuation date
Inp_Data	Table containing the data for the inflation rate
Num_Days(_Man)1 … 5	Number of days that year 1 … 5 contains
Num_Days_Sum1 … 2	Summation of the number of days that year 1 … 2 of the Dashboard sheet contains
Pres_Val_Sum	Summation of the present values of the expected dividends + net buybacks
Pres_Val_Tot(_Man)	Present value of the dividends + net buybacks for all years
Rf_Par(_Man)	Risk-free rate at valuation date
Rf_Proxy	Time period chosen to base the risk-free rate on
Val_Date(_Man)	Valuation date
Yield_10	Table containing the data for the 10-year government bond yield
Yield_30	Table containing the data for the 30-year government bond yield

Appendix III: Excel Code

1. Expected dividends + net buybacks for term year (Manual input dashboard, Cell C17)

```
=IF(Div_Buy_Man5<>0;Div_Buy_Man5*(1+Inf_Par_Man);IF(Div_Buy_Man4<>0;Div_Buy_Man4*(1+Inf_Par_Man);IF(Div_Buy_Man3<>0;Div_Buy_Man3*(1+Inf_Par_Man);IF(Div_Buy_Man2<>0;Div_Buy_Man2*(1+Inf_Par_Man);Div_Buy_Man1*(1+Inf_Par_Man)))))
```

The expected dividends + net buybacks for the term year are determined by using an IF function. The function checks whether the user inserted data for the most recent year. If this is the case, then the tool calculates the value by indexing the expected dividends + net buybacks in that year by the inflation rate. If this is not the case, then the function repeats the process for the following year until it finds the value.

2. Present value of expected dividends + net buybacks for year 1 to 5 (Manual input dashboard, Cell D12:D16)

```
=Div_Buy_Man1/(1+COE_Man)^(0+(Num_Days_Man1-Day_Man1)/Num_Days_Man1)
```

We use Equation 17 to calculate the present value of expected dividends + net buybacks for year 1 to 5. The function presented above determines the present value for year 1. The function is quite straight forward, instead for the power function. We need to provide some further explanation about the cell references Num_Days_Man and Day_Man to show how the function works. The tool calculates Num_Days_Man as follows:

```
=DATE(YEAR(AX3);12;31)-DATE(YEAR(AX3);1;1)+1
```

This function determines the number of days that the current year exists of. This is necessary as once every four years, a leap year occurs. Instead of 365 days, the year exists out of 366 days in this case. The tool calculates Day_Man as follows:

```
=AX3-DATE(YEAR(AX3);1;0)
```

This function determines the current day of the year. The tool calculates both Num_Days_Man and Day_Man each year so that it applies the right partial-year discounting.

3. Present value of expected dividends + net buybacks for term year (Manual input dashboard, Cell D17)

```
=IF(For_Yea=1;Div_Buy_Term_Man/((COE_Man-Rf_Par_Man)*(1+COE_Man)^((For_Yea-1)+(Num_Days_Man1-Day_Man1)/Num_Days_Man1));IF(For_Yea=2;Div_Buy_Term_Man/((COE_Man-Rf_Par_Man)*(1+COE_Man)^((For_Yea-1)+(Num_Days_Man2-Day_Man2)/Num_Days_Man2));IF(For_Yea=3;Div_Buy_Term_Man/((COE_Man-Rf_Par_Man)*(1+COE_Man)^((For_Yea-1)+(Num_Days_Man3-
```

Day_Man3)/Num_Days_Man3));IF(For_Yea=4;Div_Buy_Term_Man/((COE_Man-Rf_Par_Man)(1+COE_Man)^((For_Yea-1)+(Num_Days_Man4-Day_Man4)/Num_Days_Man4));Div_Buy_Term_Man/((COE_Man-Rf_Par_Man)*(1+COE_Man)^((For_Yea-1)+(Num_Days_Man5-Day_Man5)/Num_Days_Man5))))))*

The reason for this function is similar as the one for Function 1. The present value of the expected dividends + net buybacks for the term year must be based on the last year for which the tool forecasts the expected dividends + net buybacks. The function checks whether the user inserted data for the most recent year. If this is the case, then the tool calculates the value by indexing the expected dividends + net buybacks in the last year for which the user reported data by the cost of equity to the right power. If this is not the case, then the tool repeats the process for the following year until it finds the value.

4. Solver tool

Figure 32 is a screenshot of the Solver tool in Excel.

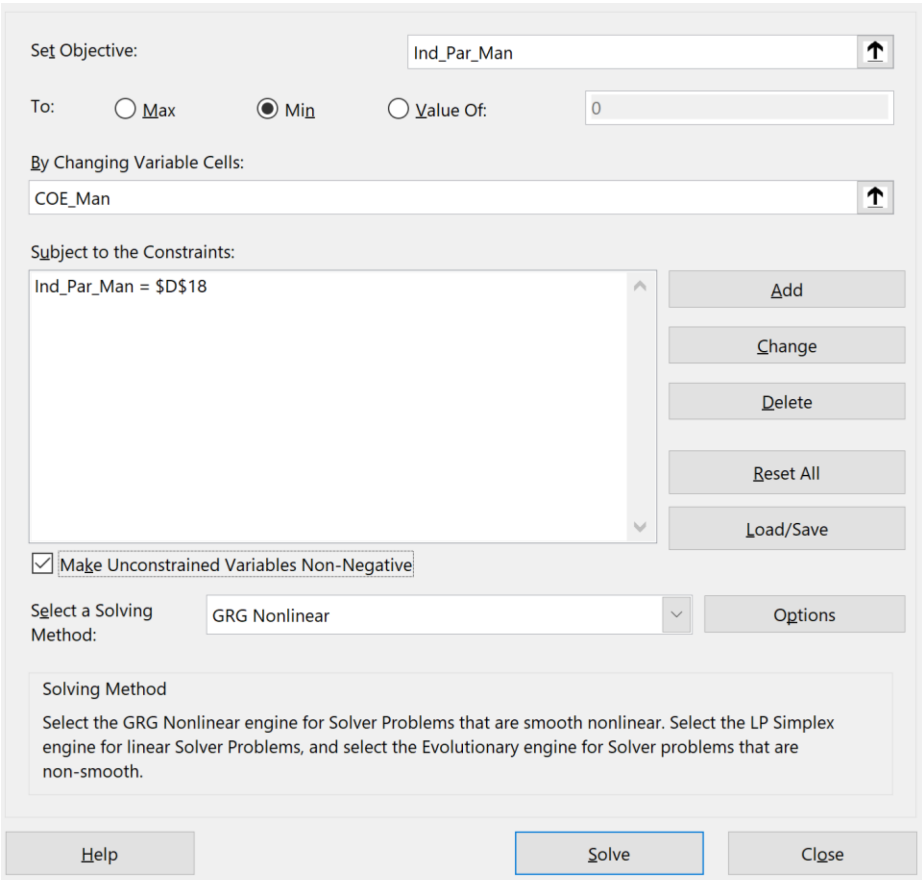

Figure 32: Solver tool

The set objective is the value that the equation must equal. In our case, this is the index price which the tool stores in Cell "Ind_Par". The solver tool approaches the objective by altering Cell "COE", which is the cost of equity. The tool may only reach the objective under the constraint that the left-side of the equation equals the right-side of the equation. It does so by adding the constraint Cell "Ind_Par" = Cell "Pres_Val_Sum". By solving this equation, the solver tool calculates the cost of equity.

5. Finding the correct non-calculation data (Dashboard, Cell G4:G6)

=IF(COUNTIF(Index_Date;Val_Date)>0;VLOOKUP(Val_Date;Index_Price;2;FALSE);IF(COUNTIF(Index_Date;Val_Date-1)>0;VLOOKUP(Val_Date-1;Index_Price;2;FALSE);IF(COUNTIF(Index_Date;Val_Date-2)>0;VLOOKUP(Val_Date-2;Index_Price;2;FALSE);VLOOKUP(Val_Date-3;Index_Price;2;FALSE))))

Based on the valuation date, an IF function determines the current year. Then, a VLOOKUP function searches for the index price corresponding to the valuation date on the Data worksheet.

To solve the problem that data does not report the index price every single day, the VLOOKUP uses the most recent historic value. The function checks whether a value is available for the valuation date, and if this is not the case, then the function searches the most recent historic day etcetera. Since the largest gap in data is four days, the function must at most search for the correct value four times.

=IF(Rf_Proxy="10 years";IF(COUNTIF(Date_10;Val_Date)>0;VLOOKUP(Val_Date;Yield_10;2;FALSE);IF(COUNTIF(Date_10;Val_Date-1)>0;VLOOKUP(Val_Date-1;Yield_10;2;FALSE);IF(COUNTIF(Date_10;Val_Date-2)>0;VLOOKUP(Val_Date-2;Yield_10;2;FALSE);VLOOKUP(Val_Date-3;Yield_10;2;FALSE))));IF(COUNTIF(Date_30;Val_Date)>0;VLOOKUP(Val_Date;Yield_30;2;FALSE);IF(COUNTIF(Date_30;Val_Date-1)>0;VLOOKUP(Val_Date-1;Yield_30;2;FALSE);IF(COUNTIF(Date_30;Val_Date-2)>0;VLOOKUP(Val_Date-2;Yield_30;2;FALSE);VLOOKUP(Val_Date-3;Yield_30;2;FALSE)))))

First, the tool uses an IF function to determine whether the tool must search for the yield on a 10- or a 30-year government bond. Then, the tool finds the risk-free rate corresponding to the valuation date through a VLOOKUP function. The same data problem related to the index price occurs when determining the risk-free rate. The tool uses the same solution to overcome this issue.

=VLOOKUP(Val_Date;Inp_Data;2;FALSE)

Because of the use of linear interpolation, the tool can use a simple VLOOKUP to determine the inflation rate.

6. Finding the correct calculation input data (Dashboard, Cell C10:C13)

*=IF(Val_Date<=Date_2016;((Num_Days1-Day_1)/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2016;4;FALSE)+(Day_1/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2017;4;FALSE);IF(Val_Date<=Date_2017;((Num_Days1-Day_1)/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2017;4;FALSE)+(Day_1/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2018;4;FALSE);IF(Val_Date<=Date_2018;((Num_Days1-Day_1)/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2018;4;FALSE)+(Day_1/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2019;4;FALSE);IF(Val_Date<=Date_2019;((Num_Days1-Day_1)/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2019;4;FALSE)+(Day_1/Num_Days1)*VLOOKUP(Val_Date+Num_Days_Sum1;Data_2020;4;FALSE);VLOOKUP(Val_Date+Num_Days_Sum1;Data_2020;4;FALSE)))))*

The function above seems difficult due to its extensiveness, but it is not that hard to understand. The function above applies the code to the first year but is conceptually the same for year 2. First, the function determines which table it should search. Once the function establishes this, it finds the appropriate value through the VLOOKUP function. The tool calculates Num_Days_Sum for year 2 by:

=Num_Days1+Num_Days2

This function determines how many days are between the valuation date and the date at hand for which it must find the value. Once it established the appropriate values, it applies Equation 21 as discussed in Section 5.3.3. The following function determines the appropriate value for the third and final year.

=IF(Val_Date<=Date_2016;VLOOKUP(Date_2016+Num_Days_Sum3;Data_2016;4;FALSE);IF(Val_Date<=Date_2017;VLOOKUP(Date_2017+Num_Days_Sum3;Data_2017;4;FALSE);IF(Val_Date<=Date_2018;VLOOKUP(Date_2018+Num_Days_Sum3;Data_2018;4;FALSE);IF(Val_Date<=Date_2019;VLOOKUP(Date_2019+Num_Days_Sum3;Data_2019;4;FALSE);VLOOKUP(Date_2020+Num_Days_Sum3;Data_2020;4;FALSE)))))

In the third year, the tool does not use Equation 21. Instead, a VLOOKUP searches for the final date of the appropriate year.

Appendix IV: VBA Code

1. Show/hide rows

```
Sub HideRows()

Dim X As Integer
Dim Y As Integer

X = 4 - Sheets("Manual input dashboard").Range("D8").Value
Sheets("Manual input dashboard").Rows("1:25").EntireRow.Hidden = False

For Y = 0 To X
   Sheets("Manual input dashboard").Rows(16 - Y).EntireRow.Hidden = True
Next Y

End Sub
```

This sub hides or shows rows if the user changes the number of forecast years. We did not link the code to a button. Instead, each time that the value changes, the tool calls the macro so that the user does not have to apply unnecessary steps.

2. Estimate Equity Risk Premium

```
Sub CalculateMarketRiskPremium()

   SolverOk SetCell:="$G$4", MaxMinVal:=2, ValueOf:=0, ByChange:="$G$12",
Engine:= _
      1, EngineDesc:="GRG Nonlinear"
   SolverSolve UserFinish:=True

End Sub
```

This VBA code calls the Solver tool as described in Appendix III, Function 4. We linked it to the Calculate Equity Risk Premium button so that user does not have to apply the Solver tool manually.

3. Equity Risk Premium Simulation

```
Sub Simulation()
Dim D As Date
Dim X As Integer

Application.ScreenUpdating = False
Sheets("Dashboard").EnableCalculation = True
Sheets("Dashboard").Select

Sheets("Results").Cells.Clear
Sheets("Results").Range("A1").Value = "Date"
Sheets("Results").Range("B1").Value = "Market Risk Premium"

D = "29/12/2015"
Sheets("Dashboard").Range("D4") = D + 2
For X = 2 To 1463
   Sheets("Dashboard").Range("D4").Value = D + X
   SolverOk SetCell:=Sheets("Dashboard").Range("G4"), MaxMinVal:=2, ValueOf:=0,
ByChange:=Sheets("Dashboard").Range("G12"), Engine:= _
      1, EngineDesc:="GRG Nonlinear"
   SolverSolve UserFinish:=True
   Sheets("Results").Cells(X, 1).Value = Sheets("Dashboard").Cells(4, 4).Value
   Sheets("Results").Cells(X, 1).NumberFormat = "DD-MM-YY"
   Sheets("Results").Cells(X, 2).Value = Sheets("Dashboard").Cells(14, 7).Value
   Sheets("Results").Cells(X, 2).NumberFormat = "0.00%"
Next X

Application.ScreenUpdating = True
Sheets("Results").Select
Range("A1:B1").Interior.Color = RGB(35, 64, 143)
Range("A1:B1").Font.Color = vbWhite
Range("A1:B1").Font.Bold = True
Range("B1:B1463").Borders(xlEdgeRight).LineStyle = XlLineStyle.xlContinuous
Range("A1463:B1463").Borders(xlEdgeBottom).LineStyle = XlLineStyle.xlContinuous
Range("A1:A1463").NumberFormat = "mm/dd/yyyy"
Range("A1:B1463").Font.Name = "Century Gothic"
Range("A1:B1463").Font.Size = 10
Range("A2:A1463").HorizontalAlignment = xlLeft
Range("B1").HorizontalAlignment = xlRight

End Sub
```

The simulation starts by deleting the content on the worksheet. Then, the simulation changes the valuation date the first date for which data is available to calculate the ERP, 31-12-2015. Next, the solver tool determines the EQD ERP estimate for the current valuation date. The code then copies the date and the EQD ERP estimate to the corresponding cells on the Simulation worksheet. It repeats this process for all the valuation dates until it reaches the date of 31-12-2019. Finally, the code fixes the layout of the worksheet.

4. Input Parameter Simulation

```
Sub SimulateIndexPrice()
Dim X As Integer
Dim Y As Integer
Dim Min As Integer
Dim Max As Integer

Application.ScreenUpdating = False
Sheets("Manual input dashboard").EnableCalculation = True
Sheets("Manual input dashboard").Select

Sheets("Manual input dashboard").Range("D4").Value = "31-12-2019"
Sheets("Manual input dashboard").Range("D5").Value =
Sheets("Simulation").Range("B2").Value
Sheets("Manual input dashboard").Range("D6").Value =
Sheets("Simulation").Range("C2").Value
Sheets("Manual input dashboard").Range("D7").Value =
Sheets("Simulation").Range("D2").Value

Sheets("Simulation").Range("F1:G1463").Clear
Sheets("Simulation").Range("F1").Value = "Index Price"
Sheets("Simulation").Range("G1").Value = "Market Risk Premium"

Max = Sheets("Simulation").Range("B3").Value
Min = Sheets("Simulation").Range("B4").Value
Y = 100

For X = 0 To Y
   Sheets("Manual input dashboard").Range("D5").Value = Min + (0.01 * X) * (Max -
Min)
   SolverOk SetCell:=Sheets("Manual input dashboard").Range("D5"), MaxMinVal:=2,
ValueOf:=0, ByChange:=Sheets("Manual input dashboard").Range("D21"), Engine:=
_
      1, EngineDesc:="GRG Nonlinear"
   SolverSolve UserFinish:=True
   Sheets("Simulation").Cells(X + 2, 6).Value = Sheets("Manual input
dashboard").Cells(5, 4).Value
   Sheets("Simulation").Cells(X + 2, 7).Value = Sheets("Manual input
dashboard").Cells(23, 4).Value
   Sheets("Simulation").Cells(X + 2, 7).NumberFormat = "0.00%"
Next X

Application.ScreenUpdating = True
Sheets("Simulation").Select
Range("F1:G1").Interior.Color = RGB(35, 64, 143)
Range("F1:G1").Font.Color = vbWhite
Range("F1:G1").Font.Bold = True
Range("F1:F102").Borders(xlEdgeLeft).LineStyle = XlLineStyle.xlContinuous
Range("G1:G102").Borders(xlEdgeRight).LineStyle = XlLineStyle.xlContinuous
Range("F102:G102").Borders(xlEdgeBottom).LineStyle = XlLineStyle.xlContinuous
```

```
Range("F1:G102").Font.Name = "Century Gothic"
Range("F1:G102").Font.Size = 10
Range("F2:F102").HorizontalAlignment = xlLeft
Range("G1").HorizontalAlignment = xlRight

End Sub
```

This macro simulates the different input parameters for a range of values. The example applies the code above to the index price, but the simulation applies the same concept to all other parameters. The simulation starts by deleting the content in the cells. Then, it resets the input parameters to the average values so that the results are comparable. Next, the minimum and maximum are determined so that it knows the simulation range. It then copies the date and the EQD ERP estimate to the corresponding cells on the Simulation worksheet. It repeats this for all the index prices until it reaches the final price. Finally, it fixes the layout of the worksheet.