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Bottom-up macro exposures and relation to expected returns

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TIIVISTELMÄ:
This thesis will review the relationship between macroeconomic risk and expected returns based on the previous asset pricing literature. Classical research has been based largely on aggregated macroeconomic variables and so-called top-down approaches, which cannot always identify differences between companies on the macroeconomic exposures.

In the central part of the thesis are bottom-up exposures, where macroeconomic risk is examined through firm-level qualities, factor-based portfolios, and return-based measures. The reviewed literature suggests that firms that are more sensitive to unfavorable macroeconomic circumstances gain higher expected returns on average as compensation for bearing systematic risk. In addition, macroeconomic exposures fluctuate significantly between industries and firms, and their significance is highlighted especially in economic uncertainties.

According to the literature, bottom-up approaches complement traditional asset pricing models by offering a more precise and flexible way to review how macroeconomic risk is shown in expected returns on a firm-level.

AVAINSANAT: asset pricing, expected returns, macroeconomic risk, bottom-up exposures

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TIIVISTELMÄ:
Tässä tutkimuksessa tarkastellaan makrotaloudellisen riskin ja odotettujen osaketuottojen välistä suhdetta olemassa olevaa omaisuuserien hinnoittelua koskevan kirjallisuuden perusteella. Perinteinen tutkimus on nojannut paljolti aggregoituihin makrotaloudellisiin muuttujiin ja ylhäältä alas -lähestymistapoihin, jotka eivät välttämättä kykene havaitsemaan merkityksellisiä eroja yritysten makrotaloudellisessa altistumisessa.

Tutkielma keskittyy alhaalta ylös -lähestymistapaan makrotaloudellisten altistumien mittaamisessa, jossa makrotaloudellinen riski päätellään yritystason ominaisuuksista, faktoriperusteisista salkuista sekä tuottoihin perustuvista mittareista. Tarkasteltu kirjallisuus viittaa siihen, että yritykset, joiden altistuminen epäedullisille makrotaloudellisille olosuhteille on suurempaa, saavuttavat korkeampia odotettuja tuottoja kompensaationa systemaattisesta riskistä. Lisäksi makrotaloudelliset altistumiset vaihtelevat yritysten ja alojen välillä ja korostuvat erityisesti taloudellisen stressin aikana.

Kokonaisuutena tulokset osoittavat, että alhaalta ylös -lähestymistavat täydentävät perinteisiä omaisuuserien hinnoittelumalleja tarjoamalla yksityiskohtaisemman ja joustavamman viitekehyksen makrotaloudellisen riskin heijastumisen ymmärtämiseksi odotettuihin osaketuottoihin.

AVAINSANAT: asset pricing, expected returns, macroeconomic risk, bottom-up exposures

Sisällys

1 Introduction

Expected returns are an essential part of asset pricing because they represent compensation investors receive for bearing risk. In particular, understanding why expected returns differ across assets has been a central question in asset pricing research. A large body of research has documented persistent cross-sectional differences in expected returns and examined their relationship to risk exposures (Harvey et al., 2015).

Macroeconomic conditions are often considered an important source of systematic risk that may help explain these cross-sectional differences. Changes in macroeconomic conditions, such as inflation, influence firms' profitability and investment opportunities, as well as investors' expectations about future returns. For this reason, much of the existing literature has examined the relationship between macroeconomic factors and expected returns, using top-down measures of the economy as aggregates. Harvey et al. (2015) note that this method has provided valuable insights; aggregate macroeconomic variables may mask important differences across firms and may not fully capture how macroeconomic risk is reflected at the firm level.

In response to these limits, more recent research has gradually shifted towards firm-level approaches to measuring macroeconomic risk. Rather than relying directly on aggregate macroeconomic variables, this kind of research infers macroeconomic exposures from firm-level characteristics and asset returns (Kelly et al., 2019). These kinds of bottom-up approaches aim to capture heterogeneity in macroeconomic risk across firms and to provide a more detailed view of how macroeconomic conditions are reflected in expected stock returns (Gu et al., 2020).

Firm-level measures of macroeconomic exposure also have practical relevance for investors. Understanding how individual firms are exposed to macroeconomic risk can, for example, portfolio construction, risk management, and the targeting of specific macroeconomic exposures. This has made bottom-up macro exposure approaches relevant for institutional investors, such as pension funds and asset managers, like Elo,

who seek to manage macroeconomic risks more precisely at the portfolio level (Esakia & Goltz, 2023).

1.1 Purpose of The Study

The purpose of this thesis is to examine how bottom-up macro exposures are related to expected stock returns. This focus is on firm-level approaches to measuring macroeconomic risk and on their relevance for explaining differences in expected returns across firms. The thesis is conducted as a literature review and does not include original empirical analysis. Instead, it builds on and synthesizes findings from the existing asset pricing literature.

In traditional asset pricing theory, expected returns are explained as compensation for bearing systematic risk. If bottom-up macro exposures reflect firms' sensitivities to underlying macroeconomic risks, it's reasonable to expect that investors require a risk premium for holding firms with higher exposures. Previous studies suggest that firm-level characteristics and factor-based portfolio constructions can be used to capture such macroeconomic risks at the firm level (Kelly et al., 2019). Based on this, we can form our first hypothesis:

H1: Firms with higher bottom-up macro exposures gain higher expected stock returns.

However, macroeconomic conditions do not affect all companies equally. Companies that operate in different industries are exposed to, for example, business cycles, inflation, and interest rates in different ways. Because of these, macro exposures and their pricing may exhibit significant differences based on industries. From this, we can make our second hypothesis:

H2: The relationship between bottom-up macro exposures and expected stock returns differs across industries.

Macroeconomic risk pricing may also change over time. During periods of high inflation, financial crisis, or other macroeconomic shocks, investors' idea of risk may change significantly. In situations like this, the importance of macroeconomic risk in asset pricing may be highlighted, thereby strengthening the connection between macro exposures and expected returns. Based on this, we can make our third hypothesis:

H3: The relationship between bottom-up macro exposures and expected stock returns is stronger during periods of heightened macroeconomic uncertainty.

The hypotheses serve as the structural basis for the thesis's literature review. The thesis doesn't test the hypotheses empirically, but reviews how the previous research supports or challenges them and what similarities, differences, or restrictions there may be in the literature.

1.2 Structure of The Study

After an introduction and a research goal, Chapter 2 examines how macroeconomic conditions are related to expected stock returns in the asset-pricing literature. The chapter will first introduce essential macroeconomic indicators, after which the chapter will investigate the role of macro exposures in asset pricing and previous research about the connection between macroeconomic risk and expected return.

In chapter 3, the perspective will move from aggregated top-down perspectives to a review of bottom-up perspectives. The chapter will handle the concept of bottom-up macro exposures and how factor models, portfolio structures, and company-specific qualities may describe the macro sensitivities of companies. In addition, the chapter will review the empirical research regarding the topic.

Chapter 4 will combine the literature review's central findings and will review what the previous research as a whole talks about the relationship between the bottom-up macro exposures and expected returns. Moreover, the chapter will review the practical effects on investors, the limitations of research, and a possible research topic for the future.

The last chapter will present the thesis's conclusion by consolidating the key findings and reviewing their significance from the perspective of investors and institutional portfolios.

2 Macroeconomic Factors and Expected Returns

Macroeconomic conditions are usually held as a significant source of systematic risk in asset pricing, because they affect the economic environment in which corporations operate, and investors form expectations about future returns. Expected returns are typically viewed as compensation for bearing systematic risk, which creates a natural connection between macroeconomic fluctuations and asset prices (Harvey et al., 2015). Fluctuations in macroeconomic conditions may influence expected returns, for example, cash flows, discount rates, and general economic uncertainty (Bansal & Yaron, 2004).

In previous research, this connection has been reviewed primarily through aggregated top-down approaches, where macroeconomic variables are compared with market- or portfolio-level returns (Ludvigson et al., 2007). This chapter will review the research literature, and it will create a foundation for the bottom-up approach, which will be reviewed later in the chapters.

2.1 Overview of Key Macroeconomic Indicators

Macroeconomic indicators have a central role in asset pricing research because they provide information about the systematic risk investors face. In the literature on expected returns, these indicators are used to describe broad economic circumstances, which affect different assets simultaneously rather than firm-specific risk (Harvey et al., 2015). Because of this, macroeconomic variables have been utilized broadly in theoretical and empirical research to explain differences in expected returns.

From an asset pricing perspective, macroeconomic indicators are especially significant because they reflect changes in economic activity and financial conditions, which affect firms' future cash flows and discount rates (Bansal & Yaron, 2004). Ludvigson et al. (2007) conclude that empirical research has proven that combinations of several macroeconomic variables serve as a useful measure of systematic risk, which are linked to expected returns in different asset classes. Instead of an individual variable, research

reviews multiple different indicators simultaneously to get a wider picture of the economic state.

The thesis will concentrate on three different macroeconomic indicators: GDP, inflation and interest rates. These variables picture different dimensions of the macroeconomic risk, and their connection to expected returns has been studied in previous research.

2.1.1 GDP

Gross domestic product (GDP) is a central macroeconomic measure because it describes the general activity of the economy and the development of production. Research considering asset pricing, GDP growth has been often used to depict economic environments, which affects firm's future cash flows, investments and general development of financial markets. A slowing down of the economic growth or uncertainty regarding it may reflect on firms' return expectations and, in that way, also in risk premia required by investors.

Bansal & Yaron (2004) especially highlight the importance of uncertainty related to long-term economic growth in asset pricing. According to their long-run risk models, changes in expected economic growth and economic uncertainty also affect investors required returns even in the long-run. Also, Ludvigson et al. (2007) point out that macroeconomic variables include information, which is connected to expected returns changes in the financial markets.

Empirical research points out that variables related to economic growth are related to expected returns and risk premia. For example, Ludvigson et al. (2007) noticed that variables that describe the activity of the real economy explain the variation in expected returns across different assets. In addition, research scores suggest that stock markets react to news regarding economic growth, which supports the view that information regarding economic growth is priced in the markets (Savor & Wilson, 2014). Based on

these observations, GDP growth can be considered a useful measure of cyclical risk in asset pricing.

2.1.2 Inflation

Inflation measures the change in the general price level over time, and it is a great source of macroeconomic risk in the financial markets. Inflation influences investors, especially because it changes the value of future cash flows and the purchasing power of investments. Because of this, inflation plays an important role in research on expected returns (Ang et al., 2007).

From an asset pricing point of view, inflation may influence expected returns through multiple mechanisms. Higher inflation often relates to higher discount rates, which may reduce the present value of future cash flows. Unexpected inflation may also weaken companies' real profitability and increase economic uncertainty. In long-term risk models, inflation is considered an essential component of macroeconomic risk, for which investors demand compensation (Bansal & Yaron, 2004).

Empirical research supports the view that variables related to inflation are priced in the financial markets. Ludvigson et al. (2007) point out that macro variables describing price development help to explain the difference in expected returns. In addition, stock prices have been shown to react to news about inflation (Savor & Wilson, 2014). Based on these findings, inflation may be held as a systematic risk factor that is relevant to expected returns.

2.1.3 Interest Rates

Interest rates describe the price of borrowed money and the return on riskless or low-risk investments, which is why they play a central role in financial markets. In asset pricing, interest rates are directly related to discount rates, which are used to value future cash flows. Because of these changes in interest rates, expected returns are also affected (Ang & Piazzesi, 2003).

Generally, higher interest rates lift the discount rates, which may reduce the present value of future cash flows, and it may also weaken stock valuations. A low-interest environment, on the other hand, is often related to easier financial conditions and lower yield requirements. Thus, changes in interest rates affect expected returns through both discount rates and general financial conditions (Bansal & Yaron, 2004).

Empirical research indicates that discount rates and other financial policy-related variables are associated with expected returns and macroeconomic risk. Ludvigson et al. (2007) noticed that variables describing financial conditions explain the changes in risk premia. In addition, more recent research points out that real-time interest rates and macroeconomic information help predict interest rates and other assets (Huang et al., 2022). Based on these observations, interest rates can be held as an important measure of financial policies and economic cycles.

2.2 Macroeconomic Variables in Asset Pricing Theory

Asset pricing theory strives to explain why expected returns differ between assets and how these differences link to systematic risk. Expected returns are generally seen as compensation for the risk that cannot be diversified away. Because of these risks, that affect simultaneously to a wide group of assets, are especially significant in explaining differences in expected returns (Bali et al., 2016, ch. 1). Macroeconomic risks are usually seen as these systematic risk factors, because they affect multiple companies at the same time.

Bansal & Yaron (2004) highlight that macroeconomic risk is especially important, when it affects long run expectations of economic growth and uncertainty. Macroeconomic fluctuations don't affect asset prices directly, but their effect is mediated through economic mechanisms that shape both cash flows and discount rates. When the economic outlook weakens, or uncertainty grows, investors generally demand higher expected returns as compensation for the increased systematic risk.

Macroeconomic risk influences expected returns through multiple channels. One of the most important channels is discount rates because changes in the economic conditions affect both the risk-free rates and risk premia required by investors. In addition, macroeconomic changes reflect companies' cash flows through, for example profitability, investment opportunities and general economic cycles. Because these economic conditions can affect simultaneously both firms' future results and the interest at which future cash flows are valued (Ludvigson et al., 2007).

Even though macroeconomic variables have a central position in theory, considering asset pricing, their use in empirical research faces several challenges. Harvey et al. (2015) point out that aggregated macroeconomic variables are published often seldom, with delays and are also a subject to after publication revision. This makes it harder to use them especially in models that aim to explain changes in the financial markets in real time. In addition, aggregated measures cannot always describe differences between companies in macroeconomic exposure.

Pastor (2000) points out that in asset pricing, macroeconomic risk doesn't need to be described solely by observable macro variables. The same underlying economic risks can also be described through alternative model structures, such as through factor models or return-based portfolios. In this context, macro variables work as a theoretical foundation to understand systematic risk, even though they wouldn't be used directly in empirical models. This helps to explain why empirical research often utilizes indirect measures of macro risk instead of macro variables.

2.3 Empirical Evidence on Macroeconomic Risk and Expected Returns

Empirical research offers abundant evidence that macroeconomic conditions are related to expected returns in different financial markets. Early studies found that exposure to general economic fluctuations is reflected in risk premia, suggesting that macroeconomic risk is priced in financial markets (Shanken & Weinstein, 2006).

A significant portion of the literature focuses on macroeconomic risk that involves economic growth. Bansal & Yaron (2004) examine, that assets, which are exposed to unfavourable long time economic circumstances, offer higher expected returns as compensation for bearing systematic risk. Similar research findings suggest that sensitivity to economic downturns and long-lasting growth shocks is a key factor in explaining return differences between assets.

Macroeconomic variables related to inflation and monetary policy have also been found to affect expected returns. Inflation influences firms' real-time cash flows and discount rates, while changes in interest rates reflect both monetary policies and general financial circumstances. Empirical research shows that inflation and interest rate fluctuations are related to systematic changes in the stock and interest markets' risk premia (Ludvigson et al., 2007). Furthermore, in fixed income markets, real-time macroeconomic information has been found to contain predictive value for future returns, which highlights the importance of macroeconomic conditions in asset pricing (Huang et al., 2022).

In addition to changes in macroeconomic levels, asset prices also react to macroeconomic news and unexpected shocks. Savor & Wilson (2014) noticed that market reactions to macroeconomic publications aren't symmetrical, which refers that, changes in the investors' expectations affect significantly to forming of risk premia. With this said, not only actual macroeconomic changes are relevant, but also changes in expectations have an important effect from the expected returns standpoint.

While the empirical literature generally supports the role of macroeconomic risk in explaining expected returns, the findings vary remarkably depending on the methods and the type of macroeconomic measures used. The study made by Bansal & Yaron (2004) on the long-run risk models emphasizes persistent economic growth and uncertainty as key factors of expected returns. On the other hand, many other studies focus on short-term macroeconomic fluctuations and news announcements (Savor & Wilson, 2014). This distinction highlights that different dimensions of macroeconomic risk may be priced in different ways across financial markets.

In addition, there is an important distinction between time-series and cross-sectional approaches. Time-series studies examine how changes in macroeconomic conditions affect aggregate market returns over time, while cross-sectional studies focus on whether differences in macroeconomic exposure can explain variation in expected returns across assets at a given point in time. Evidence suggests that macroeconomic variables tend to have stronger explanatory power in the cross-section than in short-term return predictability. This highlights the differences in how macroeconomic risk is reflected in asset prices (Harvey et al., 2016).

These differences indicate that macroeconomic risk is a comprehensive concept that may not be fully captured by any single empirical approach. Instead, the relationship between macroeconomic conditions and expected returns appears to depend on how macroeconomic risk is defined, measured, and incorporated into asset pricing models.

Empirical studies differ in whether they emphasize time-series or cross-sectional evidence. Ludvigson et al. (2007) study how changes in aggregate macroeconomic conditions are related to movements in asset returns over time. In contrast, other studies focus on whether differences in macroeconomic exposure help explain return variation across assets at a given point in time. Evidence suggests that macroeconomic risk factors are more consistently related to the cross-section of expected returns than

to short-term market timing, emphasizing their relevance for explaining persistent differences in expected returns across assets (Harvey et al., 2016).

The research literature supports quite extensively the idea that macroeconomic risk has a role in explaining expected returns, but results of the research are not always in line. The differences are largely related to the types of methods and macroeconomic measures that researchers use. Bansal & Yaron (2004) emphasize long-run risk in their model, especially for long-term economic growth and uncertainty. On the other hand, part of the research is focused more on the short-term economic cycles and the effects of macroeconomic news on financial markets (Savor & Wilson, 2014). This suggests that macroeconomic risk is not always shown in the markets as a uniform phenomenon, but its effects can depend on the used perspective.

The literature also highlights the difference between time-series and cross-sectional approaches. Time-series research usually focuses on how changes in the macroeconomic conditions affect market returns over time. The cross-sectional research, on the other hand reviews, do differences in the macroeconomic exposures of firms or assets explain differences in expected returns. Harvey et al. (2016) exhibit that macroeconomic variables often seem to explain cross-sectional differences better than short-term market returns. This suggests that macroeconomic risk is reflected in asset prices differently depending on whether returns are viewed over time or across assets.

Based on these results, macroeconomic risk is seen as a wide and multidimensional concept. A single empirical approach may not be able to describe it fully. The link between macroeconomic conditions and expected returns appears to be dependent on how macroeconomic risk is defined, measured, and incorporated into asset pricing models.

3 Bottom-up Macro Exposures

In the previous chapter, macroeconomic risk was reviewed mainly from the top-down perspective, where attention was focused on aggregated macroeconomic variables. However, an alternative approach that shifts attention to the firm-level has also become common in asset pricing research. Instead of reviewing macroeconomic risk directly through variables that describe the whole economy, research aims to identify the risk through corporate qualities, returns, and portfolio behavior. This development reflects the interest in how wide economic risks are shown in different ways in a single firm and asset classes.

The idea of bottom-up macro exposures is that corporate-level data can reveal hidden sensitivities to macroeconomic environments. Kelly et al. (2019) show that corporate qualities are closely related to underlying economic risks, which suggests that macroeconomic exposures can be identified without direct macro variables. At the same time, Gu et al. (2020) noticed that corporate-level signals contain information about systematic risk, which helps to explain expected returns.

Bottom-up approaches complement traditional macro-based models by enabling the examination of macroeconomic risk at a significantly more detailed level. By utilizing the cross-sectional differences between companies, these methods can notice differences in macro exposures, which are easily hidden in aggregated analyses (Harvey et al., 2016). From the practical standpoint, corporate-level macro exposures have been noticed to be useful also in portfolio construction and risk management, especially for institutional investors, who seek to target their investments to specific macroeconomic risks (Esakia & Golts, 2023).

This chapter will review central approaches to identifying bottom-up macro exposures. The focus is on factor models, portfolio structures, and firm-specific qualities. These perspectives will help to form a comprehensive picture of how firm-specific macro exposures relate to expected returns.

3.1 Concept and Motivation for Bottom-up Macro Exposures

Bottom-up macro exposures refer to an approach to asset pricing in which companies' exposure to macroeconomic risk is assessed based on company-level information instead of using directly aggregated macroeconomic variables. This perspective doesn't connect expected returns straight to, for example, GDP growth or inflation, but attention is focused on how macroeconomic risks are shown in firms' qualities, returns, and factor sensitivities. A key idea is that macroeconomic risk can be reflected at the firm-level, even though it can't be directly observed in aggregated macro data (Kelly et al., 2019).

Macroeconomic conditions do not affect every firm in the same way. Differences in, for example, business models, cost structures, and dependence on economic cycles mean that companies' responses to the same economic environment can vary considerably. Because of this, changes in profitability, investment opportunities and financial restrictions are shown in different ways in different firms. Gu et al. (2020) state that firm-specific characteristics and return development can consequently act as indirect measures of macroeconomic risk and highlight variability that isn't necessarily shown at aggregated markets.

These differences across firms can be linked to economic mechanisms hidden underneath. For example, companies who operate in cyclical industries are usually more sensitive to changes in demand, and their cash flows react more strongly to economic cycles. The business of firms that operate in defensive industries, on the other hand, is more stable despite the economic fluctuations. Giglio et al. (2016) point out, that exposure to general economic risk differs remarkably between corporations and it shows in the expected returns.

Another important factor has to do with the cost structure of firms. Companies with high operative leverage, may experience big changes in profitability, when return fluctuates, which increases their sensitivity to macroeconomic changes. These kinds of differences help to explain, why otherwise same kind of firms may react very differently to the same economic shock.

The financial structure of companies also matters. Companies who are more dependent on external financing or who have a lot of debt, are often more sensitive to changes in interest rates and financial conditions. He (2017) highlights especially how financial market intermediaries and financial constraints affect how macroeconomic shocks are transmitted to firms and different assets.

To understand corporate-level heterogeneity it is useful to review the wider risk field, that affects firms' exposure to uncertainty. In addition to macroeconomic changes, companies are affected by, for example, political, operational, financial, and external risks, which can together transform how economic shocks are transmitted to corporations. From an asset pricing view, all these risks aren't as relevant because expected returns should primarily reflect systematic risks that cannot be diversified away.

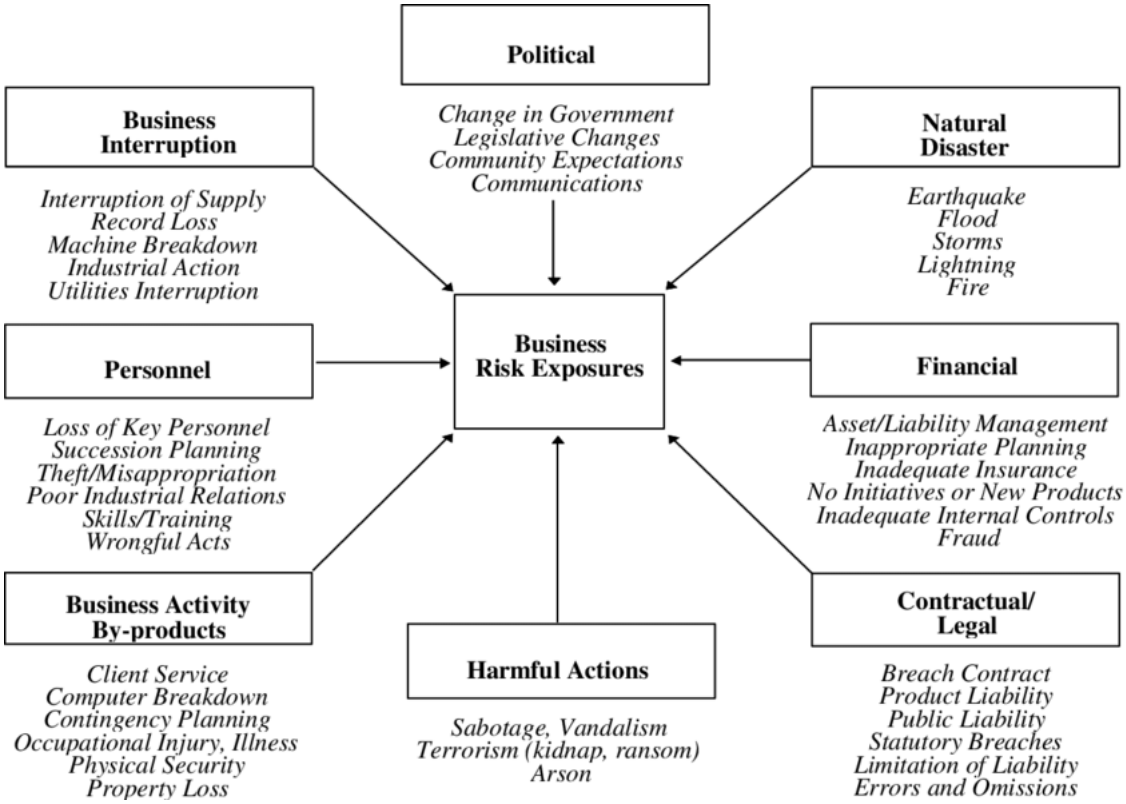

Figure 1 Company risk exposure

Figure 1 provides a conceptual overview of the multiple risk categories that contribute to firm-level risk exposure. Even though figure contains operative, legal, financial and external risks, all of them are not directly relevant to asset pricing. This thesis will focus especially on macroeconomic risk as a systematic riskfactor, that affects companies' cash flows and discount rates.

The purpose is therefore not to analyze single operational or management risks, but to focus on how macroeconomic conditions are shown on firms' results and market-based measures. This way, the focus is on systematic and financially significant risks that may be reflected in expected returns. The role of the figure is, above all, to illustrate why the research focuses specifically on macroeconomic risk as part of a broader corporate risk complex.

Traditional top-down approaches are usually based on aggregated macroeconomic variables to explain asset returns. Even though these kinds of models offer useful information about risk factors of the whole economy, they are also associated with many restrictions. Problems are caused by, the low data publishing frequence, measurement errors, and that it is difficult to link aggregated shocks to individual companies. In addition, aggregated measures smooth out differences between companies, which makes it difficult to examine macroeconomic risk between hetegoneneous companies (Harvey et al., 2016). These restrictions have added interest in alternative ways to measure macroeconomic exposure.

These challenges may also be illustrated using traditional asset pricing theory, where the relation between risk and expected returns is reviewed at an aggregate level. In models based on average-variance thinking, assets and portfolios are evaluated based on their location in the efficient frontier, where attention is focused on systematic risk pricing and not on firm-specific mechanisms. This is why models like this offer a quite limited picture of how single firms form their exposure to macroeconomic risk.

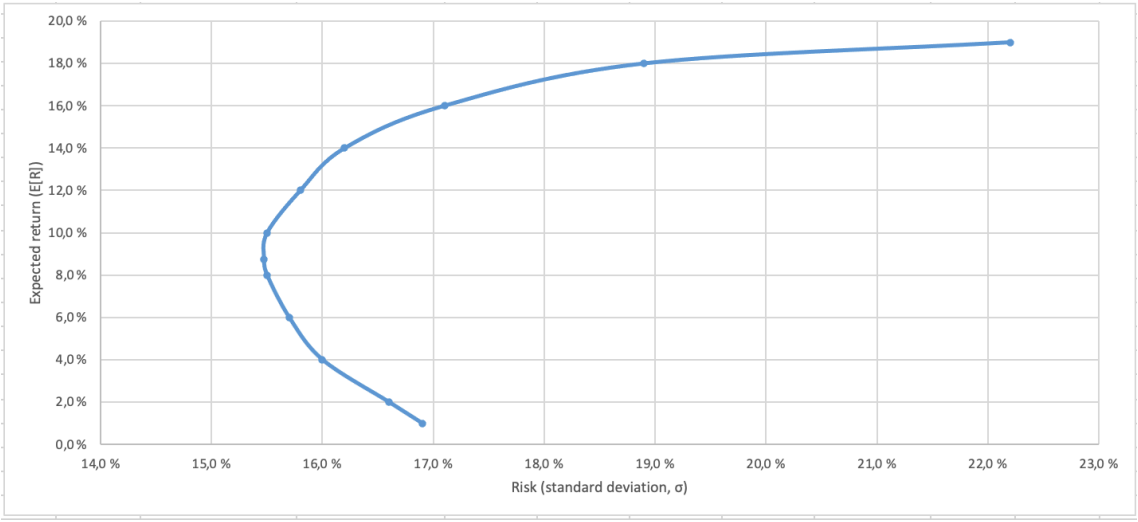

Figure 2 An efficient frontier

Figure 2 visualizes the traditional relationship between risk and expected return in asset pricing. Portfolios on the efficient frontier offer higher expected return in a certain risk-level, while portfolios that are below the frontier are considered inefficient due to inadequate diversification. Even though this framework helps to understand the pricing of risk in a general level, it doesn't explain, why firms that are on the same risk level can react very differently to macroeconomic changes. This is highlighted especially in situations where macroeconomic risk is shown at the firm level, but not necessarily in aggregated macro variables.

Giglio et al. (2016) show that macroeconomic risks can be seen in firm-level results, even when aggregated measures are only weakly related to asset returns. The results support the vision that systematic economic risk can be identified with firm-level data, which strengthens the theoretical foundation of bottom-up macro exposures. Examining differences between companies allows us to identify macro sensitivities that are easily hidden in aggregated analyses.

Firm-level approaches offer justification for the use of bottom-up macro exposures because they allow macroeconomic risk to be examined at the very level where differences between firms are observable. Instead of relying solely on aggregated macro variables, macroeconomic risk can be described using market-based measures that are constructed of stock returns and firm-specific qualities (Esakia & Goltz, 2023). This creates a foundation for the factor models and portfolio structures that are discussed in the next subsection.

The literature also highlights several limitations related to bottom-up approaches. Kelly et al. (2019) point out that because macroeconomic risk is inferred indirectly from firm-level data, the measures used are inevitably based on different proxy variables, which do not necessarily fully capture the underlying economic mechanisms. Because of this the interpretation of results can be harder compared to the models, that use direct macroeconomic variables.

In addition, results may be sensitive to modeling choices. Gu et al. (2020) exhibit that different variable choices and model specifications can lead to different conclusions about which risks are priced. This raises the question about, do the observed connections reflect real economic risk or are partly structures produced by the empirical method. Therefore, bottom-up approaches can be seen as a complementary view to traditional macro-based models rather than a direct replacement for them.

3.2 Factor-Based Models and Portfolio Constructions

Factor-based models are an essential part of modern asset pricing because they allow expected returns to be linked to systematic risk factors. Instead of modeling macroeconomic risk directly through macro variables, factor-based models depict risk exposures through portfolios, which are formed for example stock returns or firm-specific qualities. In this kind of framework, expected returns are explained by how strongly assets are exposed to the common risk-factor, which are thought to reflect the underlying economic risks (Pastor, 2000).

In the context of this thesis, factor-based models are especially interesting because they help to review macroeconomic risk indirectly without the analysis being based on directly observable macro variables. The purpose of factor-based models is not to describe macroeconomic conditions themselves, but how these risks are shown in asset returns.

A lot of well-known factors are closely related to macroeconomic conditions, even though they are not defined directly as macroeconomic variables. For example, value-, size-, momentum-, and carry-factors behave differently during economic cycles and economic stress. Value stocks can succeed in different ways than growth stocks during a recession, while momentum strategies may react strongly to sudden movements in the markets. Observations like these suggest that factor returns are not only a statistical phenomenon, but they can also reflect underlying macroeconomic mechanisms. Factor-

based portfolios often contain indirect exposures to risks related to, for example, economic growth, inflation, liquidity, or financial conditions (Koijen et al., 2018). For this reason, factor-based approaches form a natural link between traditional macroeconomic pricing models and firm-specific analysis.

Kelly et al. (2019) present that firm-specific qualities can be used as indirect measures for how firms' returns move in relation to underlying economic shocks. From this perspective, factor-based portfolios, which are formed based on, for example, company size, valuation multiples, or profitability, can capture systematic differences in macroeconomic exposure. These kinds of portfolios gather firm-specific information in a way, that contains cross-sectional differences between the companies without, that analysis needs to rely on infrequently published macroeconomic indicators. However, it is important to recognize that not all firm characteristics necessarily reflect macroeconomic risk. For example, some qualities may be driven by market inefficiencies.

Lettau & Pelger (2020) point out that factor-based models can explain the variation in expected returns both across assets and over time. This suggests that carefully constructed factors are based on economically meaningful risk factors and not just statistical associations. Gu et al. (2020) also reach similar results. According to their research, firm-level signals combined with factor structures contain a lot of information about expected returns, which supports the significance of bottom-up approaches in asset pricing. At the same time, literature highlights that the economic interpretation of factors is not always fully clear. This is why used models and data choices may affect the types of risk factors identified in studies.

The research refers that factor-based models aren't solely restricted to describing a single market phenomenon. Gosponidov et al. (2021) exhibit that the same pricing factors can reach multiple asset classes. This supports the idea that factor models can reflect broader macroeconomic forces instead of individual market phenomena. Based

on the results, macroeconomic risk can be detected through factors even when the actual macro variables are not included straight into the model.

Factor-based literature, on the other hand, faces considerable criticism. Harvey et al. (2016) notice that the number of new factors has grown rapidly, which adds the possibility of false findings. As a result, it becomes more difficult to distinguish significant risk-factors from random statistical associations. Hou et al. (2020) present similar findings, which state that many reported return anomalies do not repeat consistently in different datasets and time periods. This suggests that not all factor-based models necessarily picture permanent sources of systematic risk.

Factor-based approaches also have practical advantages compared to traditional top-down models. Because factor-based returns are based on portfolios that are observable and investable in the market, they can be used to examine macroeconomic risk through up-to-date market information. In addition, portfolios made from firm-level qualities contain differences between companies in macroeconomic exposures better than aggregated macro variables, where some of this variation may disappear (Pastor & Stambaugh, 2003).

Factor-based models and portfolio-based approaches thus offer one way to review macroeconomic risk using the information contained in asset returns. In these models, firm-level data is combined with asset pricing theory, allowing for a more detailed analysis of the relationship between macroeconomic conditions and the variation in expected returns. Even though factor-based models work at a more aggregated level than individual company qualities, they form an important link between top-down macro models and a firm-level analysis. The next chapter will review more directly how macroeconomic exposures are shown in firm-level characteristics.

3.3 Firm-level Characteristics and Macro Sensitivities

Firm-level characteristics provide a practical way to capture differences in macroeconomic exposure across firms. Rather than assuming unified responses to economic conditions, this literature emphasizes that firms differ systematically in how macroeconomic risk affects their operations, financing decisions, and expected returns. These differences are seen in different firm-level variables that describe the economic environment and business structure of firms.

Empirical research shows that there is considerable variation in the sensitivity of firms to macroeconomic risks. Giglio et al. (2016) noticed, that exposure to the general economic risk varies significantly between the firms and that this variation shows also in the cross-section of expected returns. The results suggest that firm-level data can reveal economically significant structures that are not visible in aggregated macro-level measures.

Also, the structure of financial structure matters on how macroeconomic risks are transmitted to companies. He (2017) shows that financial intermediaries have a central role in how economic shocks affect different firms and assets. This strengthens the idea that aggregated macro variables may mask significant variation in the financial sensitivity of companies.

An extensive research literature studying firm-specific characteristics also supports the significance of this perspective. Hou et al. (2020) state that a majority of proposed firm-level variables are unable to consistently predict returns across different datasets and time periods. However, according to their research, a smaller set of firms characteristics seems to explain systematic differences in expected returns between companies. These differences are often related, for example, to firms' investment behavior and profitability, which are also sensitive to macroeconomic changes.

In a more recent study, firm-level information is more directly linked to macroeconomic sensitivities. Esakia & Goltz (2023) show that firms characteristics can be used to assess their exposure to broader economic risks that are relevant to asset pricing. This supports the idea that firm-level analysis can offer a more presice picture of macroeconomic risk than approaches, that are based purely on aggregated macro variables.

3.4 Evidence from previous research

Empirical research offers a strong evidence that bottom-up macro exposures help explain cross-sectional differences in expected stock returns. The research literature isn't based purely on aggregated macroeconomic variables, but also proves that firm-specific data and portfolio-based structures can reveal how macroeconomic risk is priced in different assets. A central finding of the studies is that macroeconomic exposure varies considerably across firms, and this variation is reflected systematically in expected returns. At the same time, the interpretation depends on how macro exposures are defined and measured, which is why empirical results differ between different approaches.

Evidence from factor-based and portfolio -level studies suggests that firm-specific qualities often contain economically relevant macro risks. Kelly et al. (2019) show that firms' characteristics are closely related to systematic factors, which means that portfolios constructed based on these kinds of qualities contain exposures to underlying macroeconomic conditions. At the same time, Lettau & Pelger (2020) noticed that carefully constructed factor models can explain the difference in returns, both over time and between different assets. This supports the view that the factors are based on genuine economic risk, not just statistical correlations.

The results suggest that both firm-specific characteristics and factor-based approaches largely describe the same underlying financial risks, although their measurement methods differ. The literature also emphasizes that macroeconomic risk is not a directly observable phenomenon. Its identification largely depends on the type of model and measurement method used to examine the risk.

Firm-level research especially highlights that macroeconomic exposure varies significantly across firms. Companies cannot be assumed to react the same way to macroeconomic shocks because research results prove that sensitivities depend on factors such as industry, debt, and financial structure. Giglio et al. (2016) noticed that companies with higher exposure to risks related to economic downturns achieve higher expected returns as compensation for bearing systematic risk. Similar results suggest that companies that operate in cyclical industries, heavily indebted or dependent on external financing, are usually more sensitive to macroeconomic fluctuations than companies that operate in a steadier industry (He, 2017).

These findings support the idea that macroeconomic risk is not equally distributed across companies, but depends on the qualities and environments of the companies. At the same time, it suggests that aggregated macroeconomic measures might underestimate the real distribution in corporate risk exposures.

A growing part of the studies also highlights that macroeconomic risk is priced especially in unfavorable economic situations. Sönksen (2021) exhibits that exposure to long-term catastrophe risks is a significant predictor of expected returns. Assets that are more sensitive to rarer but serious economic crises offer higher risk premia. This fulfills the research by considering firm-level macro exposures, highlighting that expected returns not only include short-term fluctuations but also long-term economic risks and extreme economic situations.

This perspective is consistent with models that highlight downside risk and circumstantial risk premia, where macroeconomic exposure becomes more relevant during periods of economic stress.

Research suggests that macroeconomic exposures are not only related to short-term market movements but also to permanent differences in expected returns between different assets. Assets that perform poorly during recessions or periods of high uncertainty generally offer higher expected returns as compensation for downside risk (Lettau & Pelger, 2020). Kelly et al. (2019), on the other hand, show that detailed qualities regarding macroeconomic risk help to explain why some of the firms reach systematically higher returns than others.

Even though both Kelly et al. (2019) and Gu et al. (2020) highlight the importance of firm-level information in explaining expected returns, their approaches differ. Kelly et al. (2019) emphasize firm-specific characteristics that are easily interpreted economically, while Gu et al. (2020) utilize a wider data-driven approach. This suggests that although both approaches capture systematic risk, the economic interpretation of these exposures may be more transparent in characteristics-based models than in purely data-driven frameworks.

Comparisons across methodologies have consistently come to the same conclusions. Studies based on factor portfolios, firm-level characteristics, and machine learning approaches all point to the importance of macroeconomic risk embedded in firm-level data. Gu et al. (2020) demonstrate that firm-level signals extracted from large datasets contain substantial information about expected returns, much of which can be interpreted as exposure to underlying economic risks.

While these approaches often lead to similar conclusions, they rely on different modeling choices and data structures, so the estimated macro exposures are not always directly comparable across studies. In addition, the flexibility of data-driven methods may increase the risk of identifying data-specific connections instead of economically meaningful risk factors.

Concerns have been raised in the literature about the robustness of many empirical findings. Harvey et al. (2016) emphasize that the number of new factors increases the possibility of false findings and makes separating the true risk premia even more difficult. Gu et al. (2020) also noticed that many reported return anomalies do not repeat consistently across different datasets or time periods. This suggests that some of the noticed connections can relate more to the used model solutions and datasets than to a permanent macroeconomic risk.

However, empirical research supports this viewpoint that bottom-up approaches can identify links between macroeconomic risk and expected returns. Firm-level variation and long-term sensitivities seem to contain information about the macroeconomic risks that are reflected in asset pricing. At the same time, research results point out that the strength of the observed connections depends largely on how macroeconomic exposure is defined and measured. This is why results should be interpreted with caution.

Overall, the reviewed literature supports the idea that bottom-up approaches offer a useful perspective for examining macroeconomic risk at the firm level. However, research highlights that these approaches are strongly dependent on the used models and methods. This is why empirical results must be evaluated in relation to their underlying assumptions and research designs.

4 Discussion and Synthesis

This chapter concludes the main insights from the preceding literature review by moving from individual studies toward a broader synthesis. Chapter 2 reviewed the relationship between macroeconomic conditions and expected stock returns using mainly aggregate, top-down approaches, while Chapter 3 examined how similar risks can be identified through firm-level exposures and cross-sectional variation. Taken together, the literature suggests that macroeconomic risk plays a central role in shaping expected asset returns (Harvey et al., 2016).

Top-down and bottom-up approaches shouldn't be viewed just as substitutes; furthermore, recent research indicates that they offer complementary perspectives on the pricing of macroeconomic risk. Kelly et al (2019) show that firm-level characteristics can reveal underlying economic risks that are difficult to observe directly using aggregate macro variables. At the same time, factor-based models demonstrate that these firm-level exposures are systematically related to expected returns across both the time series and the cross section (Lettau & Pelger, 2020).

Based on these findings, this chapter discusses what the earlier research talks about the importance of macroeconomic risk for expected returns. Furthermore, the chapter will discuss the practical relevance for investors and institutional portfolios and assess key limitations identified in the literature.

4.1 Interpretation of Findings

The reviewed literature provides strong evidence that bottom-up macro exposures are associated with differences in expected returns between companies. In multiple studies, the sensitivity of firms to macroeconomic conditions seems to be systematically priced in the financial markets. Bottom-up approaches highlight especially that macroeconomic risk does not affect all companies in the same way, but exposure differs between companies, industries, and portfolios. This is why they offer a more detailed view on the variation in expected returns than aggregated macro models alone (Kelly et al., 2019).

Based on the literature, differences in expected returns appear to be related not only to the amount of risk but also to the economic conditions to which companies are exposed. This means that expected returns are determined partly by how macroeconomic risk is allocated across companies, not just by the general market risk.

Several studies have found that companies and assets that are more sensitive to unfavorable macroeconomic situations gain higher expected returns. This is consistent with traditional asset pricing theory, which holds that investors demand higher compensation for systematic risks that materialize, especially in weak economic times. Research based on factor-based models and firm-level analysis suggests that these risks are shown in firm returns and characteristics in ways that aggregate macroeconomic variables do not fully capture (Lettau & Pelger, 2020).

Macroeconomic risk, therefore, seems to be reflected in the market more through indirect return patterns than directly through individual macroeconomic variables. Especially significant are risks that highlight during economically weak times, because the associated risk premia appear to be higher than average.

The literature also highlights that there is considerable variation in the macroeconomic exposures. Corporations who operate in cyclical industries, highly leveraged companies, and companies whose investments are heavily dependent on the economic situation appear to be on average more sensitive to macroeconomic changes. Giglio et al. (2016) point out that differences in firms' exposure to general financial risk are also reflected in expected returns. This suggests that macroeconomic risk is distributed unevenly across companies.

The findings highlight the importance of company-level data when trying to identify economically significant risk differences between companies. As a result, models based solely on aggregate indicators may fail to capture important risk dimensions that are visible only at the firm level.

A more recent study has emphasized especially the significance of downside risk and economic circumstances in terms of expected returns. Adrian et al. (2019) point out that macroeconomic risk is not constant over time, but its impact is highlighted especially when vulnerability of the financial systems grows. Their results refer that exposure to unfavourable economic growth states is associated with higher risk premia. This supports the view that bottom-up macro exposures depict especially the sensitivity to weak economic conditions and not just the average macroeconomic changes.

The thought of state-dependent pricing of risks also helps explain why certain firm-level exposures are more strongly related to expected returns during high uncertainty. The pricing of macroeconomic risk therefore does not appear to be stable over time, but rather changes with economic conditions and investors' risk perceptions.

Differences across empirical studies reflect variation in methods, data, and economic environments. Gu et al. (2020) show that the strength of firm-level predictors can change over time, indicating that macroeconomic risk pricing is not constant across market

conditions. They also explain that data-driven approaches may capture a wider set of signals, some of which lack a clear economic interpretation.

Research on other asset classes also supports the idea that macroeconomic risk is transmitted to markets through multiple channels, such as liquidity and funding constraints, which further affects the cross-section of expected returns (Gosponidov et al., 2021). Even though different approaches often end up with similar conclusions, they may at the same time describe slightly different dimensions of macroeconomic risk.

As a whole, the literature supports the idea that bottom-up macro exposures fit well with traditional asset pricing theory, while also providing a more accurate picture of how macroeconomic risk is reflected in expected returns at the firm-level. Especially companies' sensitivity to economically weak conditions seem to be an essential factor in forming of expected returns.

At the same time, the study shows that some of the results are strongly dependent on how macroeconomic exposures are defined and modeled. This is why empirical findings should also be interpreted with some caution.

4.2 Implications for Investors and Institutional Portfolios

Bottom-up macro exposures have multiple practical applications form an investment and, in particular portfolio risk management perspective. When investors recognize how individual corporations are exposed to different macroeconomic conditions, they can review portfolio risks much more accurately than through aggregate market measures alone. This is highlighted especially in situations, where macroeconomic environment is changing rapidly or risk are divided unevenly between different industries and firms.

Bottom-up approaches able to review macroeconomic risk at the firm-level, instead of basing the analysis solely on general market indicators. Kelly et al. (2019) that firm-specific qualities and covariation in returns contain information about macroeconomic risks that traditional top-down measures do not necessarily capture. This may help investors to target risk more precisely and to build more distributed portfolios that can take macroeconomic exposures more directly into account.

These perspectives are especially significant for institutional investors, like pension funds. Long-term investors are exposed to macroeconomic risks across multiple asset classes, which is why identifying individual risk-factors is important for the entire portfolio. He (2017) exhibits that macroeconomic shocks are transformed through different asset classes. This highlights the significance of firm-level macro exposures, especially in situations where market uncertainties grow.

Bottom-up approaches can also complement traditional factor-based investing. Factor-based portfolios often contain indirect macroeconomic exposures, even though their underlying risks are not always easily observable. Gu et al. (2020) show that economically relevant information related to macroeconomic risks and risk premia can be separated from firm-level signals. This is why bottom-up analysis can help the investors to better understand where the true risk of the portfolio is formed.

Firm-level macro exposures can also be utilized practically in portfolio construction. Esakia & Goltz (2023) noticed that macro exposures identified at the firm-level allow investors to manage portfolio sensitivity to economic conditions more precisely than traditional top-down strategies. This can be useful, for example, when investors aim to shelter themselves from inflation, recession risks, or uncertainty in the financial markets, but the financial decisions are based purely on the timing of macroeconomic variables.

The literature also points out multiple practical challenges. Firm-level macro exposures are often based on rather indirect measures, which is why their interpretation is not always as simple. In addition, exposures can change over time in firms' business models, financial structures, and market conditions. This is why macro sensitivities identified based on the historical materials may not necessarily remain the same in the future.

Bottom-up macro exposures can be a useful addition to investors' and institutional portfolios, especially for risk management and portfolio construction. At the same time, their utilization requires caution, as results are strongly dependent on the used models, measures, and material choices.

4.3 Limitations and Suggestions for Future Research

Research containing bottom-up macro exposures has increased over the last few years, but at the same time, the literature has raised several restricting factors. A central problem is that macroeconomic risk cannot be observed directly, but is estimated indirectly through firm-level characteristics, factor-based returns, and portfolio structures. Kelly et al. (2019) note that these kinds of measures are based on different proxy variables, which may not necessarily fully picture the economic risks hidden in the background. This is why empirical results may differ greatly on how macroeconomic exposure is defined and operationalized.

The interpretation of research results is also complicated by strong model dependence. Bottom-up macro exposures are often built on factor-based models or statistical methods, where used variables, materials, and model specifications may impact on the results. Gu et al. (2020) point out that flexible statistical methods can identify economically important connections, but at the same time, they might adapt too much to the materials. As a result, some of the detected connections may reflect more on the statistical structures than actual macroeconomic risk factors.

The literature has also questioned how stable empirical research results are across different data sets and time periods. Hou et al. (2020) noticed that not many firm-level return anomalies are repeated constantly in different research environments. Similar problems also apply to bottom-up macro exposures, as their explanatory power can change significantly in different market situations and economic environments. Therefore, some of the noticed macro sensitivities are not necessarily as constant as the research results may suggest.

The large volume and multidimensionality of the firm-level data also add to the problems. Harvey et al. (2016) highlight that the rapid expansion of new factors and explanatory variables increases the risk of false positives and makes it more difficult to identify truly economically significant risk factors. In the case of bottom-up approaches, this means that factors describing true macroeconomic risk from data-specific or temporary phenomena can be challenging.

However, the same restrictions also open new opportunities for further research. One interesting research direction relates to how firm-level characteristics could be linked more precisely to specific macroeconomic mechanisms, such as cyclical sensitivity, inflation risk, or changes in financial conditions. This kind of approach could strengthen the economic interpretation of bottom-up macro exposures.

It would also be important to review bottom-up macro exposures more broadly across markets, asset classes, and economic environments. Most of the current study is focused on the United States stock markets, which is why it isn’t totally clear how well the results generalize to other countries or different market structures. In addition, it would be useful to review how macroeconomic exposures behave, for example, in interest markets or alternative investments.

Based on the literature, the development of hybrid models that combine firm-level information and direct macroeconomic variables also seems promising. These kinds of models could potentially improve both the readability of the results and their stability in different market conditions.

Also, the role of firm-level variables would be useful to review more closely in future research. Especially interesting would be to find out what variables picture macroeconomic risk most consistently in different materials and time periods. This could improve the empirical foundation of bottom-up approaches and at the same time, improve their practical applications from the investing standpoint.

5 Conclusions

The goal of this study was to examine how bottom-up exposures are related to expected returns based on previous literature on asset pricing. The focus of the review was especially on firm-level approaches, which seek to identify macroeconomic risk, firm-specific qualities, factor-based models, and portfolio structures rather than aggregated macro variables.

Based on the literature review, macroeconomic risk seems to have an important role in the formation of expected returns. Previous research points out that risks related to economic growth, inflation, and financial circumstances are shown in risk premia in different financial markets. At the same time, research highlights that aggregated macroeconomic variables do not fully describe differences in macroeconomic exposure between companies.

Bottom-up approaches aim to address this problem by utilizing firm-level information to identify macroeconomic risk. The reviewed literature suggests that firm characteristics, factor-based returns, and different portfolio structures contain information about the systematic economic risks. Companies who are more sensitive to unfavourable economic circumstances look to reach higher expected returns on average as compensation for bearing higher systematic risk.

Research also highlights that macroeconomic risk is not distributed evenly between companies. The industry, debt, cost structure, and dependence on financing of the firms affect how strongly macroeconomic changes are reflected in their operations and returns. This supports the idea that firm-level review gives more detailed picture of the macroeconomic risk than just aggregated top-down models.

The literature has also raised restrictions considering bottom-up approaches. Macroeconomic exposures are not usually measured directly, but they are based on indirect measures and different modeling solutions. This is why research results can differ significantly depending on the used data and methods. In addition, some of the observed associations may reflect statistical structures rather than permanent economic risk factors. Therefore, bottom-up approaches can be held as a more traditional macro models complementing view than their substitute.

As a whole, the reviewed literature shows that bottom-up macro exposures offer a flexible way to analyze how macroeconomic risk is reflected in expected returns. Taking into account differences between companies at the corporate level also provides a broader picture of risk pricing in financial markets, which is why bottom-up approaches complement traditional top-down models (Gu et al., 2020). However, research results are not unified, which suggests that measuring macroeconomic exposures is still heavily dependent on the used models and data sets.

The main goal of this literature review has been to combine macroeconomic asset pricing and firm-level empirical research into a unified whole. Reviewed literature supports the idea that bottom-up macro exposures have an important role in explaining cross-sectional differences in expected returns. Their significance seems to be highlighted especially during economic uncertainty.

Overall, the literature supports the idea that bottom-up approaches offer a complimentary way to review macroeconomic risk at the firm-level, while complementing traditional macroeconomic asset pricing models. At the same time, the research results emphasize that macroeconomic risk pricing is a multidimensional phenomenon that cannot be fully described by a single model or empirical approach.

References

Adrian, T., Boyarchenko, N., & Giannone, D. (2019). Vulnerable growth. *American Economic Review*. https://doi.org/10.1257/aer.20161923

Ang, A., Bekaert, G., & Wei, M. (2007). Do macro variables, asset markets, or surveys forecast inflation better? *Journal of Monetary Economics*. https://doi.org/10.1016/j.jmoneco.2006.04.006

Ang, A., & Piazzesi, M. (2003). A no-arbitrage vector autoregression of term structure dynamics with macroeconomic and latent variables. *Journal of Monetary Economics*. https://doi.org/10.1016/S0304-3932(03)00032-1

Bali, T. G., Engle, R. F., & Murray, S. (2016). *Empirical asset pricing: The cross section of stock returns* (Chapter 1). Wiley.

Bansal, R., & Yaron, A. (2004). Risks for the long run: A potential resolution of asset pricing puzzles. *Journal of Finance*. https://doi.org/10.1111/j.1540-6261.2004.00670.x

Esakia, M., & Goltz, F. (2023). Targeting macroeconomic exposures in equity portfolios: A firm-level measurement approach for out-of-sample robustness. *Financial Analysts Journal*. https://doi.org/10.1080/0015198X.2022.2150500

Giglio, S., Kelly, B., & Pruitt, S. (2016). Systemic risk and the macroeconomy: An empirical evaluation. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2016.01.010

Gospodinov, N., Kan, R., & Robotti, C. (2021). Common pricing across asset classes: Empirical evidence. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2020.12.001

Gu, S., Kelly, B., & Xiu, D. (2020). Empirical asset pricing via machine learning. *Review of Financial Studies*. https://doi.org/10.1093/rfs/hhaa009

Harvey, C. R., Liu, Y., & Zhu, H. (2016). … and the cross-section of expected returns. *Review of Financial Studies*. https://doi.org/10.1093/rfs/hhv059

He, Z. (2017). Intermediary asset pricing: New evidence from many asset classes. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2017.08.002

Hou, K., Xue, C., & Zhang, L. (2020). Replicating anomalies. *Review of Financial Studies*. https://doi.org/10.1093/rfs/hhy131

Huang, D., Jiang, F., Li, K., Tong, G., & Zhou, G. (2022). Are bond returns predictable with real-time macro data? *Journal of Econometrics*. https://doi.org/10.1016/j.jeconom.2022.09.008

Kelly, B., Pruitt, S., & Su, Y. (2019). Characteristics are covariances: A unified model of risk and return. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2019.05.001

Koijen, R. S. J., Moskowitz, T. J., Pedersen, L. H., & Vrugt, E. B. (2018). Carry. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2017.11.002

Lettau, M., & Pelger, M. (2020). Factors that fit the time series and cross-section of stock returns. *Review of Financial Studies*. https://doi.org/10.1093/rfs/hhaa020

Ludvigson, S. C., & Ng, S. (2007). The empirical risk–return relation: A factor analysis approach. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2005.12.002

Pástor, Ľ. (2000). Comparing asset pricing models: An investment perspective. *Journal of Financial Economics*. https://doi.org/10.1016/S0304-405X(00)00044-1

Pástor, Ľ., & Stambaugh, R. F. (2003). Liquidity risk and expected stock returns. *Journal of Political Economy*. https://doi.org/10.1086/374184

Savor, P., & Wilson, M. (2014). Asset pricing: A tale of two days. *Journal of Financial Economics*. https://doi.org/10.1016/j.jfineco.2014.04.005

Shanken, J., & Weinstein, M. I. (2006). Economic forces and the stock market revisited. *Journal of Empirical Finance*. https://doi.org/10.1016/j.jempfin.2005.09.001

Sönksen, J. (2021). Empirical asset pricing with multi-period disaster risk. *Journal of Econometrics*. https://doi.org/10.1016/j.jeconom.2020.08.001

Appendices

Appendix 1. Writing Notes

This thesis uses artificial intelligence tools in a limited and explained way. Grammarly was used only to make writing clearer. All main text, explanations, and conclusions are based only on academic sources and were created by the author.