

Literature Review

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1 Whited, T. M., & Wu, G. (2006). Financial constraints risk. *The Review of Financial Studies*, 19(2), 531-559.

In their paper, Whited and Wu (2006) investigate the impact of financial constraints on the risk and expected returns of firms. They develop a novel measure of financial constraints and test its ability to explain the cross-section of stock returns. The authors aim to contribute to the understanding of how financial constraints affect firms' investment decisions, risk profiles, and stock returns.

The study proposes a financial constraints index that incorporates several firm-level characteristics, including size, age, dividend payments, and cash holdings, as well as macroeconomic variables, such as the term structure of interest rates. This composite index is designed to capture the degree to which firms are financially constrained and, consequently, their riskiness.

Whited and Wu find that financially constrained firms exhibit higher stock return volatility and higher systematic risk, as captured by their beta estimates. They also show that these firms have higher expected returns, which is consistent with the notion that investors demand a premium for holding stocks of financially constrained companies due to their higher risk.

The authors test the robustness of their findings by conducting various sensitivity analyses. They use alternative proxies for financial constraints, apply different estimation methodologies, and analyze sub-samples of firms to ensure the robustness of their results. The findings remain consistent, reinforcing the conclusion that financial constraints are an important determinant of firms' risk and expected returns.

The study contributes to the literature on the relationship between financial constraints and stock returns, providing valuable insights for investors, financial analysts, and policymakers. It highlights the importance of considering financial constraints when evaluating firms' risk profiles and the potential impact of these constraints on expected stock returns. Additionally, the authors' financial constraint index can serve as a useful tool for researchers and practitioners to measure and analyze the impact of financial constraints on firm-level outcomes.

2 Cooper, R. W., & Ejarque, J. (2003). Financial frictions and investment: Requiem in Q. *The Review of Economic Dynamics*, 6(4), 710-728.

In their paper, Cooper and Ejarque (2003) examine the relationship between financial frictions and investment decisions, focusing on the role of Tobin's Q as an investment determinant. The authors challenge the standard neoclassical investment model, which assumes that Tobin's Q is sufficient to capture the impact of financial frictions on investment. They propose an alternative model incorporating financial constraints and assess its ability to explain firm-level investment behavior.

The study begins by discussing the limitations of the neoclassical investment model, which is based on the assumption that firms can finance their investment projects by issuing new shares at

their market value. In reality, firms may face financial frictions, such as asymmetric information and agency problems, that limit their ability to raise external financing. These frictions can affect investment decisions, and Tobin's Q may not fully capture their impact.

To address this issue, Cooper and Ejarque propose an alternative model that incorporates financial constraints as a determinant of investment. In this model, firms face borrowing constraints, and their investment decisions depend on both Tobin's Q and their internal financial resources. The authors argue that this model provides a more accurate representation of the relationship between financial frictions and investment.

Using firm-level data, the authors estimate their model and compare its performance with the standard neoclassical model. They find that the alternative model with financial constraints performs better in explaining investment behavior, highlighting the importance of considering financial frictions in investment analysis. The results suggest that Tobin's Q alone may not be sufficient to capture the impact of financial constraints on investment decisions.

Cooper and Ejarque's study contributes to the understanding of the role of financial frictions in investment decisions and challenges the conventional wisdom that Tobin's Q is an adequate measure of the investment incentive. The authors' findings have important implications for both empirical research on investment behavior and the design of policies aimed at promoting investment and economic growth.

3 Brown, J. R., Fazzari, S. M., & Petersen, B. C. (2009). Financing innovation and growth: Cash flow, external equity, and the 1990s R&D boom. *The Journal of Finance*, 64(1), 151-185.

In their paper, Brown, Fazzari, and Petersen (2009) explore the relationship between financing sources, such as cash flow and external equity, and firms' research and development (R&D) investments during the 1990s R&D boom. The authors aim to understand how different financing sources influenced firms' innovation activities and growth during this period, characterized by rapid technological advancements and a surge in R&D spending.

The study uses a panel of firm-level data from Compustat to examine the role of cash flow and external equity in financing R&D investments. The authors employ a fixed-effects model to control for unobservable firm-specific factors and focus on the impact of financing sources on R&D spending.

Brown, Fazzari, and Petersen find that both cash flow and external equity were important drivers of R&D investments during the 1990s. They show that firms with higher cash flow and those that raised external equity through stock issuance were more likely to increase their R&D spending. The relationship between financing sources and R&D investments was particularly pronounced for smaller and younger firms, which typically face greater financial constraints and rely more heavily on internal cash flow and external equity to fund their innovation activities.

The authors also analyze the role of financial constraints in determining the sensitivity of R&D investments to cash flow and external equity. They find that financially constrained firms were more sensitive to changes in financing sources, suggesting that these firms' innovation activities were more vulnerable to fluctuations in available funding.

Brown, Fazzari, and Petersen's study contributes to the understanding of the role of financing sources in promoting innovation and growth. The findings have important implications for policymakers, as they highlight the need to facilitate access to external financing for innovative firms, particularly smaller and younger ones, to support their R&D activities and promote economic growth. Additionally, the study provides valuable insights for investors and financial analysts interested in the relationship between firms' financing decisions and their innovation outcomes.

4 Aghion, P., Bond, S., Klemm, A., & Marinescu, I. (2004). Technology and financial structure: Are innovative firms different? *Journal of the European Economic Association*, 2(2-3), 277-288.

In their paper, Aghion, Bond, Klemm, and Marinescu (2004) investigate whether innovative firms exhibit different financial structures compared to non-innovative firms. The authors focus on the relationship between technology, innovation, and financial structure to better understand the financing choices of innovative firms and the potential impact of these choices on their growth and performance.

The study uses a unique dataset from the United Kingdom, which includes information on firms' innovation activities, such as R&D spending and patenting behavior, as well as their financial structure. The authors employ a range of econometric techniques, including panel data analysis and instrumental variable estimation, to assess the relationship between innovation and financial structure.

Aghion, Bond, Klemm, and Marinescu find that innovative firms exhibit different financial structures compared to non-innovative firms. Specifically, they show that innovative firms tend to have a higher reliance on external equity financing and a lower reliance on debt financing. This pattern is consistent with the idea that innovative firms face greater informational asymmetries and agency problems, making it more difficult for them to raise debt financing. Additionally, the authors find that innovative firms with higher levels of external equity financing exhibit faster growth in sales and employment, suggesting a positive relationship between external equity financing and firm performance.

The study also explores the role of financial constraints in shaping the relationship between innovation and financial structure. The authors find that financially constrained innovative firms are more likely to use external equity financing and have a lower reliance on debt financing. This result highlights the importance of considering financial constraints when analyzing the financial structure of innovative firms.

Aghion, Bond, Klemm, and Marinescu's paper contributes to the understanding of the relationship between technology, innovation, and financial structure. The findings have important implications for investors, financial analysts, and policymakers, as they suggest that innovative firms may require different financing strategies to support their growth and performance. Additionally, the study provides valuable insights into the role of financial constraints in shaping the financing choices of innovative firms, with potential implications for policies aimed at promoting innovation and economic growth.

5 Asker, J., Farre-Mensa, J., & Ljungqvist, A. (2015). Corporate investment and stock market listing: A puzzle? *Review of Financial Studies*, 28(2), 342-390.

In their paper, Asker, Farre-Mensa, and Ljungqvist (2015) explore the differences in investment behavior between publicly listed and privately held firms. The authors aim to understand the puzzle of why public firms invest less than their private counterparts, despite having easier access to external financing. They investigate the factors that may contribute to this puzzle and assess the potential implications for firm performance and economic growth.

The study uses a comprehensive dataset of U.S. manufacturing firms, which includes both public and private firms, to analyze the differences in investment behavior between the two groups. The authors employ a range of econometric techniques, including panel data analysis and propensity

score matching, to control for observable and unobservable firm-specific factors that may influence investment decisions.

Asker, Farre-Mensa, and Ljungqvist find that public firms invest significantly less than their private counterparts, even after controlling for firm characteristics and industry-specific factors. They show that this gap in investment cannot be fully explained by differences in firm size, growth opportunities, or access to external financing. Instead, the authors argue that the lower investment by public firms may be driven by a combination of factors, including managerial short-termism, the influence of activist investors, and the pressure to meet earnings targets.

The study also explores the potential implications of this investment gap for firm performance and economic growth. The authors find that the lower investment by public firms may have negative consequences for their long-term growth prospects, as well as for aggregate economic growth. They argue that this finding highlights the need for a better understanding of the factors driving the investment behavior of public firms and for policy interventions that may help to mitigate the negative consequences of underinvestment.

Asker, Farre-Mensa, and Ljungqvist's paper contributes to the literature on corporate investment and stock market listing by providing a comprehensive analysis of the differences in investment behavior between public and private firms. The findings have important implications for investors, financial analysts, and policymakers, as they highlight the potential costs associated with stock market listing and the need for a better understanding of the factors that drive the investment decisions of public firms.

6 Titman, S., Wei, K. C. J., & Xie, F. (2004). Capital investments and stock returns. *Journal of Financial and Quantitative Analysis*, 39(4), 677-700.

In their paper, Titman, Wei, and Xie (2004) investigate the relationship between capital investments and subsequent stock returns. The authors aim to understand whether the level of a firm's capital investments can predict its future stock performance and, if so, to identify the potential factors that may explain this relationship.

The study uses a large sample of U.S. firms from the Compustat database, covering the period from 1971 to 1999. The authors employ a range of econometric techniques, including panel data analysis and cross-sectional regressions, to assess the relationship between capital investments and stock returns. They control for various firm-specific factors, such as size, book-to-market ratio, and past stock performance, that may influence stock returns.

Titman, Wei, and Xie find that there is a negative relationship between capital investments and subsequent stock returns, indicating that firms with higher levels of capital investments tend to underperform their counterparts with lower investments. This relationship is robust to controlling for other firm-specific factors and persists over various time horizons.

The authors explore several potential explanations for this negative relationship between capital investments and stock returns. They find evidence that suggests that the relationship may be driven by a combination of factors, including overinvestment by firms, mispricing of growth opportunities, and market inefficiencies. The authors argue that their findings are consistent with the idea that the market may overvalue firms with high capital investments, leading to subsequent underperformance as the overvaluation is corrected.

Titman, Wei, and Xie's paper contributes to the literature on capital investments and stock returns by providing a comprehensive analysis of the relationship between these two variables. The findings have important implications for investors, financial analysts, and portfolio managers, as they suggest that capital investments can be a useful predictor of future stock performance. Additionally, the study provides valuable insights into the potential factors driving this relationship,

with implications for understanding market inefficiencies and the role of capital investments in firm valuation.

7 Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56.

In their influential paper, Fama and French (1993) propose a multifactor asset pricing model that aims to better explain the variation in stock and bond returns compared to the traditional single-factor capital asset pricing model (CAPM). The authors introduce two additional risk factors, size and book-to-market equity ratio, in addition to the market risk factor, to capture the common risks driving stock and bond returns.

The study uses a large sample of U.S. stocks and bonds spanning from 1963 to 1990. Fama and French employ various econometric techniques, including time-series regressions and cross-sectional analyses, to test the validity of their multifactor model and to compare its explanatory power to that of the CAPM.

Fama and French find that their three-factor model outperforms the traditional CAPM in explaining the cross-sectional variation in stock and bond returns. The size factor, represented by the difference in returns between small-cap and large-cap stocks (SMB), and the book-to-market equity factor, represented by the difference in returns between high and low book-to-market stocks (HML), are found to be significant in explaining the variation in returns beyond what is captured by the market risk factor alone.

The authors also examine the performance of their multifactor model in explaining the returns of various bond portfolios. They find that the three-factor model is capable of explaining the variation in bond returns as well, although the size and book-to-market equity factors play a less significant role compared to the market risk factor for bond portfolios.

Fama and French's paper has had a profound impact on the field of finance and investment management. The three-factor model they propose has become a cornerstone of modern finance, leading to the development of additional multifactor models and shaping the way investors and portfolio managers assess risk and construct portfolios. The findings of their study also challenge the traditional CAPM, highlighting the importance of considering multiple risk factors when analyzing the performance of stocks and bonds.

8 Tobin, J. (1969). A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking*, 1(1), 15-29.

In his seminal paper, Tobin (1969) presents a general equilibrium approach to monetary theory, focusing on the role of money in determining the allocation of resources and the pricing of assets in an economy. The paper aims to provide a more comprehensive and coherent framework for understanding the relationships between money, interest rates, and asset prices, as well as the implications of these relationships for monetary policy and macroeconomic stability.

Tobin's general equilibrium approach is grounded in the principles of neoclassical economics, with the key assumption that individual agents (consumers, firms, and investors) optimize their behavior based on their preferences and the constraints they face. The model incorporates both real and financial assets, allowing for a rich analysis of the interactions between the monetary and real sectors of the economy.

In the context of this general equilibrium framework, Tobin introduces the concept of Tobin's Q , which is the ratio of the market value of an asset to its replacement cost. Tobin's Q serves as a key determinant of firms' investment decisions in the model, as it reflects the relative attractiveness of investing in new capital goods versus purchasing existing ones. When Tobin's Q is greater than one, it implies that the market value of assets is higher than their replacement cost, signaling that firms have an incentive to invest in new capital goods. Conversely, when Tobin's Q is less than one, firms are more likely to purchase existing assets instead of investing in new capital goods.

Tobin's paper also discusses the role of monetary policy in influencing the allocation of resources and the stability of the economy. In particular, the author highlights how changes in the money supply can affect interest rates, asset prices, and ultimately the level of investment and economic activity. This analysis has important implications for the design and conduct of monetary policy, as it underscores the need for central banks to consider the broader macroeconomic consequences of their actions, beyond simply targeting inflation or short-term interest rates.

Tobin's (1969) general equilibrium approach to monetary theory has had a lasting impact on the field of economics, shaping the way researchers and policymakers think about the role of money in the economy and the interactions between monetary policy and the real sector. The concept of Tobin's Q has also become a widely used tool for analyzing firms' investment decisions and the determinants of asset prices, both in theoretical and empirical research.

9 Hou, K., Mo, H., Xue, C., & Zhang, L. (2019). Which Factors?*. The Review of Finance, 23(1), 1-40.

In their 2019 paper, Hou, Mo, Xue, and Zhang conduct a comprehensive evaluation of the performance of 65 well-known asset pricing factors in the cross-section of US stock returns. The authors aim to identify which factors are truly robust in explaining the variation in stock returns, and whether some factors are merely redundant or can be subsumed by others.

The authors employ a two-pass regression methodology and out-of-sample tests to assess the performance of these factors. They also investigate the importance of controlling for microcaps (stocks with the smallest market capitalizations) in their analysis, as these stocks can have a substantial impact on the results.

The study finds that only a small subset of factors are robust in explaining the cross-section of stock returns. Specifically, the authors identify five factors that are consistently significant and robust across various test specifications:

The market factor (MKT): The excess return of the market portfolio over the risk-free rate. The size factor (SMB): The difference in returns between small-cap and large-cap stocks. The investment factor (CMA): The difference in returns between firms with low and high investment-to-capital ratios. The profitability factor (RMW): The difference in returns between firms with high and low profitability (measured by gross profits-to-assets). The momentum factor (MOM): The difference in returns between stocks with high and low past 12-month returns, excluding the most recent month. The authors also find that controlling for microcaps is important, as excluding them from the analysis leads to weaker factor performance. Additionally, the study reveals that many of the other factors considered in the literature are either redundant or can be explained by the five robust factors mentioned above.

In conclusion, Hou et al.'s (2019) paper provides valuable insights into the performance of various asset pricing factors and highlights the importance of focusing on a small set of robust factors when analyzing the cross-section of stock returns. Their findings have important implications for both academic research and practical applications in asset pricing and portfolio management.

10 Stambaugh, R. F. (2017). Mispricing factors. *The Review of Financial Studies*, 30(4), 1270-1315.

In this paper, Robert F. Stambaugh proposes an approach for building factors that are better suited to capturing mispricing in stock returns rather than just risk-based factors. He argues that conventional factor models, such as the Fama-French three-factor model, may not accurately measure mispricing because they are designed to capture risk-related variation in stock returns.

Stambaugh's approach involves constructing factors that measure the difference between a stock's forecasted return and its realized return. The forecasted return is based on a model that incorporates several known return predictors. When the realized return deviates significantly from the forecast, it suggests the presence of mispricing. By creating factors that capture these deviations, Stambaugh aims to build a factor model that can better identify mispriced stocks.

To test the effectiveness of his approach, Stambaugh constructs a four-factor mispricing model that includes the market factor (MKT) and three mispricing factors:

The underreaction factor (UR): This factor captures the difference between the realized return and the forecasted return for stocks that are expected to experience positive returns due to underreaction to news or other information. The overreaction factor (OR): This factor captures the difference between the realized return and the forecasted return for stocks that are expected to experience negative returns due to overreaction to news or other information. The cash flow-to-price factor (CP): This factor measures the difference between the realized return and the forecasted return for stocks with high cash flow-to-price ratios, which are typically considered value stocks. Stambaugh compares the performance of his mispricing model to the Fama-French three-factor model and finds that his model better explains the cross-section of stock returns. Specifically, the mispricing model captures more variation in returns and better identifies stocks with high future returns. Additionally, the mispricing factors exhibit lower correlations with the Fama-French factors, suggesting that they capture different sources of variation in stock returns.

In conclusion, Stambaugh's (2017) paper presents a novel approach to building factors that are better suited to capturing mispricing in stock returns. This approach has important implications for both academic research and practical applications in asset pricing and portfolio management. By focusing on mispricing factors, investors may be able to identify and exploit mispriced stocks more effectively.

11 Eberhart, A. C., Maxwell, W. F., & Siddique, A. R. (2004). An examination of long-term abnormal stock returns and operating performance following R&D increases. *Journal of Finance*, 59(2), 623-650.

In this paper, Eberhart, Maxwell, and Siddique investigate the long-term stock returns and operating performance of firms that increase their research and development (R&D) expenditures. The authors hypothesize that the stock market may undervalue the benefits of R&D investments, leading to abnormal stock returns for firms that increase their R&D spending.

The study uses a sample of firms that experienced substantial increases in R&D expenditures between 1975 and 1998. The authors examine the stock returns and operating performance of these firms for up to five years after the R&D increase, comparing them to a control group of firms that did not experience significant changes in R&D spending.

Key findings of the study include:

1. Firms with R&D increases experience positive abnormal stock returns for up to five years after the R&D increase. These returns are statistically significant and economically meaningful,

suggesting that the stock market initially underestimates the benefits of increased R&D investments.

2. The positive abnormal stock returns are more pronounced for firms with higher market-to-book ratios and lower institutional ownership, indicating that the undervaluation of R&D investments is more likely to occur in growth firms and those with less institutional investor attention.
3. Firms with R&D increases exhibit improvements in operating performance relative to the control group. This improvement is observed across various measures of operating performance, including return on assets (ROA), gross margin, and sales growth.
4. The improved operating performance following R&D increases is primarily driven by growth in sales and gross margin rather than cost reductions, suggesting that increased R&D investments lead to product and market innovations that enhance firms' revenue-generating capabilities.

In conclusion, Eberhart et al.'s (2004) paper provides evidence that firms that increase their R&D expenditures experience positive long-term abnormal stock returns and improvements in operating performance. The findings suggest that the stock market may initially undervalue the benefits of R&D investments, presenting potential opportunities for investors to exploit this mispricing. The study also highlights the importance of R&D investments for firms' long-term growth and competitiveness.

12 Chan, L. K., Lakonishok, J., & Sougiannis, T. (2001). The stock market valuation of research and development expenditures. *The Journal of Finance*, 56(6), 2431-2456.

In this paper, Chan, Lakonishok, and Sougiannis investigate the relationship between research and development (R&D) expenditures and stock returns. They examine whether the stock market appropriately values R&D investments and assess the long-term implications of R&D on firms' operating performance.

The study uses a sample of U.S. firms from 1975 to 1995, focusing on firms with positive R&D expenditures. The authors employ various portfolio-based and regression-based tests to analyze the relationships between R&D expenditures, stock returns, and operating performance.

Key findings of the study include:

1. Firms with high R&D expenditures, relative to their market capitalization, tend to have lower market-to-book ratios. This finding suggests that the stock market may undervalue the benefits of R&D investments, particularly for high R&D intensity firms.
2. Firms with high R&D intensity experience higher future stock returns. The authors find a positive relationship between R&D intensity and future stock returns, which is robust to various controls, including size, book-to-market ratio, and past returns. This result indicates that the market underreacts to the information contained in R&D investments, leading to abnormal returns for high R&D intensity firms.
3. Firms with high R&D intensity exhibit improvements in operating performance. The study finds that firms with high R&D investments experience higher future sales growth, return on assets (ROA), and gross margin, indicating that R&D investments contribute positively to firms' long-term growth and profitability.

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4. The market's underreaction to R&D investments is more pronounced for firms with low analyst coverage and institutional ownership, as well as for firms in industries with lower R&D intensity. These findings suggest that the market's undervaluation of R&D investments is more likely to occur when there is less public information or attention focused on the firm or industry.

In conclusion, Chan et al.'s (2001) paper provides evidence that the stock market tends to under-value the benefits of R&D investments, particularly for firms with high R&D intensity. The study demonstrates that high R&D intensity firms experience higher future stock returns and improvements in operating performance, highlighting the importance of R&D investments for long-term growth and competitiveness. The findings also suggest potential opportunities for investors to exploit the market's underreaction to R&D expenditures.