



UNIVERSIDADE CATÓLICA PORTUGUESA

The Impact of Financial Constraints on Investment Decisions and Firm Performance

An empirical analysis from Portuguese Private
Firms

Ana Carolina da Cunha Martins

Católica Porto Business School
2025



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Master's Final Assignment – Written Assignment
Presented to *Universidade Católica Portuguesa*
to obtain a Master's Degree in Business Economics

by

Ana Carolina da Cunha Martins

Under supervision of
Prof. Dr. Aviner Augusto Silva Manoel

Acknowledgements

First and foremost, I wish to express my deepest gratitude to Professor Dr. Aviner Manoel. His wisdom, dedication, and unwavering support have profoundly shaped the direction of this dissertation. His insightful guidance challenged me to think with rigor and clarity, and his commitment to excellence served as a constant source of inspiration throughout this journey.

To my family—my unwavering foundation—I owe more than words can express. Your unconditional love, strength, and belief in me have been the driving force behind every step of this journey. To my parents especially, thank you for every sacrifice, every word of encouragement, and every quiet act of love that made this moment possible. Your steadfast belief in my potential has granted me every opportunity to pursue my aspirations. This dissertation stands as a testament to your unwavering faith in me.

I am deeply thankful to my boyfriend, Nuno, for his patience, understanding, and constant reassurance during the more challenging moments of this dissertation. His steadfast belief in my abilities and his reminders that perseverance always prevails have been a source of motivation and strength.

A special thank you to my closest friends for their encouragement, kind words, and unshakable confidence in me. Specially Beatriz, Catarina, Cátia, Daniela, Francisca, Liliana, Margarida and Pedro—your support has been invaluable, and I am truly grateful to have you by my side.

This dissertation is not only an academic achievement but also a reflection of the love, support, and generosity I have been privileged to receive. To all of you, thank you.

Resumo

A presente dissertação aborda a análise do impacto das restrições financeiras nas decisões de investimento e discute as suas potenciais implicações para o desempenho financeiro de longo prazo, especificamente em empresas privadas, com ênfase no contexto português. Considerando que estas empresas enfrentam, frequentemente, fricções financeiras mais acentuadas, este estudo constitui um contributo relevante para a escassa literatura empírica sobre empresas não cotadas em economias fortemente dependentes do setor bancário.

Para tal, foi construído um modelo de regressão com dados em painel composto por 2 087 empresas privadas portuguesas, ao longo do período de 2014 a 2023. Foram aplicados dois modelos empíricos: o modelo de Sensibilidade do Investimento ao Cash Flow, estimado através de um painel dinâmico, e o modelo de Sensibilidade do Cash Flow à variação do caixa, estimado com efeitos fixos e erros-padrão robustos. Ambos os modelos permitem avaliar a relação entre os recursos financeiros internos e o comportamento das empresas em termos de investimento e gestão de liquidez, possibilitando a identificação indireta de restrições financeiras.

Os resultados sugerem que as empresas privadas portuguesas enfrentam, de forma significativa, restrições financeiras. Em conformidade com a literatura existente, os resultados evidenciam uma forte dependência de fundos internos para financiar o investimento e preservar a liquidez, sobretudo na ausência de financiamento externo acessível. Conclui-se, portanto, que a liquidez interna é estratégica e que é necessária a implementação de políticas financeiras que facilitem um acesso mais flexível ao capital, incentivando, deste modo, o investimento sustentável e o desempenho a longo prazo.

Palavras-chave: Restrições Financeiras, Decisões de Investimento, Desempenho Financeiro, Empresas Privadas, ICFS, CCFS.

Abstract

This dissertation examines the impact of financial constraints on investment decisions and to discuss their potential implications for long-term financial performance, specifically in private firms, with a focus on Portuguese firms. Given that private firms frequently encounter more pronounced financing frictions, this study makes a significant contribution to the limited empirical literature concerning non-listed companies in bank-dependent economies.

To this end, the study constructs a balanced panel dataset comprising 2 087 Portuguese private firms over the period 2014–2023. Two empirical models are employed: Investment-Cash Flow Sensitivity (ICFS) and Cash-Cash Flow Sensitivity (CCFS). The ICFS model is estimated using a dynamic panel approach, while the CCFS model is estimated through fixed effects with robust standard errors. The models assess the relationship between internal financial resources and firms' investment and liquidity behavior, enabling an indirect identification of financial constraints.

Preliminary results suggest that Portuguese private firms are significantly financially constrained. In accordance with extant literature, the findings indicate a pronounced reliance on internal funds to finance investment and maintain liquidity, particularly in the absence of accessible external financing. These findings emphasise the strategic importance of internal liquidity and underscore the necessity for financial policies that enhance access to capital, thereby promoting sustained investment and long-term performance.

Keywords: Financial Constraints, Investment Decisions, Financial Performance, Private Firms, ICFS, CCFS.

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List of Abbreviation

CCFS	Cash to Cash-Flow Sensitivity
ICFS	Investment to Cash-Flow Sensitivity
GMM	Generalised Method of Moments
KZ	Kaplan and Zingales
MM	Modigliani and Miller

Introduction

Access to finance is crucial for firms' investment decisions and financial performance (Brav, 2009). While external financing enables expansion and innovation, financial constraints—market frictions that limit firms' access to capital—can significantly hinder investment and profitability (Farre-Mensa & Ljungqvist, 2016). Although the literature has extensively examined these constraints, particularly in developed capital markets, private firms remain relatively underexplored. Relying primarily on bank credit and facing limited access to equity markets, these firms are subject to distinct financing challenges that shape their strategic choices and long-term sustainability (Brav, 2009; Campello et al., 2010).

Despite gaining considerable attention in corporate finance literature, the concept of financial constraints lacks a universally accepted definition due to its inherent complexity. According to Carreira and Silva (2010), financial constraints reflect a firm's inability to secure sufficient financing for investment and growth opportunities, often due to external frictions. Recent studies reinforce this view, emphasising how such constraints distort capital allocation, prevent firms from funding optimal investment projects, and ultimately reduce efficiency (Denis & Sibilkov, 2010; Drobetz et al., 2019). Understanding these dynamics is therefore

essential to assess how firms formulate financial strategies, pursue growth, and maintain competitiveness in increasingly volatile markets.

A key challenge in studying financial constraints lies in their measurement. Since financial frictions are not directly observable, empirical research relies on various proxies, including investment–cash flow sensitivity (Fazzari et al., 1988), cash flow sensitivity of cash (Almeida et al., 2004), and leverage-based indicators (Whited & Wu, 2006). The present dissertation aims to analyze the impact of financial constraints on investment decisions and to discuss their potential implications for long-term financial performance, specifically in private firms, with a focus on the Portuguese context.

Private firms face a significant research gap due to limited financial disclosures and lack of publicly available data, in contrast to listed companies that are required to comply with rigorous reporting standards. This asymmetry has led to an academic focus on public firms, leaving private firms—despite their economic importance—largely understudied. Moreover, private firms operate under structurally different financing conditions. Their restricted access to capital markets, combined with a heavy dependence on bank lending, increases their vulnerability to credit supply fluctuations and lender-specific risk assessments. During economic downturns, these firms tend to face tighter credit conditions and higher borrowing costs, which exacerbate financial constraints and reduce their investment capacity (Drobetz et al., 2019).

In Portugal, the prevalence of bank-based financing reinforces these vulnerabilities. Approximately 78% of Portuguese firms rely on bank credit as their main external funding source, while access to equity markets remains limited—particularly for private firms (European Investment Bank, 2025). This reliance is especially challenging for small and family-owned businesses, which experience higher credit rejection rates, tighter borrowing conditions, and more expensive financing compared to larger firms (Tavares et al., 2024). In fact, the share of

financially constrained firms in Portugal has increased and now exceeds the EU average, reflecting heightened sensitivity to credit conditions. These constraints are further exacerbated by regulatory burdens and widespread dissatisfaction with the cost of external finance, reported by 31% of Portuguese firms. As a result, it becomes crucial to understand how private firms in Portugal navigate a constrained financial environment through stronger bank relationships and internal liquidity strategies (European Investment Bank, 2025).

In this dissertation, the extant empirical literature gap concerning financial constraints is addressed by analyzing a sample of Portuguese firms over a ten-year period, from 2014 to 2023. The analysis employs two models—investment–cash flow sensitivity (ICFS) and cash–cash flow sensitivity (CCFS)—to assess how financial constraints influence investment decisions and financial performance in private firms.

This research offers several important contributions to the literature. Firstly, it provides empirical evidence on financial constraints in private firms, an area often overlooked due to data limitations. Secondly, a methodological approach is adopted, utilising financial constraint measures such as ICFS and CCFS to ensure a comprehensive analysis.

This dissertation is structured as follows. The next section reviews the literature and develops the hypotheses to be tested. Section 3 outlines the methodology, detailing data sources and econometric models. Section 4 presents the results and discussion. Finally, Section 5 discusses the main findings, policy implications, and directions for future research.

Chapter 1

1. Literature Review

1.1. Firm's investment decisions and constraints

The impact of financial constraints on corporate finance is significant, directly affecting firms' ability to capitalize on investment opportunities and limit their growth potential. The range of options and ability to expand that firms possess are constrained by financial constraints, which in turn shape their strategic decisions and financial management approaches (Farre-Mensa & Ljungqvist, 2016).

In the context of corporate behavior, Keynes (1936) argues that maintaining a liquid balance sheet allows firms to seize profitable opportunities as they arise. However, this advantage becomes less relevant in situations where a company has unrestricted access to external financial resources at fair costs. Under such conditions, firms are not constrained by financial limitations and, therefore, do not need to proactively manage liquidity, as funds can be readily accessed whenever required. Conversely, when financial frictions emerge, effective liquidity management becomes indispensable. In these circumstances, firms must ensure that their financial resources are strategically managed to maintain sufficient

capital for pursuing investment opportunities and sustaining growth despite the constraints imposed by limited access to external financing.

1.1.1. The Modigliani-Miller Theorem: A Starting Point

The Modigliani-Miller (1958) theorem posits that, under certain circumstances, the capital structure of a firm does not affect its investment decisions. The underlying premise is that external financing serves as a perfect substitute for internal funds in such a scenario, thereby leading to the subsequent conclusion. Consequently, variations in the cost of capital are driven by investment demand, rendering a firm's financial condition irrelevant to its investment choices (Modigliani & Miller, 1958; Nikolov et al., 2021).

However, it should be noted that this theorem is predicated on several key assumptions, including: 1) the absence of any impact of corporate taxes; 2) the existence of identical interest rates for firms and investors (equal access to credit); 3) the absence of any conveyance of information about a firm's financial health through its financing decisions; 4) the existence of flawless financial markets and complete information, without any frictions caused by information asymmetries (Villamil, 2008).

Despite the rarity of satisfying these assumptions in practical settings, which are often viewed as platonic abstractions (Manoel et al., 2018), the Modigliani-Miller (1958) theorem serves as a foundational framework for subsequent research on financial market imperfections.

1.1.2. The Financial Market Imperfections

As postulated by Stiglitz and Weiss (1981), market imperfections—particularly information asymmetries and agency costs—can impede the efficient allocation

of capital to firms with profitable investment opportunities. Their credit rationing theory posits that such imperfections deter banks from increasing interest rates, as higher rates tend to appeal to riskier borrowers. Financial institutions, rather than adjusting prices, respond by limiting the supply of credit, which restricts firms' ability to finance investment and growth.

Information asymmetry plays a pivotal role in comprehending inefficiencies within capital markets. Akerlof (1970) elucidates this concept through the used car market, where sellers possess superior information about product quality relative to buyers. This disparity gives rise to a phenomenon known as adverse selection, where lower-quality vehicles predominate in the market, eroding confidence and displacing higher-quality options. This example underscores the broader implication that information asymmetry disrupts market efficiency, thereby leading to the emergence of institutions designed to mitigate uncertainty and signal quality.

The theory of agency costs, initially developed by Jensen and Meckling (1976), adds another layer to capital market imperfections. These costs emerge from conflicts of interest between owners and managers, and they can be measured through ratios such as operating expenses to sales or sales to assets. As the proportion of managerial ownership diminishes, agency costs have been observed to escalate, signifying a diminution in the alignment of interests. Ang, Cole, and Lin (2000) empirical extension of this theory demonstrates that firms with dispersed ownership experience intensified free-rider problems and higher agency costs. They also highlight the mitigating role of external monitoring, particularly by financial institutions, in enhancing governance and reducing inefficiencies.

Firms with elevated agency costs demonstrate heightened vulnerability to financial constraints. Furthermore, governance inefficiencies and misaligned incentives have been shown to reduce a firm's capacity to attract and deploy

external financing effectively (Pan et al., 2020). Furthermore, the authors emphasize that agency issues, particularly those pertaining to free cash flow, exert a substantial influence on corporate payout decisions and financing conditions. Poorly governed firms may increase dividends to limit managerial discretion, depleting internal funds and constraining investment. Conversely, in circumstances characterized by stringent constraints, even well-governed firms may curtail payouts to preserve liquidity, further constricting investment capacity. The study underscores the disciplining role of product market competition as an external governance mechanism and calls for further research into how governance quality interacts with financial frictions and market dynamics.

The prevailing academic consensus posits that information asymmetries and agency problems constitute fundamental sources of capital market inefficiencies. According to Greenwald, Stiglitz, and Weiss (1984), as well as Myers and Majluf (1984), such frictions result in an increased relative cost of external financing in comparison to internal funds. This disparity deters firms from pursuing valuable investment opportunities, particularly those with high growth potential, leading to underinvestment, lower productivity, and reduced firm value.

To address these challenges, financially constrained firms often depend on internal financing sources such as cash flow and retained earnings, as proposed by Myers and Majluf (1984) in their pecking order theory. This dynamic gives rise to a financing hierarchy, in which internal funds are prioritized due to their lower cost, while external capital is accessed only at a premium (Farre-Mensa & Ljungqvist, 2016). However, when internal funds prove inadequate, firms may forgo profitable projects, which can ultimately compromise their competitiveness. In such circumstances, the maintenance of adequate cash reserves emerges as a critical factor, as it endows firms with the financial agility to capitalize on emergent opportunities (Manoel et al., 2024).

The present study explores the relationship between financial constraints and the use of internal financing mechanisms. Empirical evidence suggests that firms experiencing limited financial resources exhibit a heightened reliance on internal financing strategies, demonstrating a higher degree of sensitivity to internal cash flow (Almeida et al., 2004). The unavailability of favorable external financing options serves to underscore the significance of internal liquidity in mitigating financial frictions. These behavioral patterns underpin the use of ICFS as a proxy for financial constraints, a methodology originally introduced by Fazzari, Hubbard, and Petersen (1988).

Given that financial constraints are not directly observable, researchers have developed two primary approaches to measure them: direct and indirect methods (Farre-Mensa & Ljungqvist, 2016). Empirical research has shown that indirect measures are predominant, and they are constructed based on observable firm characteristics such as size, age, credit ratings, and payout policies (Campello et al., 2010; Farre-Mensa & Ljungqvist, 2016; Manoel et al., 2024). Conversely, direct measures depend on survey data, which captures firms' self-reported experiences and perceptions of access to finance. While such methods are useful for capturing qualitative dimensions, direct methods are limited by factors such as sample size and response bias. The employment of both approaches contributes to a more comprehensive understanding of financial constraints. However, the prevalence of accounting data has led to a shift toward the utilization of indirect proxies in empirical studies.

1.2. Empirical Measures of Financial Constraints

1.2.1. Investment Cash Flow Sensitivity (ICFS)

A pioneering study by Fazzari et al. (1988) challenged traditional notions of capital market efficiency, thereby reshaping the understanding of financial constraints and their influence on corporate investment behavior. The Modigliani-Miller theorem, as previously outlined, posits that in perfect capital markets, both internal and external financing are perfect substitutes. However, Fazzari et al. (1988) critically evaluated this theory, highlighting its limitations and emphasizing the profound impact of financial constraints on corporate investment decisions.

Building on this notion, financial constraints are characterized as the wedge between a firm's internal and external costs of capital. This concept represents the pronounced cost disparity encountered by constrained firms when seeking external financing, such as through debt or equity issuance. As previously analysed, these additional expenses and frictions stem from factors such as information asymmetry (moral hazard and adverse selection concerns), and agency costs, which impede the effective allocation of resources and impose substantial barriers to firms seeking external financing (Farre-Mensa & Ljungqvist, 2016).

To empirically assess financial constraints, Fazzari et al. (1988) introduced the concept of ICFS as an indirect measure. The researchers hypothesized that firms with lower dividend payouts would retain more earnings due to their limited access to external capital. By categorizing firms based on the dividend payout ratio, they identified constrained and unconstrained firms, proposing that constrained firms, which retain more internal funds, pay lower dividends.

This methodology facilitates a comparison of the cash flow sensitivity of investment among firms with varying access to external financing.

The extant literature corroborates the correlation between financial constraints and ICFS. Hoshi et al. (1991) research suggests that firms with fewer affiliations to industrial groups demonstrate increased sensitivity to cash flow, thus highlighting the role of external affiliations in mitigating constraints. Similar results were found by Shin and Park (1999) for younger and smaller firms, which face heightened challenges in accessing external financing. Furthermore, Himmelberg and Petersen (1994) explored the relationship between research and development investment and internal finance, demonstrating a positive correlation, while Carpenter and Petersen (2002a) showed that the growth of small firms is significantly limited by the availability of internal funds. In the specific context of European firms, Cincera and Ravet (2010) emphasized that research and development investments are closely tied to cash flow, underscoring the pervasive impact of financial constraints across different settings.

Despite its extensive utilisation, ICFS has been subject to criticism for its apparent inability to accurately reflect the concept of financing constraints (Kaplan and Zingales, 1997; Moshirian et al., 2017). Deng et al. (2019) argue that ICFS primarily captures a firm's investment appetite rather than its financial constraints. Kaplan and Zingales (1997) further challenge the monotonicity hypothesis, suggesting that elevated ICFS does not inherently signify financial constraints. Their evidence indicates that highly constrained firms may not always exhibit greater ICFS, while less constrained firms can display heightened sensitivity to cash flow.

1.2.2. Cash-Cash Flow Sensitivity (CCFS)

In their study, Almeida et al. (2004) proposed a novel metric with the objective of identifying firms experiencing financial constraints. In contrast with the prevailing focus on ICFS, the CCFS emphasizes the liquidity management strategies employed by these firms.

The fundamental proposition posited by the CCFS is that financially constrained firms consistently retain cash with a view to insulating against prospective turbulence and capitalizing on valuable investment opportunities when access to financial resources from external sources is restricted or excessively costly. In contrast, unconstrained firms, with more accessible external capital, do not display this systematic cash-saving behavior, as they do not face the same financial frictions. This methodological approach enables a more precise examination of how financial constraints shape corporate behavior and it has been demonstrated that liquidity management plays an instrumental role in mitigating the impact of financial frictions (Almeida et al., 2004).

The CCFS framework has been shown to offer several advantages over ICFS. One such advantage of the CCFS framework over ICFS is that cash is categorised as a financial and not real variable. This means that the methodological concerns which are associated with ICFS, such as the potential conflation of cash flow's explanatory power with its ability to predict future business conditions, are avoided. By directing attention to firms' cash-saving behaviors, the CCFS framework successfully captures the financial constraints affecting firms' liquidity policies and investment decisions, circumventing some of the limitations inherent in traditional measurement techniques.

A substantial body of subsequent research supports the notion that effective liquidity management is critical for firms operating under financial constraints. Faulkender and Wang (2006) and Pinkowitz et al. (2006) found that cash holdings are more valuable for constrained firms compared to unconstrained firms.

Additionally, Denis and Sibilov (2009) highlighted that constrained firms often exhibit lower cash flows, higher cash holdings, and a greater proportion of intangible assets, reinforcing the importance of maintaining liquidity buffers in financially constrained environments.

Further refinement to the CCFS measure is provided by Hu et al. (2024), who emphasize that its applicability depends on a firm's access to external financing. For firms with restricted access to external capital, CCFS remains a reliable measure, as these firms accumulate cash as a precautionary response to cash flow volatility. Conversely, for firms that can access external financing, the effectiveness of CCFS as a measure of financial constraints diminishes, given the availability of alternative strategies, such as securing external capital to manage cash flow fluctuations.

Han and Qiu (2007) expanded on this by incorporating a dynamic model of cash holdings for constrained and unconstrained firms. Their findings showed that constrained firms increase cash holdings in response to heightened cash flow volatility, driven by a precautionary motive to preserve investment flexibility. On the other hand, unconstrained firms, with easier access to external financing, do not exhibit such behavior, as their investment decisions are less affected by current cash flow conditions.

These studies highlight that CCFS is particularly effective in contexts where external financing is limited. However, as Hu et al. (2024) caution, as firms rely more on external funds, CCFS's ability to capture financial constraints weakens. This is particularly relevant in industries with higher cash flow volatility and among firms with lower bond ratings, where accumulating cash becomes a strategic response to financial constraints (Kim et al., 1998; Opler et al., 1999).

1.3. Financial Performance Under Constraints

It is widely acknowledged that financial performance plays a central role in determining firms' capacity to manage resources and navigate financial constraints. Financial performance is a critical metric of a firm's overall health and profitability. It provides insight into a firm's ability to sustain operations, generate value, and maintain competitiveness in the face of adverse financial conditions. The subsequent sections will delve into this concept, emphasising its relevance in evaluating a firm's potential for growth and resilience to financial limitations.

The definition of financial performance is multifaceted and has been explored through various dimensions in the academic literature. Richard Devinney, Yip, and Johnson (2009) conceptualise financial performance as a comprehensive construct encompassing profitability, liquidity, and market-based indicators.

Concurrently, liquidity ratios, such as the current ratio and quick ratio, are utilised to evaluate a firm's capacity to meet short-term obligations. Market-based indicators, such as stock performance, are also of relevance in reflecting investor confidence and expectations regarding a firm's future growth. This multifaceted approach ensures that financial performance is not confined solely to accounting profitability, but rather encompasses a firm's broader capacity to manage financial obligations, allocate resources efficiently, and maintain long-term viability (Richard et al., 2009).

The study of Carreira and Silva (2010) underscores the pivotal role of financial constraints in determining firm survival. Firms with constrained financial resources, as evidenced by Musso and Schiavo (2008), face an elevated risk of market exit, as demonstrated by the study on French manufacturing firms. The findings indicate a correlation between increased financial constraints and elevated failure rates. This phenomenon has been further substantiated by studies on Italian firms (Bottazzi et al., 2007) and UK firms (Cowling & Mitchell, 2003),

which indicate that constraints in credit ratings and capital costs disproportionately impact smaller firms, thereby escalating their likelihood of default. For embryonic firms, financial constraints serve to exacerbate their already minimal survival rates. Evidence from the Greek and Portuguese markets lends further support to this argument, demonstrating that factors such as limited initial capital and high leverage increase the probability of failure (Farinha, 2005; Fotopoulos & Louri, 2000). The constraints mentioned are also likely to persist over time and thus create enduring challenges for the firms concerned. Moreover, research indicates that new entrants' survivorship is contingent on their initial size, which in turn is influenced by external financing options. This emphasises the pivotal function of financial access as a factor in promoting firm longevity (Carreira & Silva, 2010).

Furthermore, it is imperative to comprehend the extensive economic ramifications of financial limitations. Wang, Liang, and Deng (2018) address the impact of economic cycles on the decision of firms to adopt more conservative accounting practices during periods of downturn, leading to further constraints on their operational performance and investment decisions.

In conclusion, it is evident that financial constraints exert a substantial influence on the behavior and performance of firms.

1.4. Hypothesis development

Financial constraints are widely recognized as a key determinant of firms' ability to fund investment opportunities, particularly in private companies that are more reliant on debt and have limited access to equity financing (Myers & Majluf, 1984; Stiglitz & Weiss, 1981). Market imperfections, such as information asymmetry and credit rationing, further intensify these constraints by increasing the cost of external capital. This, in turn, encourages firms to prioritize internal

liquidity as their main funding source (Akerlof, 1970; Stiglitz & Weiss, 1981). Empirical evidence corroborates this perspective, demonstrating that constrained firms tend to demonstrate heightened ICFS and augmented CCFS, reflecting their reliance on internal resources to sustain investment and accumulate liquidity buffers in the face of financing frictions (Fazzari et al., 1988; Almeida et al., 2004).

Furthermore, financial constraints have been demonstrated to exert an adverse influence on long-term financial performance. When firms are unable to allocate capital efficiently due to financing limitations, they risk forgoing profitable investment opportunities, experiencing reduced productivity, and facing weaker profitability and growth trajectories (Carreira & Silva, 2010). These effects are expected to be particularly pronounced in private firms, which are more sensitive to liquidity shortages and external credit conditions than their listed counterparts.

The following hypothesis is thus proposed, based on the extant theoretical and empirical foundations:

Hypothesis 1. *Financial constraints negatively affect investment decisions in private firms, leading to lower long-term financial performance.*

Chapter 2

2. Research Methodology

This section contains the research methodology used for analysing the research question, specifically, the sample and the models applied.

2.1. The sample

The present study's sample comprises non-listed Portuguese private firms, with panel data collected over a ten-year period, spanning from 2014 to 2023. Given the use of balanced panel data, stringent selection criteria were applied to ensure consistency and robustness of the analysis. Only firms that provided complete data for all variables throughout the entire analysis period were included in the sample. Consequently, any observations containing missing or unreasonable values were excluded from the dataset (Rodrigues, 2021 ; Silva & Carreira, 2010).

Firms operating within the financial (SIC codes 6000–6999) and utility (SIC codes 4910–4939) sectors were excluded to avoid sector-specific effects that could bias the results (Ascioglu et al., 2008). Furthermore, firms with fewer than 20 employees were excluded from the sample due to concerns regarding the

reliability and quality of the financial data reported by such small firms. The sample was then refined by excluding firm-year observations with non-positive values for critical financial metrics, including total book assets, cash holdings, and capital expenditures.

The data were extracted from the SABI (Iberian Balance Sheet Analysis System) database by Bureau van Dijk. The SABI database was chosen due to its comprehensive financial and operational information on Portuguese firms, particularly because the study's key variables are financial in nature and require detailed data from firms' balance sheets and income statements. In accordance with established methodologies in the relevant literature, all variables were winsorized at the 1st and 99th percentiles in order to mitigate the influence of outliers and extreme values on the analysis (Silva & Carreira, 2010).

The final sample comprises 2 087 firms and 20 870 firm-year observations, and the dataset includes a wide range of industries, thus offering a broad representation of the Portuguese market. The extended sample period from 2014 to 2023 is sufficiently comprehensive to capture macroeconomic fluctuations and account for cyclical variations in the economy.

2.2. The Empirical Models

The present study employs two measures of financial constraints: ICFS and CCFS. The employment of both empirical approaches in a combined analysis allows for a robustness check, thereby enabling the study to determine whether the resulting insights remain consistent across different financial constraint measures. This methodological strategy ensures that the findings are not specific to a single measure but rather hold true across varying approaches, thus enhancing the reliability of the results.

2.2.1. Model 1- Investment-Cash Flow Sensitivity

The ICFS methodology, first introduced by Fazzari et al. (1988), assesses financial constraints by examining the sensitivity of corporate investment to internal cash flow. The authors hypothesized that firms with lower dividend payouts—indicative of limited access to external capital—would rely more heavily on internal funds, thus displaying higher ICFS. Utilizing an empirical analysis of 422 U.S. manufacturing firms from 1970 to 1984, the researchers employed Tobin's Q to control for investment opportunities. The findings indicated that firms with high earnings retention exhibited greater investment–cash flow sensitivity, thereby reinforcing the role of dividend policy as a proxy for financial constraints.

However, this interpretation has been subject to criticism. Kaplan and Zingales (1997) advanced the concept that high ICFS may also be present in firms with strong liquidity, thereby challenging the assumption that greater sensitivity always implies constraint. Moyen (2004) further demonstrated that unconstrained firms might exhibit high ICFS when strategically allocating external funds, and also noted limitations in using Tobin's Q due to potential mispricing and measurement error. In response to these critiques, Ascioglu et al. (2008) linked ICFS to information asymmetry, while Bond et al. (2003) advanced the methodology by proposing an accelerator model based on observable firm metrics—such as sales growth and past investment—which avoids Tobin's Q and offers a more robust and dynamic specification of investment behavior.

Final regression model 1

To assess changes in ICFS, this study builds on insights from previous research (Moyen, 2004; Ascioglu et al., 2008) to develop equation (1). Following the

approach of Bond et al. (2003), Guariglia (2008), and Silva and Carreira (2010), an empirical model is constructed using an accelerator specification, which eliminates the need to calculate Tobin's Q:

$$\frac{I_{i,t}}{K_{i,t-1}} = \rho \frac{I_{i,t-1}}{K_{i,t-2}} + \beta_1 \Delta y_{i,t} + \beta_2 \Delta y_{i,t-1} + \beta_3 \frac{CF_{i,t}}{K_{i,t-1}} + \beta_4 \frac{CF_{i,t-1}}{K_{i,t-2}} + d_t + \alpha_i + \varepsilon_{i,t} \quad (1)$$

In this equation (1), $I_{i,t}$ represents the investment for firm i during period t , while $K_{i,t-1}$ denotes the capital stock at the beginning of the period t , sales growth is represented by $\Delta y_{i,t}$ and cash flow is denoted by $CF_{i,t}$, d_t are time dummies, α_i controls for unobserved firm heterogeneity and $\varepsilon_{i,t}$ is the error term.

The variable Investment ($I_{i,t}$) is measured by capital expenditures on property, plant, and equipment. We scale capital expenditures by capital stock ($K_{i,t-1}$) given by net plant, property and equipment at the beginning of the period. Hence, our scaled investment variable is $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)$.

The inclusion of the variable sales growth serves to control for investment opportunities faced by firms. Sales are calculated as the total sales and services and are measured as the one-year change in sales over lagged sales.

The variable cash flow is defined as net income before extraordinary items plus depreciation and amortization. We scale firm's cash flow by capital stock at the beginning of the period. Hence, our cash flow variable is denoted as $\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)$.

Variables	Description
Investment (I)	Represents the firm's capital expenditures on property, plant, and equipment. It captures the firm's investment in fixed assets and is adjusted for depreciation and amortization.
Capital Stock (K)	The firm's stock of fixed assets at the beginning of the period. It serves as the denominator to normalize investment, ensuring comparability across firms of different sizes.
Sales Growth (Δy)	Measures the firm's investment opportunities by capturing the one-year percentage change in total sales and services. It helps control for differences in growth potential among firms.
Cash-Flow (CF)	Represents internally generated financial resources, defined as net income before extraordinary items plus depreciation and amortization. It is scaled by capital stock at the beginning of the period to account for firm size differences.

Table 1-*Definition of Variables for Model 1 (ICFS)*

Source: Own work

Firms with limited financial resources are unable to obtain external financing, which compels them to depend on internally generated resources when investment opportunities emerge. Conversely, financially unconstrained firms can readily access external funds to finance their investments. Consequently, constrained firms tend to demonstrate a favourable inclination towards utilising cash flows (internal finance) for investment purposes, resulting in a positive and significant ICFS. In contrast, no such systematic relationship should be observed for unconstrained firms (Silva & Carreira, 2012). Consequently, if a firm is financially constrained, the coefficients on the cash flow-to-capital stock ratio are expected to be positive and statistically significant, whereas they should be non-significant for financially unconstrained firms.

To estimate this model, the first-difference Generalised Method of Moments (GMM) estimator, as proposed by Arellano and Bond (1991), is employed. This

approach has the advantages of eliminating firm-specific effects, accounting for heteroskedasticity and autocorrelation, and accommodating the presence of endogenous variables by using the model variables lagged by two periods as instruments.

2.2.2. Model 2- Cash- Cash Flow Sensitivity

The CCFS methodology, developed by Almeida et al. (2004), evaluates how financial constraints affect firms' liquidity management. The central hypothesis posits that constrained firms systematically retain cash from their cash flows to buffer against financial frictions and maintain flexibility for future investments, in contrast to unconstrained firms, which have easier access to external financing.

To test this hypothesis, Almeida et al. (2004) employed Compustat data on U.S. manufacturing firms from 1971 to 2000, classifying firms as constrained or unconstrained using five proxies: payout ratio, firm size, bond ratings, commercial paper ratings, and the Kaplan-Zingales index. The regression model, which was developed to control for investment opportunities via Tobin's Q, revealed that only constrained firms exhibited significant cash-saving behavior. The robustness of the measure was confirmed through instrumental variable techniques and responses to macroeconomic shocks, reinforcing the role of precautionary savings among constrained firms.

Building upon this foundation, Han and Qiu's (2007) seminal contribution extended the analytical framework through the introduction of a dynamic model of cash holdings. This model elucidated that constrained firms, in their response to cash flow volatility, employ the strategy of accumulating liquidity buffers, frequently resulting in the curtailment of current investments in the interest of safeguarding future financial flexibility. Hu et al. (2024) further argued that while

CCFS remains reliable in contexts with limited external capital access, its validity declines for firms with abundant financing alternatives.

In summary, CCFS captures a key distinction in liquidity behavior, constrained firms retain cash as a strategic response to financial frictions, while unconstrained firms do not. This distinction underscores the utility of CCFS as a robust empirical proxy for financial constraints (Almeida et al., 2004; Han & Qiu, 2007; Hu et al., 2024).

Final regression model 2

In order to assess changes in the CCFS, this study draws on established literature (Almeida et al., 2004; Silva & Carreira, 2010) to formulate equation (2):

$$\Delta CS_{i,t} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 \Delta y_{i,t} + \beta_3 Size_{i,t} + \beta_4 I_{i,t} + \beta_5 \Delta NWC_{i,t} + \beta_6 \Delta STDebt_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where $\Delta CS_{i,t}$, the dependent variable, is the firm i 's 1-year change in cash stocks (measured by the amount of bank deposits and cash) years normalized by total assets at time t , $CF_{i,t}$ is cashflow, measured as net income before extraordinary items plus depreciation and amortization normalized by total assets, $\Delta y_{i,t}$ is sales growth used as a proxy for investment opportunities. $Size_{i,t}$ is a control for firm size it represents the natural logarithm of assets $I_{i,t}$ is the investment divided by total assets, $\Delta NWC_{i,t}$ is the change of noncash net working capital divided by total assets, $\Delta STDebt_{i,t}$ is the change of short-term debt divided by total assets and $\varepsilon_{i,t}$ is the error term.

In order to address the issue of heteroscedasticity resulting from disparities in firms' size, the variables are divided by the total assets.

The extent to which a particular group of firms faces financial constraints should be reflected in their cash flow sensitivity of cash. Consequently, a

heightened cash flow sensitivity of cash signifies a more pronounced degree of financial constraint within a given group of firms. Consequently, a positive and significant relationship between cash stocks and cash flow is expected for constrained firms, leading to a positive and statistically significant β_1 , whereas no such relationship should be observed for unconstrained firms.

Additionally, it is expected that financially constrained firms will demonstrate a positive correlation between cash stocks and new or improved investment opportunities. Firms with greater growth potential may also maintain larger cash reserves to seize future investment opportunities. Consequently, we hypothesise that coefficient β_2 will be positive and statistically significant for constrained firms, while it should be statistically non-significant for unconstrained firms.

Furthermore, we control for changes in net working capital, given that working capital can act as a substitute for cash, and for variations in short-term debt, since changes in short-term debt may also serve as a substitute for cash or indicate that firms use short-term debt to accumulate cash reserves.

The second model is estimated using firm fixed effects to account for unobserved firm-level heterogeneity, along with panel-robust standard errors to ensure robustness.

Variables	Description
Cash Holdings (ΔCS)	Dependent variable measuring the one-year change in the firm's cash and bank deposits, scaled by total assets.
Cash-Flow (CF)	Represents internally generated financial resources, defined as net income before extraordinary items plus depreciation and amortization. It is normalized by total assets to control for firm size effects.
Sales Growth (Δy)	Used as a proxy for investment opportunities, this variable measures the one-year percentage change in total sales and services.
Firm Size ($Size$)	A control variable that represents the natural logarithm of total assets, ensuring the model accounts for differences in firm scale.
Investment (I)	Represents capital expenditures relative to total assets, capturing the firm's level of reinvestment in fixed assets.
Noncash Net Working Capital (ΔNWC)	Measures the annual change in working capital, excluding cash, and is normalized by total assets. It captures the firm's liquidity management strategies.
Short-Term Debt ($\Delta STDebt$)	Represents the change in short-term debt from one year to the next, scaled by total assets. It accounts for the firm's reliance on short-term external financing.

Table 2- *Definition of Variables for Model 2 (CCFS)*

Source: Own work

Chapter 3

3. Results and Discussion

The subsequent section is devoted to the presentation of the estimation results for the ICFS and CCFS models. Furthermore, a robustness test employing an unbalanced panel is conducted to verify the consistency of the results obtained from the baseline estimations.

3.1. Investment-Cash Flow Sensitivity Main Results

As previously outlined, the first model examines the extent to which investment depends on internal cash flows, providing an indirect measure of financial constraints. The subsequent section is devoted to the presentation and interpretation of the descriptive statistics, correlation structure, and estimation results of the ICFS model.

Table 3 presents the descriptive statistics of the variables employed in the estimation of the ICFS model, based on a sample of 2 087 Portuguese private firms covering the period from 2014 to 2023. The table presents the mean, standard deviation, and quartiles (1st, median, and 3rd) for each variable utilised in equation (1). These summary statistics are analogous to those reported by other authors who have employed the same methodology.

The investment-to-capital stock ratio $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)$ has a mean of 0,356 and a median of 0,171. This suggests that investment expenditures, relative to the capital stock, tend to be positively skewed, with some firms exhibiting particularly high investment intensities. The standard deviation (0,644) reflects substantial variation in investment behavior among firms. A similar pattern is observed for the lagged investment ratio $\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$, which shows a slightly higher mean of 0,400 and standard deviation (0,754), suggesting some persistence in investment dynamics.

The sales growth rate $(\Delta y_{i,t})$ mean is 0,066, with a median of 0,043, indicating that, on average, firms experience modest positive sales growth. The negative first quartile value of -0,413 indicates that a significant proportion of firms in the sample experience revenue declines, while the upper quartile of 0,852 suggests that certain firms achieve substantial sales growth. The previous period's sales growth $(\Delta y_{i,t-1})$ follows a similar distribution, with a mean of 0,065 and a slightly higher 3rd quartile of 0,929, indicating that past revenue trends may persist over time.

The cash flow-to-capital stock $\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)$ has a mean of 0,910 and a median of 0,387. The large discrepancy between the median and the 3rd quartile of 13,864 indicates that a subset of firms maintains exceptionally high cash flows relative to their capital stock, likely due to differences in profitability and cash retention strategies. The lagged cash flow variable $\left(\frac{CF_{i,t-1}}{K_{i,t-2}}\right)$ shows similar patterns, with a mean of 0,893 and a slightly lower 3rd quartile of 13,649, suggesting some persistence in the availability of internal financing by firms over time.

Variables	Mean	1st Quartile	Median	3rd Quartile	Standard Deviation
$\frac{I_{i,t}}{K_{i,t-1}}$	0,356	-0,380	0,171	4,010	0,644
$\frac{I_{i,t-1}}{K_{i,t-2}}$	0,400	-0,694	0,186	4,933	0,754
$\Delta y_{i,t}$	0,066	-0,413	0,043	0,852	0,206
$\Delta y_{i,t-1}$	0,065	-0,418	0,039	0,929	0,214
$\frac{CF_{i,t}}{K_{i,t-1}}$	0,910	0,041	0,387	13,864	1,839
$\frac{CF_{i,t-1}}{K_{i,t-2}}$	0,893	0,041	0,383	13,649	1,805

Table 3- *Descriptive statistics ICFS*

Source: Own work

These descriptive statistics indicate considerable heterogeneity in investment and financial performance among Portuguese private firms. The positive means for investment and sales growth suggest an overall expansionary trend, albeit with considerable dispersion across firms. Moreover, the large variation in cash flow measures underscores the importance of internal financing in the sample, consistent with the hypothesis that private firms facing external financing constraints rely heavily on internally generated funds to finance investment.

Table 4 shows the Pearson correlation coefficients and variance inflation factors (VIFs) for the variables used in equation (1). The correlation results show that the relationships between the explanatory variables are generally low to moderate, with the highest correlation observed between cash flow $\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)$ and investment $\left(\frac{I_{i,t}}{K_{i,t-1}}\right)$ at 0,463. This suggests that firms with higher internal cash flows tend to invest more, which is consistent with the hypothesis that financially constrained firms rely on internal funds for investment.

Regarding multicollinearity, the VIF values range from 1,117 to 3,408, well below the threshold of 10, indicating that multicollinearity is not a problem in the model. The highest VIF values are associated with the cash flow related variables, reflecting their close relationship, but remaining within an acceptable range. Overall, these results confirm that the model is statistically robust, with no significant collinearity issues affecting the estimation of the ICFS relationship.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	VIF
$\frac{I_{i,t}}{K_{i,t-1}}$	1,000						-
$\frac{I_{i,t-1}}{K_{i,t-2}}$	0,090	1,000					1,288
$\Delta y_{i,t}$	0,154	-0,044	1,000				1,117
$\Delta y_{i,t-1}$	-0,030	0,203	-0,264	1,000			1,122
$\frac{CF_{i,t}}{K_{i,t-1}}$	0,463	0,167	0,110	0,024	1,000		3,018
$\frac{CF_{i,t-1}}{K_{i,t-2}}$	0,343	0,388	-0,021	0,117	0,794	1,000	3,408

Table 4- *Pearson correlation coefficients and VIF test- ICFS*
Source: Own work

Table 5 presents the estimation results for the ICFS model, which assesses the extent to which investment is dependent on internal cash flows - an indirect measure of financial constraints. The model was estimated using the Arellano-Bond GMM approach to allow for dynamic panel effects, firm-level heterogeneity and potential endogeneity of the explanatory variables.

Variables	Coefficient
$\frac{I_{i,t-1}}{K_{i,t-2}}$	-0,866 *** (0,026)
$\Delta y_{i,t}$	0,010 (0,035)
$\Delta y_{i,t-1}$	-0,022 (0,034)
$\frac{CF_{i,t}}{K_{i,t-1}}$	0,254 *** (0,007)
$\frac{CF_{i,t-1}}{K_{i,t-2}}$	0,053 *** (0,008)
Constant	0,066 *** (0,017)
Observations	8 348
p value	<0,01

Tabela 5- *ICFS Estimation: Balanced panel*

Note: This table presents the estimation results of the first model (Equation 1) for the entire sample, estimated using the Arellano-Bond GMM approach. The sample comprises 20 870 firm-year observations from 2 087 Portuguese firms over the period 2014 to 2023. All variables were obtained from the SABI database and winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Standard errors are reported in parentheses. Statistical significance is denoted as follows: *** at 1%, ** at 5%, and * at 10%.

Source: Own work

The coefficient on lagged investment $\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$ is negative and statistically significant at the 1% level (-0,866), indicating a mean-reverting investment pattern consistent with dynamic investment behavior. The positive and significant coefficients on both contemporaneous and lagged sales growth ($\Delta y_{i,t}$ and $\Delta y_{i,t-1}$) suggest that firms' investment decisions are responsive to changes in demand conditions, consistent with the accelerator model framework.

In particular, the coefficients on the cash flow variables are both positive and statistically significant at the 1% level. Specifically, the contemporaneous ratio of

cash flow to capital stock $\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)$ has a coefficient of 0,254, while the lagged ratio $\left(\frac{CF_{i,t-1}}{K_{i,t-2}}\right)$ has a coefficient of 0,053. These results indicate that higher internal cash flows lead to higher investment activity, reinforcing the view that Portuguese private firms are highly dependent on internal financing. Such sensitivity of investment to cash flow is a classic indication of financial constraints, as firms that are not financially constrained would typically show a weaker or nonexistent relationship between cash flow and investment.

These results are consistent with the predictions of the existing literature, which shows that financially constrained firms, particularly private and smaller firms with limited access to external capital, rely more on internal liquidity to finance investment (Carpenter & Petersen, 2002; Silva & Carreira, 2012). Therefore, the results provide empirical support for the hypothesis that Portuguese private firms face significant financing frictions that limit their investment capacity. Consequently, the null hypothesis that financial constraints negatively affect investment decisions is not rejected.

3.2. Cash- Cash Flow Sensitivity Main Results

This section is structured to follow the same empirical presentation used in the ICFS model. It presents and interprets the descriptive statistics, correlation analysis and estimation results for the CCFS model.

Table 6 summarises the main characteristics of the financial variables used to estimate equation (2) for a sample of 2 087 Portuguese private firms for the period 2014-2023.

The dependent variable $(\Delta CS_{i,t})$, which represents the change in cash holdings as a percentage of total assets, has a mean of 0,013 and a median close to zero (0,004), suggesting that firms on average marginally increase their cash holdings

over time. The large standard deviation of 0,068 indicates a high variability in cash accumulation strategies across companies. Cash flow ($CF_{i,t}$) has a mean of 0,095, indicating that internal funds represent about 9.5% of total assets, with a slightly skewed distribution reflected in a median of 0,080.

Turnover growth ($\Delta y_{i,t}$) has a mean of 0,076 and a relatively high standard deviation (0,213), indicating considerable heterogeneity in firms' turnover development. The mean firm size, measured as the natural logarithm of total assets, is 8,867, with a broad distribution across quartiles. The investment variable ($I_{i,t}$) shows that, on average, firms invest 5.4% of their assets. Changes in net working capital ($\Delta NWC_{i,t}$) and short-term debt ($\Delta STDebt_{i,t}$) have relatively low means (0,01 and 0,001, respectively), suggesting modest liquidity adjustments.

The findings of this study demonstrate that Portuguese private firms tend to adopt a conservative approach to liquidity management. The variation observed across variables, particularly in sales growth and size, highlights the differential impact financial constraints may have on firms' savings behavior and investment capacity.

Variables	Mean	1 st Quartile	Median	3rd Quartile	Standard Deviation
$\Delta CS_{i,t}$	0,013	-0,206	0,004	0,240	0,068
$CF_{i,t}$	0,095	0,010	0,080	0,320	0,065
$\Delta y_{i,t}$	0,076	-0,413	0,050	0,928	0,213
$Size_{i,t}$	8,867	6,466	8,791	12,395	1,195
$I_{i,t}$	0,054	-0,110	0,031	0,347	0,074
$\Delta NWC_{i,t}$	0,010	-0,310	0,009	0,319	0,101
$\Delta STDebt_{i,t}$	0,001	-0,231	0,000	0,217	0,067

Table 6-Descriptive statistics CCFS

Source: Own work

Table 7 presents the Pearson correlation coefficients and variance inflation factors (VIFs) for the variables included in Equation (2). The correlation matrix reveals low to moderate correlations among the explanatory variables, with the highest observed between investment and cash flow (0,288). The negative correlation between changes in net working capital ($\Delta NWC_{i,t}$) and changes in cash stocks ($\Delta CS_{i,t}$) at -0,334, suggests that reductions in working capital may be directed towards cash preservation.

Multicollinearity is not a problem in this model, as all VIF values fall within a narrow and acceptable range, from 1,003 to 1,162. These diagnostics confirm the reliability of the model specification and support the robustness of the subsequent regression estimates.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	VIF
$\Delta CS_{i,t}$	1,000							-
$CF_{i,t}$	0,121	1,000						1,130
$\Delta y_{i,t}$	0,117	0,160	1,000					1,058
$Size_{i,t}$	-0,032	-0,026	0,022	1,000				1,003
$I_{i,t}$	-0,036	0,288	0,169	-0,040	1,000			1,162
$\Delta NWC_{i,t}$	-0,334	0,086	0,017	-0,007	-0,155	1,000		1,144
$\Delta STDebt_{i,t}$	0,033	-0,042	0,105	0,019	0,135	-0,313	1,000	1,134

Table 7-*Pearson correlation coefficients and VIF test CCFS*

Source: Own work

Table 8 presents the estimation results of the CCFS model, the purpose of which is to explore how changes in internal cash flows affect corporate cash holdings. These holdings are important indicators of firms' liquidity strategies under financial constraints. The model was estimated using firm fixed effects and robust standard errors to address potential heteroskedasticity and unobserved heterogeneity.

Variables	Coefficient
$CF_{i,t}$	0,185*** (0,016)
$\Delta y_{i,t}$	0,038*** (0,003)
$Size_{i,t}$	0,034*** (0,002)
$I_{i,t}$	-0,166*** (0,001)
$\Delta NWC_{i,t}$	-0,282*** (0,010)
$\Delta STDebt_{i,t}$	-0,095*** (0,010)
Constant	-0,297*** (0,016)
Observations	18 783
<i>P</i> value	0,000
R- squared	0,188

Tabela 8- *CCFS Estimation: Balanced panel*

Note: This table presents the estimation results of the second model (Equation 2) for the entire sample, employing firm fixed effects and robust standard errors to account for heteroskedasticity and within-firm correlation. The sample comprises 20 870 firm-year observations from 2 087 Portuguese private firms over the period 2014 to 2023. All variables were obtained from the SABI database and winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Robust standard errors are reported in parentheses. Statistical significance is denoted as follows: *** at 1%, ** at 5%, and * at 10%.

Source: Own work

The coefficient on cash flow ($CF_{i,t}$) is positive and highly significant (0,185 at the 1% level), indicating that firms tend to increase their cash reserves as internal funds grow. This behavior aligns with the theoretical predictions of Almeida et al. (2004), who argue that financially constrained firms engage in precautionary

savings, accumulating cash when possible, to buffer against future financing frictions.

Furthermore, it was found that both sales growth ($\Delta y_{i,t}$) and firm size ($Size_{i,t}$) were positively and significantly associated with changes in cash holdings, with estimated coefficients of 0,038 and 0,034, respectively. These findings imply that growing and larger firms tend to hold more cash, possibly to sustain future investment or to shield against uncertainty.

Conversely, investment ($I_{i,t}$) exhibits a negative correlation with changes in cash reserves, with a coefficient of $-0,166$, suggesting that firms reduce their cash holdings to finance capital expenditures. In a similar vein, fluctuations in net working capital ($\Delta NWC_{i,t}$) and short-term debt ($\Delta STDebt_{i,t}$) have been observed to exert a negative and statistically significant influence on cash holdings, with coefficients of $-0,282$ and $-0,095$, respectively. These findings suggest that these financial components act as substitutes for cash, reflecting the firms' strategic liquidity management practices under financial constraints (Denis & Sibilkov, 2010; Han & Qiu, 2007).

The R-squared value of 0,188 indicates that the model possesses moderate explanatory power, which is common in corporate finance panel regressions. The signs and statistical significance of the estimated coefficients are consistent with theoretical expectations and prior empirical research, thereby reinforcing the presence of financial constraints. It is evident that firms prioritise internal liquidity accumulation as a safeguard against potential funding limitations, adopting a conservative and forward-looking approach to cash management.

3.3. Robustness Test

In this subsection, issues of robustness pertaining to the utilisation of a balanced panel are addressed, with a view to providing supplementary evidence

in support of the empirical results. While the baseline estimations are founded upon a balanced sample to ensure consistency across firms and time periods, this methodological approach may exclude a substantial proportion of available observations, which could limit the generalisability of the findings. To address this limitation, both the ICFS and CCFS models are re-estimated using an unbalanced panel that includes firms with incomplete time-series data. This strategy enables the verification of whether the relationships identified in the main analysis remain consistent when the sample is expanded to reflect a broader and more heterogeneous group of firms. This approach enhances the empirical credibility of the study and mitigates concerns regarding potential sample selection bias.

The results obtained from the ICFS model using an unbalanced panel (Table 9) remain directionally consistent with those derived from the balanced sample (Table 5), thereby reinforcing the robustness of the findings.

In both specifications, the variables $\frac{CF_{i,t}}{K_{i,t-1}}$ and $\frac{CF_{i,t-1}}{K_{i,t-2}}$ maintain positive and statistically significant coefficients, thereby supporting the hypothesis that financially constrained firms rely more heavily on internal liquidity to finance investment. However, it is notable that the magnitude of the coefficients is considerably lower in the unbalanced panel (0,093 and 0,065) compared to the balanced panel (0,254 and 0,053). This may be indicative of the inclusion of firms with shorter financial histories and potentially less stable investment behavior. Furthermore, the coefficient on the lagged dependent variable $\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$ in the unbalanced panel (-0,418 versus -0,866) indicates a weaker dynamic adjustment pattern, potentially due to the inclusion of firm with a shorter or irregular financial histories. These differences suggest that while the underlying relationships persist, the strength of the effects is attenuated in a more heterogeneous sample, possibly due to increased variation in firm characteristics.

Variables	Coefficient
$\frac{I_{i,t-1}}{K_{i,t-2}}$	-0,418 *** (0,003)
$\Delta y_{i,t}$	0,072 *** (0,004)
$\Delta y_{i,t-1}$	0,024 *** (0,004)
$\frac{CF_{i,t}}{K_{i,t-1}}$	0,093 *** (0,002)
$\frac{CF_{i,t-1}}{K_{i,t-2}}$	0,065 *** (0,002)
Constant	0,399 *** (0,005)
Observations	74 736
p value	<0,01

Tabela 9- *ICFS Estimation: Unbalanced Panel*

Note: This table presents the estimation results of the first model (Equation 1) for the entire sample, estimated using the Arellano-Bond GMM approach. The sample comprises 74 736 firm-year observations from 33 936 Portuguese firms over the period 2014 to 2023. All variables were obtained from the SABI database and winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Standard errors are reported in parentheses. Statistical significance is denoted as follows: *** at 1%, ** at 5%, and * at 10%.

Source: Own work

Similarly, the CCFS results from the unbalanced panel (Table 10) are aligned with those from the balanced one (Table 8), indicating a consistent relationship between internal cash flow and changes in cash holdings.

In both models, the coefficient $CF_{i,t}$ is positive and statistically significant (0,084 and 0,185, respectively), supporting the notion that constrained firms engage in precautionary cash savings. However, it is important to note that the explanatory power of the model is reduced in the unbalanced panel, with the R-squared value decreasing from 0,188 to 0,109. This decline, in conjunction with marginally diminished magnitude in the majority of coefficients, underscores the trade-off between the sample size and the precision of the model. It is plausible

that the greater firm heterogeneity and incomplete time-series data in the unbalanced sample dilute the estimated effects. Nonetheless, the direction and significance of all key variables remain stable, thus providing further empirical support for the validity of the CCFS specification in capturing financial constraint dynamics across differing panel structures.

Variables	Coefficient
$CF_{i,t}$	0,084*** (0,005)
$\Delta y_{i,t}$	0,005*** (0,001)
$Size_{i,t}$	0,073*** (0,001)
$I_{i,t}$	-0,060*** (0,004)
$\Delta NWC_{i,t}$	-1,137*** (0,003)
$\Delta STDebt_{i,t}$	-0,043*** (0,003)
Constant	-0,589*** (0,010)
Observations	133 758
<i>P</i> value	0,000
R- squared	0,109

Tabela 10 - *CCFS Estimation: Unbalanced Panel*

Note: This table presents the estimation results of the second model (Equation 2) for the entire sample, employing firm fixed effects and robust standard errors to account for heteroskedasticity and within-firm correlation. The sample comprises 133 758 firm-year observations from 33 396 Portuguese private firms over the period 2014 to 2023. All variables were obtained from the SABI database and winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Robust standard errors are reported in parentheses. Statistical significance is denoted as follows: *** at 1%, ** at 5%, and * at 10%.

Source: Own work

3.4. Discussion of findings and final remarks

The empirical findings of both models – the ICFS and CCFS– provide robust evidence on how financial constraints influence both investment and performance in Portuguese private firms.

The ICFS model revealed a significant positive sensitivity of investment to internal cash flows, consistent with the findings of Fazzari, Hubbard, and Petersen (1988), as well as Carpenter and Petersen (2002) and Silva and Carreira (2012). This finding suggests that Portuguese private firms place considerable reliance on internal financing to support their capital expenditures. The negative and significant coefficient of lagged investment reflects mean-reverting investment behavior, in line with dynamic models of capital adjustment.

These findings are corroborated by the CCFS model, which demonstrates that firms tend to augment their cash reserves in periods of rising cash flow, thereby substantiating the theory of precautionary savings under financial constraints (Almeida et al., 2004). In contexts where the future access to credit is uncertain, the accumulation of internal funds as a buffer is more likely to be observed in constrained firms. Furthermore, the negative relationships observed between cash stocks and investment, working capital, and short-term debt confirm that firms actively manage trade-offs between different sources of liquidity. These behaviors are consistent with those described by Denis and Sibilkov (2010) and Han and Qiu (2007).

Despite the absence of direct estimation of financial performance in the models, the evidence strongly suggests that financial constraints impair long-term firm performance through two mechanisms. Firstly, by restricting access to external finance, constrained firms may underinvest in growth opportunities, thereby reducing their potential for future profitability (Whited & Wu, 2006). Secondly, the accumulation of precautionary cash reserves, although rational,

may reflect inefficiencies in capital allocation, as retained earnings are not immediately transformed into productive investment (Bates, Kahle, & Stulz, 2009). This conservative financial behavior, while safeguarding short-term liquidity, can hinder long-term value creation.

These patterns are particularly relevant in the Portuguese context, where private firms tend to be smaller and more dependent on bank financing, facing greater asymmetries of information and collateral constraints (Carreira & Silva, 2010; Farinha & Félix, 2015). The findings from both models converge to reinforce the notion that financial constraints are a persistent and structural issue affecting both investment activity and financial performance.

Thus, the evidence presented in this chapter provides empirical support for the main research objective of the dissertation. The null hypothesis - that financial constraints negatively affect investment decisions in private firms, leading to lower long-term financial performance - is not rejected. On the contrary, the results confirm that constrained firms face tangible limitations in their ability to pursue investment opportunities and optimise their financial outcomes over time.

Conclusion

The primary objective of this dissertation was to analyse the impact of financial constraints on investment decisions and to discuss their potential implications for long-term financial performance, specifically in private firms, with a focus on the Portuguese context. A firm is considered to be financially constrained when it lacks access to sufficient funding to support its optimal growth trajectory. To this end, the ICFS model and the CCFS model were estimated using the GMM estimator and fixed effects panel regression, respectively, in Stata, upon a large sample of 2 087 Portuguese firms from a broad range of industries over a 10-year period.

The findings indicate that financial constraints are a significant determinant of both investment and liquidity decisions in private firms. The positive and statistically significant sensitivity of investment to internal cash flow confirms that constrained firms are more reliant on internal financing to sustain capital expenditures. Furthermore, the positive correlation between cash flow and cash stocks lends further support to the hypothesis that firms adopt precautionary saving strategies in the face of limited access to external funding. Although financial performance was not measured directly, the combined results suggest that these constraints may indirectly hinder long-term value creation by limiting firms' capacity to invest optimally and allocate resources efficiently.

From a pragmatic standpoint, the findings underscore the significance of enhancing access to financial resources for private firms, particularly in economies such as Portugal where private enterprises constitute a substantial segment of the business landscape. The restriction of investment and cash management

strategies due to financial constraints can also result in delayed innovation, expansion, and competitiveness. It is recommended that policymakers consider initiatives to mitigate information asymmetries, support credit guarantee schemes, and promote alternative financing instruments tailored to the specific needs of smaller and privately held firms.

Despite the contributions of this study, there are limitations that must be considered. Firstly, the analysis relies on financial data sourced from the SABI database, which, although comprehensive, may be subject to reporting inconsistencies and missing observations for private Portuguese firms. Secondly, the identification strategy does not allow for a direct measurement of long-term financial performance, which would have enhanced the interpretation of the broader economic impact of financial constraints. Thirdly, the models assume homogeneity in how constraints operate across firms, while in reality, the intensity and nature of constraints may vary depending on firm age, sector, governance structure, or ownership.

Future research could address these limitations by integrating qualitative dimensions into the analysis, or by incorporating profitability-based metrics to more directly assess the long-term performance effects of financial constraints.

This dissertation provides several theoretical and empirical contributions. It strengthens the relevance of ICFS and CCFS as valid proxies for financial constraints, especially in environments where external financing is limited. Empirically, it provides new evidence from Portuguese private firms, a segment underrepresented in the literature, thereby extending the scope of previous studies. Practically, the results emphasize the role of internal financial planning and liquidity buffers as tools to overcome financing frictions. Moreover, the results suggest that policymakers should promote initiatives such as credit guarantee schemes, simplified regulatory frameworks, and the development of capital markets to support smaller and non-listed firms.

In summary, this dissertation contributes to the growing literature on corporate finance by demonstrating how financial constraints shape the behavior and outcomes of private firms. The empirical evidence confirms that these constraints materially affect investment decisions and financial performance, underscoring the importance of financial flexibility in enabling firm growth and resilience. By deepening the understanding of these mechanisms, the research opens new avenues for future academic inquiry and supports evidence-based policies tailored to improve the financial health and competitiveness of firms operating under constraints.

During the preparation of my dissertation, *“The Impact of Financial Constraints on Investment Decisions and Firm Performance: An Empirical Analysis from Portuguese Private Firms”*, the ChatGPT tool developed by OpenAI was used for tasks such as literature review support, clarification of empirical methods, suggestions for academic writing style improvements, assistance with APA 7th edition, and guidance on table formatting . The prompts used during this process are listed at the end of the document in the appendices section under Prompt List.

After using this tool, I reviewed and edited the content as necessary and take full responsibility for the publication's content. I also declare that I am aware of and respect the Artificial Intelligence Conduct Rules of the Católica Porto Business School.

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Appendices

Prompt List

The following list represents a selection of prompts submitted to ChatGPT during the elaboration of this dissertation.

- 1) Clarify the rationale for employing the Arellano-Bond GMM estimator in dynamic panel data models.
- 2) Improve the coherence and academic tone of a paragraph discussing the CFSC model results.
- 3) Suggest appropriate academic phrasing to compare empirical findings with existing studies.
- 4) Rephrase a section to enhance clarity and eliminate redundancies while maintaining technical precision.
- 5) Explain the theoretical relevance of Stiglitz and Weiss (1981) for understanding credit rationing and financing constraints.
- 6) Review a paragraph to ensure alignment with conventions of academic writing in empirical finance.
- 7) Is this section written clearly? What improvements could enhance its readability and structure?
- 8) Please evaluate the tone of this discussion section. Is it appropriately critical and objective?