

7525618-corporate-liquidity-and-firm-resilience-during-monetary-tightening-cycles

SUMMARY: This study examines whether firms with higher cash holdings during periods of monetary tightening exhibit stronger resilience in terms of investment, shareholder payouts, financial stability, market risk, and profitability compared to firms with lower liquidity reserves. The research uses difference-in-differences regressions with firm and year fixed effects, lagged industry-adjusted cash holdings, firm-level controls, and firm-clustered standard errors. The study covers publicly traded non-financial and non-utility firms in the United States from 2002 to 2024, distinguishing three monetary tightening cycles (2004-2006, 2015-2018, and 2022-2023) from non-tightening years. The findings indicate that firms with higher cash holdings show stronger investment, payout, financial-stability, market-risk, and profitability outcomes during tightening periods.

METHOD: The study employs difference-in-differences regressions with firm and year fixed effects, lagged industry-adjusted cash holdings, firm-level controls, and firm-clustered standard errors. The data used is a panel of up to 90,988 firm-year observations for publicly traded non-financial and non-utility firms in the United States from 2002 to 2024, distinguishing three monetary tightening cycles from non-tightening years. The analysis also includes entropy balancing, a residual excess-cash specification, two-way clustering, and dynamic event-study methodology using Stata 18.

KEY FINDINGS:

- Firms with higher cash holdings show stronger investment outcomes during tightening periods.
- Firms with higher cash holdings exhibit stronger payout outcomes during tightening periods.
- Firms with higher cash holdings display stronger financial-stability outcomes during tightening periods.
- Firms with higher cash holdings show lower market-risk outcomes during tightening periods.
- Firms with higher cash holdings exhibit stronger profitability outcomes during tightening periods.

IMPLICATION FOR TRADING: The findings suggest that maintaining higher levels of corporate liquidity can enhance a firm's resilience during periods of monetary tightening. Practitioners can use this information to develop strategies that focus on maintaining sufficient cash reserves, which can help mitigate the negative effects of monetary tightening on investment, payouts, financial stability, market risk, and profitability. Additionally, this research can inform policymakers and regulators about the importance of corporate liquidity in ensuring financial stability and resilience during economic downturns.

Corporate Liquidity and Firm Resilience During Monetary Tightening Cycles

Md Maruf Ul ALAM,  PhD Student, Department of Finance, Sam M. Walton College of Business, University of Arkansas, USA

Toufiq NAZRUL,  PhD, Brennen School of Business, Washburn University, USA

Md Asif Ul ALAM (corresponding author, alam@kutztown.edu),  PhD, Department of Business Administration, College of Business, Kutztown University of Pennsylvania, USA

Type of manuscript:
research paper

Received June 25, 2026

Accepted August 16, 2026

Published September 21, 2026

Keywords: cash holdings;
monetary tightening;
financial flexibility;
corporate resilience;
financial distress;
investment policy.

JEL Classification: G32;
E52; G31; G33; E44.

Founder and Publisher:
Academic Research and
Publishing UG (i.G.),
Germany

Abstract: Restrictive monetary policy raises borrowing costs, tightens credit conditions, and can weaken corporate investment, shareholder distributions, financial stability, market risk, and operating performance, making liquidity a critical source of resilience to financing shocks and an important moderator of monetary-policy transmission. Although prior research has extensively examined the determinants and valuation effects of corporate cash holdings, evidence remains limited on whether liquidity reserves simultaneously strengthen multiple dimensions of corporate resilience during Federal Reserve monetary tightening cycles. This study examines whether firms classified as High Cash on the basis of lagged industry-adjusted cash holdings display stronger investment, payout, financial-stability, market-risk, and profitability outcomes during tightening periods than firms with lower liquidity reserves. The underlying panel contains up to 90,988 firm-year observations for publicly traded non-financial and non-utility firms in the United States from 2002 to 2024 and distinguishes the monetary tightening cycles of 2004–2006, 2015–2018, and 2022–2023 from non-tightening years. Difference-in-differences regressions with firm and year fixed effects, lagged industry-adjusted cash holdings, firm-level controls, and firm-clustered standard errors are complemented by entropy balancing, a residual excess-cash specification, two-way clustering, and dynamic event-study estimation in Stata 18. In the baseline models, the High Cash $\times$ Tightening interaction is positive and significant at the 1% level for capital expenditures (0.005), total shareholder payouts (0.002), the natural logarithm of the Altman Z-score (0.091), and return on assets (0.018), whereas the negative coefficient for equity volatility (−0.021) indicates lower market risk. Entropy-balanced estimates remain closely aligned with the baseline results, at 0.005 for capital expenditures, 0.003 for payouts, 0.098 for financial stability, −0.024 for equity volatility, and 0.020 for operating performance, reducing concerns that observable firm differences drive the findings. The residual excess-cash specification likewise yields interaction estimates of 0.006, 0.003, 0.067, −0.008, and 0.014 across the five outcomes, while two-way clustered inference remains significant, and the reported pre-treatment coefficient at event −2 is statistically insignificant for four of the five outcomes, with the financial-stability estimate significant and therefore requiring cautious interpretation. Overall, greater corporate liquidity is associated with stronger resilience across investment, shareholder distributions, financial stability, market risk, and profitability under restrictive monetary conditions, while the findings point to a potentially important firm-level dimension of monetary-policy transmission and open avenues for further research on heterogeneity across industries, financing constraints, governance structures, and monetary-policy regimes.

Cite as: Alam, M. M. U., Nazrul, T., & Alam, M. A. U. (2026). Corporate liquidity and firm resilience during monetary tightening cycles. *Financial Markets, Institutions and Risks*, 10(3), 28–48. [https://doi.org/10.61093/fmir.10\(3\).28-48.2026](https://doi.org/10.61093/fmir.10(3).28-48.2026).

INTRODUCTION

Monetary tightening is a central instrument of macroeconomic stabilization policy. When inflationary pressures increase, central banks typically raise policy interest rates to moderate aggregate demand and restore price stability. Although such actions are necessary for controlling inflation, they also alter the financial conditions under which firms operate. Higher interest rates increase borrowing costs, reduce the present value of investment opportunities, and may restrict firms' access to external capital. Consequently, periods of monetary tightening can create significant challenges for firms seeking to sustain investment, shareholder payouts, financial stability, operating performance, and overall resilience.

The effects of monetary tightening are particularly important for the corporate sector because firms differ substantially in their capacity to absorb financing shocks. Some firms possess sufficient internal financial resources to continue operating and investing despite unfavorable credit conditions, whereas others depend heavily on external financing and may be required to reduce expenditures when borrowing becomes more costly. These differences influence not only firm-level outcomes but also broader economic activity. Firms that maintain investment and operations during restrictive monetary environments continue to support capital formation, productivity, innovation, and employment. In contrast, widespread reductions in corporate spending may amplify the real effects of monetary tightening and weaken economic growth.

Corporate liquidity may be an important determinant of firms' ability to withstand restrictive financial conditions. Recent evidence also suggests that firms with greater cash holdings are better able to absorb the effects of higher interest rates through lower net interest expenses and stronger investment resilience (Ahn et al., 2024). Cash and short-term investments provide immediately available resources that do not depend on current capital-market conditions. When external financing becomes costly or difficult to obtain, firms with substantial liquidity reserves may be better positioned to finance productive investments, meet financial obligations, sustain shareholder payouts, reduce market

uncertainty, and avoid operational disruptions. Corporate cash holdings may therefore function as a financial buffer that enables firms to adapt to rising borrowing costs and tighter credit conditions.

The importance of this issue has increased following the substantial changes in U.S. monetary policy over the past two decades. The Federal Reserve implemented three major interest-rate hiking cycles during the study period: June 2004 to June 2006, December 2015 to December 2018, and March 2022 to July 2023 (Blinder, 2023; Board of Governors of the Federal Reserve System, n.d.). Although these episodes occurred under different macroeconomic conditions, each involved sustained increases in policy rates and a corresponding tightening of financing conditions. The most recent cycle was particularly pronounced, as the Federal Reserve raised interest rates rapidly in response to post-pandemic inflation. These episodes provide an economically relevant setting in which to evaluate whether firms with substantial liquidity reserves are better able to withstand restrictive monetary environments.

The resilience of the corporate sector is also closely linked to financial stability and the transmission of monetary policy. Recent Federal Reserve Financial Stability Reports emphasized that the condition of corporate balance sheets and firms' ability to meet their financial obligations are important components of overall financial-system stability, particularly during periods of elevated interest rates and tighter financial conditions (Board of Governors of the Federal Reserve System, 2023, 2024). When firms lack sufficient liquidity, higher financing costs may lead to reduced investment, weaker shareholder payouts, greater financial vulnerability, heightened market uncertainty, and deteriorating operating performance. Conversely, stronger corporate liquidity positions may moderate these responses, thereby reducing the amplification of monetary-policy shocks through the corporate sector.

Although an extensive literature has examined the determinants and value of corporate cash holdings, existing research has focused primarily on financial crises, recessions, firm-specific financing constraints, or individual corporate outcomes. Comparatively little evidence is available on whether corporate

liquidity enables firms to remain resilient during deliberate monetary tightening episodes, when financing conditions deteriorate because of policy-induced increases in interest rates. Moreover, prior studies have typically evaluated the benefits of liquidity through a single outcome, such as investment, firm value, or financing decisions, providing only a partial view of corporate resilience. Consequently, less is known about whether cash holdings simultaneously support multiple dimensions of firm performance and moderate the transmission of restrictive monetary policy through the corporate sector.

Against this background, the aim of this study is to examine whether corporate cash holdings enhance firm resilience during Federal Reserve monetary tightening cycles. Using a sample of publicly traded U.S. non-financial and non-utility firms from 2002 to 2024, the study compares firms with high cash holdings with firms possessing lower liquidity reserves during three major monetary tightening episodes. Firm resilience is evaluated across five complementary dimensions: investment activity, shareholder payouts, financial stability, market risk, and operating performance. Employing a difference-in-differences framework, complemented by extensive robustness analyses and event-study evidence, the study provides a comprehensive assessment of whether internal liquidity enables firms to adapt to restrictive financing conditions and sustain economically important activities when the cost of external capital rises. In doing so, the study contributes to the literature on corporate liquidity, corporate resilience, and monetary-policy transmission by identifying internal liquidity as an important firm-level mechanism through which firms respond to restrictive monetary policy.

LITERATURE REVIEW

Theoretical Background

The role of corporate cash holdings is commonly explained through the concept of financial flexibility. Financial flexibility refers to a firm's ability to access and deploy financial resources in response to unexpected shocks, financing constraints, and investment opportunities (DeAngelo & DeAngelo,

2007; Denis, 2011). Firms with greater financial flexibility can adjust to changes in their operating and financing environments without making substantial reductions in productive activities. Cash holdings represent an important source of such flexibility because they provide immediately available funds that can be used without issuing securities or obtaining additional debt.

Financial flexibility becomes particularly valuable when external financing conditions deteriorate. During monetary tightening, increases in policy interest rates are transmitted to corporate borrowing costs and credit availability. Firms that rely heavily on bank financing or debt markets may therefore face higher interest expenses, more restrictive lending standards, and reduced access to credit. Firms with substantial internal liquidity are less dependent on these external sources and may be able to maintain their planned activities despite unfavorable capital-market conditions.

The pecking order theory provides a related explanation for the value of corporate liquidity. According to Myers (1984) and Myers and Majluf (1984), firms generally prefer internal financing to debt and prefer debt to equity because external financing involves information asymmetry, issuance costs, and potential adverse-selection problems. When monetary tightening increases the cost of debt and reduces the availability of external funds, the relative value of internal financing increases. Cash-rich firms can use accumulated liquidity to fund investment and operations without incurring the additional costs associated with external capital.

The precautionary motive offers another theoretical basis for holding cash. Firms accumulate cash to protect themselves against uncertainty, cash-flow shortfalls, and future financing constraints (Almeida et al., 2004; Han & Qiu, 2007; Han & Wang, 2023). More recent evidence also suggests that the relation between uncertainty and corporate liquidity depends on firms' governance characteristics and agency considerations (Javadi et al., 2021).

Precautionary cash reserves are especially valuable when firms cannot be certain that external financing will remain available on acceptable terms. Monetary tightening creates such an environment by increasing borrowing costs and uncertainty regarding future credit availability. Cash reserves

may therefore help firms absorb temporary shocks, meet contractual obligations, and avoid costly adjustments to investment and operations.

The financial-constraints literature has similarly emphasized the importance of internal resources. [Fazzari et al. \(1988\)](#) argued that firms facing greater financing frictions rely more heavily on internally generated funds to finance investment. The credit-channel literature has further suggested that monetary-policy tightening affects real economic activity partly by weakening firms' balance sheets and limiting access to external financing ([Gertler & Gilchrist, 1994](#); [Bernanke & Gertler, 1995](#)). These effects are likely to be stronger among firms with limited internal liquidity, because such firms have fewer alternative financing resources when credit conditions become restrictive.

From a financial-distress perspective, cash reserves can reduce firms' vulnerability to earnings declines, refinancing pressures, and unexpected cash-flow disruptions. Liquidity provides a cushion that enables firms to service debt, meet short-term obligations, and avoid financially costly responses when operating conditions deteriorate. Consistent with this view, conservative financial policies and stronger liquidity positions are associated with greater financial stability and lower distress risk. For example, [Alam et al. \(2025\)](#) documented that founder-led utility firms maintain stronger liquidity positions, lower leverage, and greater financial stability, highlighting the role of internal financial resources in supporting organizational resilience.

Taken together, financial-flexibility theory, pecking order theory, the precautionary motive, and the financial-constraints literature suggest that cash holdings can reduce firms' dependence on external capital markets. This buffering capacity may allow firms to sustain investment, preserve shareholder payouts, strengthen financial stability, reduce market risk, and maintain operating performance when monetary conditions become restrictive.

Cash Holdings, Monetary Tightening, and Investment Resilience

Corporate investment is particularly sensitive to financing conditions because many investment projects require substantial current expenditures

while producing benefits over an extended period. Firms facing external financing constraints may be required to postpone or abandon profitable projects when internally generated funds are insufficient. Consequently, the availability of cash can influence whether firms are able to maintain investment when credit conditions deteriorate.

Prior studies have shown that firms accumulate cash to finance investment opportunities, manage uncertainty, and reduce dependence on costly external capital ([Opler et al., 1999](#); [Azar et al., 2016](#); [Duong et al., 2020](#)). [Amess et al. \(2015\)](#) and [Deng and Yao \(2021\)](#) further demonstrated that the value of corporate cash depends partly on the financing circumstances of the firm, implying that liquidity becomes more valuable when external financing is costly.

Research on capital-structure decisions has also suggested that firms manage financing and liquidity policies to preserve financial flexibility and reduce the risk of being unable to finance future activities ([Akhter & Maruf-Ul-Alam, 2019](#)).

Evidence from periods of financial disruption indicates that limited access to external finance can generate meaningful reductions in corporate investment. [Campello et al. \(2011\)](#) showed that firms relied on both internal liquidity and credit lines during the financial crisis and that access to liquidity helped support corporate spending. [Das et al. \(2024\)](#) documented a decline in corporate investment following the financial crisis, particularly among firms with limited internal financial resources. These findings indicate that liquidity can help firms avoid underinvestment when external capital becomes difficult to obtain.

Although monetary tightening differs from a financial crisis, it can create similar financing pressures through higher borrowing costs and more restrictive lending conditions. Firms with limited cash reserves may therefore reduce capital expenditures or postpone growth opportunities when interest rates rise. Cash-rich firms, by contrast, may use internal liquidity to continue financing productive projects. Accordingly, the following hypothesis is proposed:

H1: Firms with high cash holdings maintain higher investment levels during monetary tightening periods than firms with lower cash holdings.

Cash Holdings and Shareholder Payouts

Shareholder payout policy represents another important dimension of financial flexibility. Firms distribute cash to shareholders primarily through cash dividends and share repurchases, both of which reduce internally available liquidity. During periods of monetary tightening, rising interest rates increase borrowing costs and may limit access to external financing. Consequently, firms facing tighter financing conditions may reduce shareholder distributions to preserve internal funds for investment, debt servicing, and operating needs.

Prior studies have suggested that payout decisions reflect firms' financial capacity and expectations about future cash flows. Past research indicated that payout decisions are closely connected to firms' broader financing, investment, incentive, and risk-management policies (Farre-Mensa et al., 2014). Brav et al. (2005) further documented that managers place considerable importance on maintaining stable payout policies because unexpected reductions may convey unfavorable information to investors.

Although dividends have traditionally received greater attention, share repurchases have become an increasingly important component of corporate payout policy, allowing firms greater flexibility in returning cash to shareholders.

The ability to sustain shareholder payouts during monetary tightening should therefore depend partly on firms' liquidity positions. Rising financing costs increase the opportunity cost of external capital and may require firms with limited internal liquidity to conserve cash by reducing distributions. Firms holding substantial cash reserves, however, possess greater financial flexibility to continue rewarding shareholders while simultaneously funding investment opportunities and meeting financial obligations. Accordingly, maintaining higher shareholder payouts during restrictive monetary conditions can be viewed as an indicator of financial strength and organizational resilience.

Accordingly, the following hypothesis is proposed:

H2: Firms with high cash holdings maintain higher shareholder payouts during monetary tightening periods than firms with lower cash holdings.

Cash Holdings, Financial Stability, and Market Risk

Financial stability reflects a firm's ability to meet its financial obligations, withstand adverse shocks, and avoid financial distress. Cash holdings can strengthen financial stability by providing readily available resources when operating cash flows decline or refinancing becomes more difficult. This benefit is likely to be particularly important during periods of monetary tightening, when rising interest rates increase debt-servicing costs and restrict access to external financing.

Acharya et al. (2007) argued that cash serves as an effective hedge against financing shocks because it provides internal funding precisely when external capital becomes costly or unavailable. Denis and Sibilkov (2010) similarly showed that cash holdings enhance firms' ability to continue investing while reducing financial vulnerability under financing constraints. These findings suggest that liquidity reserves improve firms' capacity to withstand restrictive monetary environments without experiencing severe financial distress.

Financial stability, however, represents only one dimension of corporate resilience. Market participants continuously assess firms' exposure to risk and incorporate expectations about future financial performance into stock prices. Consequently, market-based measures provide complementary evidence on firms' ability to withstand restrictive monetary conditions. Equity return volatility reflects investors' perceptions of uncertainty regarding firms' future cash flows, financing capacity, and overall financial prospects. Periods of monetary tightening may increase market uncertainty because higher interest rates raise financing costs, reduce expected growth opportunities, and increase refinancing risk. Firms possessing substantial internal liquidity may therefore experience lower equity-return volatility because investors perceive them as better able to absorb adverse financing shocks, maintain stable operations, and preserve financial flexibility.

By jointly examining an accounting-based measure of financial stability, $\ln(Z\text{-Score})$, and a market-based measure of risk, equity volatility, this study provides a more comprehensive assessment of

whether corporate liquidity enhances resilience during restrictive monetary environments. While financial stability captures firms' underlying solvency and financial health, equity volatility reflects investors' assessments of firms' ability to withstand adverse financing conditions. Considering both measures therefore provides complementary evidence on whether liquidity reserves strengthen corporate resilience during monetary tightening.

Accordingly, the following hypothesis is proposed:

H3: Firms with high cash holdings exhibit stronger financial stability and lower market risk during monetary tightening periods than firms with lower cash holdings.

Cash Holdings and Operating Performance

Operating performance represents firms' ability to maintain profitable business activities despite adverse financing conditions. Monetary tightening can weaken operating performance indirectly when financing constraints force firms to reduce investment, employment, inventories, research and development, or other expenditures that support future revenues. Higher interest rates may also reduce demand and increase firms' overall cost burden.

Cash holdings can protect operating performance by enabling firms to avoid disruptive financial adjustments. Firms with adequate liquidity can continue financing working-capital needs, maintain productive assets, and pursue profitable opportunities even when external funds become costly. Consequently, firms with greater liquidity are better positioned to sustain business activities and preserve operating performance during periods of financial stress. By reducing dependence on costly external financing, liquidity enhances firms' ability to adapt to adverse economic conditions while maintaining financial flexibility.

The relationship between financing structure and firm performance is also supported by evidence showing that firms' financial policies influence profitability and operational efficiency ([Islam & Maruf-Ul-Alam, 2021](#)). When financing shortages compel firms to delay projects or reduce necessary expenditures, future performance may decline.

Conversely, liquidity reserves allow firms to respond to changing market conditions without abandoning value-enhancing activities.

During monetary tightening, cash-rich firms should therefore experience fewer operational disruptions and maintain stronger profitability than firms with limited liquidity. This leads to the following hypothesis:

H4: Firms with high cash holdings exhibit superior operating performance during monetary tightening periods compared with firms with lower cash holdings.

Identification of the Research Gap

The accumulated literature has established that cash holdings can support financial flexibility, reduce financing constraints, and help firms respond to adverse economic shocks. However, much of the existing evidence examined the determinants of cash holdings, the valuation of liquidity, firm-specific financial constraints, or corporate behavior during financial crises and recessions. Financial crises generally involve abrupt disruptions to financial intermediation, severe uncertainty, and broad declines in economic activity. Deliberate monetary tightening is conceptually different: it represents a policy-driven increase in interest rates intended to moderate inflation and aggregate demand. Despite its importance for corporate financing, there remains limited direct evidence on whether liquidity reserves enable firms to withstand these purposeful and sustained increases in the cost of capital.

A second limitation is that prior studies have commonly evaluated the value of liquidity through a single corporate outcome, such as investment, financing, or firm value. Corporate resilience, however, cannot be fully captured by one measure. A firm may maintain investment while experiencing greater financial distress or preserve profitability by sharply reducing dividends and long-term expenditures.

Consequently, evaluating only one response may provide an incomplete assessment of whether the firm is genuinely resilient. A multidimensional analysis is needed to determine whether the associations between corporate liquidity and resilience extend simultaneously to investment

continuity, payout stability, financial stability, market risk, and operating performance.

A third unresolved issue concerns the connection between corporate liquidity and the transmission of monetary policy. Existing research on the credit channel explains how tighter monetary policy affects firms through borrowing costs, balance-sheet strength, and credit availability. However, less is known about whether cash reserves moderate these effects across several areas of corporate decision-making within a unified empirical framework. Establishing this connection is important because firm-level responses to monetary tightening can collectively influence capital formation, financial-system stability, and real economic activity.

The present study addresses these gaps by examining whether high-cash firms demonstrate stronger resilience during three Federal Reserve monetary tightening cycles. It evaluates resilience across investment activity, shareholder payouts, financial stability, market risk, and operating performance. By bringing these complementary outcomes together within a common difference-in-differences framework and supporting the identification strategy with an event-study analysis, the study provides a comprehensive assessment of whether corporate liquidity buffers firms against the financing pressures associated with restrictive monetary policy.

METHODOLOGY

Sample Selection and Data Sources

The sample consists of publicly traded U.S. firms from 2002 to 2024 obtained from the Compustat database. Following standard practice in the corporate finance literature, financial firms (Standard Industrial Classification (SIC) codes 6000–6999) and utility firms (SIC codes 4900–4999) are excluded because their cash management practices, regulatory environments, and capital structures differ substantially from those of non-financial corporations. Observations with missing values required for a particular specification are also excluded from the analysis. The resulting panel contains up to 90,988 firm-year observations, with

the estimation sample varying across outcomes according to variable availability.

To identify periods of restrictive monetary policy, this paper focuses on three major Federal Reserve interest-rate hiking cycles: June 2004–June 2006, December 2015–December 2018, and March 2022–July 2023 (Blinder, 2023; Board of Governors of the Federal Reserve System, n.d.). Because the empirical analysis is conducted at the firm-year level, the Tightening indicator equals one for observations in 2004–2006, 2015–2018, and 2022–2023, and zero otherwise. This annual classification represents a temporal approximation of monetary-policy cycles that began or ended within individual calendar years and should not be interpreted as implying that every month within each designated year was marked by an identical monetary-policy regime. These periods are characterized by sustained increases in the federal funds rate and tightening financial conditions that raise the cost of external financing. Consistent with prior research on monetary policy shocks, these episodes provide a useful setting for examining whether firms with greater liquidity reserves exhibit stronger resilience when financing conditions become restrictive.

Financial statement information is obtained from Compustat, while stock return data used to construct the equity volatility measure are obtained from the Center for Research in Security Prices (CRSP) database. Variables are winsorized at the 1st and 99th percentiles to mitigate the influence of extreme observations.

Measurement of Cash Holdings

The primary variable of interest is *Cash Holdings*, measured as cash and short-term investments divided by total assets. To account for industry-specific differences in corporate liquidity policies, this study first constructs industry-adjusted cash holdings, calculated as the difference between a firm's cash ratio and the median cash ratio of firms within the same industry-year. *High Cash* is then defined as an indicator equal to one if a firm's lagged industry-adjusted cash holdings fall within the highest quartile of the industry-year distribution and zero otherwise.

As a robustness test, this study employs an alternative measure based on excess cash holdings. Excess cash holdings are estimated as the residuals from a regression of cash holdings on firm characteristics, including firm size, market-to-book ratio, leverage ratio, net working capital, cash flow ratio, capital expenditures, dividend payer status, and year fixed effects. Firms whose lagged excess cash holdings fall within the highest quartile of the industry-year distribution are classified as High Cash under the alternative specification.

Measures of Corporate Resilience

Corporate resilience is treated as a multidimensional concept encompassing a firm's ability to sustain investment activity, preserve shareholder distributions, maintain financial stability, limit market risk, and preserve operating performance during adverse economic conditions. Accordingly, this paper evaluates corporate resilience across five complementary measures.

Investment resilience is measured using the Capital Expenditures Ratio (*CapEx*), calculated as capital expenditures divided by total assets. Firms that maintain investment spending during tightening periods are considered more resilient because they avoid underinvestment despite higher financing costs.

Payout stability is measured using *Total Payout*, calculated as the sum of cash dividends and share repurchases divided by total assets. Firms that maintain shareholder payouts during tightening periods are considered more financially resilient because they continue returning capital to shareholders despite more restrictive financing conditions.

Financial stability is assessed using the Altman Z-score (Altman, 1968), a widely used indicator of corporate financial health and bankruptcy risk. Higher Z-scores indicate greater solvency and a lower likelihood of financial distress. Because the Z-score is highly skewed, the analysis uses its natural logarithm, $\ln(\text{Z-Score})$. As the natural logarithm is defined only for positive values, observations with non-positive Altman Z-scores are treated as missing before applying the logarithmic transformation. Consequently, 17,168 observations, equivalent to approximately 18.9% of the full sample of 90,988

firm-year observations, are excluded from the $\ln(\text{Z-Score})$ analysis, which is therefore restricted to observations with positive Altman Z-scores.

Market risk is measured using *Equity Volatility*, calculated as the annualized standard deviation of monthly stock returns within each fiscal year. Lower equity volatility reflects lower uncertainty in firm value and indicates that firms are less vulnerable to fluctuations in capital markets during periods of monetary tightening.

Operating resilience is measured using Return on Assets (*ROA*), calculated as net income divided by total assets. Firms that maintain profitability during tightening cycles are considered more resilient to adverse financing conditions.

Because corporate resilience is not directly observable, the joint examination of investment resilience, payout stability, financial stability, market risk, and operating performance provides a broader assessment of its financial and operational dimensions.

Empirical Methodology

Following the growing corporate finance literature employing quasi-experimental approaches (Bertrand et al., 2004; Angrist & Pischke, 2009), this paper uses a difference-in-differences (DiD) framework to examine whether firms with high cash holdings exhibit greater resilience during periods of monetary tightening. The DiD approach compares changes in resilience outcomes between firms with high cash holdings and firms with lower cash holdings during Federal Reserve tightening cycles while controlling for time-invariant firm characteristics and common macroeconomic shocks through firm and year fixed effects.

The treatment group consists of firms classified as High Cash, defined as firms whose lagged industry-adjusted cash holdings fall within the highest quartile of the industry-year distribution. Using one-year lagged cash holdings ensures that treatment status is determined prior to the corresponding outcome period, thereby reducing concerns that firms' liquidity positions are simultaneously influenced by contemporaneous monetary tightening or the resilience outcomes being examined. The interaction term therefore captures whether firms entering a

year with relatively high liquidity reserves exhibit systematically different resilience outcomes during monetary tightening periods compared with firms holding lower cash reserves.

Nevertheless, because treatment assignment is based on firms' observed financial characteristics rather than exogenous assignment, the findings are interpreted as evidence of a strong association rather than definitive causal effects.

The baseline specification is as follows:

$$Resilience_{it} = \alpha + \beta_1(HighCash_{it} \times Tightening_t) + \gamma X_{it} + \delta_i + \lambda_t + \varepsilon_{it}, \quad (1)$$

where:

- $Resilience_{it}$ represents one of the five resilience measures for firm i in year t ;
- $HighCash_{it}$ equals one if a firm's lagged industry-adjusted cash holdings are in the highest quartile of the industry-year distribution, and zero otherwise;
- $Tightening_t$ equals one during Federal Reserve monetary tightening periods and zero otherwise;
- $HighCash_{it} \times Tightening_t$ is the interaction term of interest;
- β_1 measures the differential association between high cash holdings and corporate resilience during monetary tightening periods;
- X_{it} denotes a vector of firm-level control variables;
- δ_i represents firm fixed effects;
- λ_t represents year fixed effects; and
- ε_{it} is the error term.

Control Variables

Following prior studies examining corporate liquidity and financial flexibility, this paper includes several firm-level control variables that may influence resilience outcomes. *Firm Size* is measured as the natural logarithm of total assets. Larger firms generally enjoy greater access to capital markets and may be less vulnerable to financing shocks. *Market-to-Book Ratio* captures growth opportunities and investment prospects. *Leverage Ratio* is measured as total debt divided by total assets and controls for financial risk arising from debt financing. Net Working Capital (*NWC*) equals current assets minus

current liabilities scaled by total assets and serves as an alternative source of liquidity.

Cash Flow Ratio is measured as operating cash flow divided by total assets and captures internally generated funds. *Tangibility* is measured as net property, plant, and equipment divided by total assets and reflects collateral value. *Dividend Payer Dummy* equals one if a firm pays dividends and zero otherwise. All regressions include firm fixed effects and year fixed effects to control unobservable firm characteristics and macroeconomic conditions. Standard errors are clustered at the firm level to account for serial correlation and heteroskedasticity. All statistical analyses were conducted using Stata 18.

Robustness Tests

The validity of the difference-in-differences (DiD) design depends on the parallel-trends assumption, which requires treated and control firms to have followed similar outcome trends in the absence of treatment. To strengthen the credibility of the empirical design and mitigate concerns about systematic differences between high-cash and low-cash firms, several robustness analyses are conducted.

First, entropy balancing (Hainmueller, 2012) is employed to construct a more comparable control group by reweighting observations based on pre-treatment firm characteristics. This approach improves covariate balance between treated and control firms and reduces concerns arising from observable differences. Second, the analysis is repeated using an alternative measure of high cash holdings based on excess cash holdings, which are estimated as the residuals from a regression of cash holdings on firm characteristics.

Third, the baseline regressions are re-estimated using two-way clustered standard errors at the firm and year levels to account for potential cross-sectional dependence and serial correlation in the error terms. Finally, an event-study specification is estimated to assess the plausibility of the parallel-trends assumption underlying the DiD design.

Collectively, these robustness tests provide additional evidence that the documented associations are not driven solely by the alternative explanations addressed by these specifications.

RESULTS

Descriptive Statistics

Table 1 presents summary statistics for the variables used in the analysis. The sample consists of 90,988 firm-year observations from publicly traded

U.S. firms over the period 2002–2024. Average Cash Holdings represent approximately 25.1% of total assets, indicating that liquidity constitutes a substantial component of corporate balance sheets. The mean Capital Expenditure ratio is 4.5% of total assets, while the average Total Payout equals 3.2% of total assets.

Table 1. Summary statistics

Variables	Mean	Median	Std. Dev.	25th Percentile	75th Percentile	Obs
Cash Holdings	0.251	0.144	0.264	0.048	0.374	90986
CapEx	0.045	0.026	0.057	0.011	0.055	90677
Total Payout	0.032	0.005	0.062	0.000	0.036	84317
$\ln(\text{Z-Score})$	1.222	1.211	1.010	0.670	1.767	73820
Equity Volatility	0.519	0.428	0.345	0.289	0.640	90495
Return on Assets (ROA)	-0.104	0.018	0.369	-0.114	0.068	90845
Firm Size	6.272	6.209	2.220	4.636	7.801	90988
Market-to-Book Ratio	2.203	1.580	1.845	1.144	2.500	90700
Leverage Ratio	0.233	0.184	0.236	0.020	0.362	90653
Net Working Capital	0.010	0.005	0.192	-0.073	0.116	89246
Cash Flow Ratio	-0.013	0.086	0.326	-0.031	0.146	90736
Tangibility	0.244	0.151	0.243	0.057	0.361	90926
Dividend Payer Dummy	0.313	0.000	0.464	0.000	1.000	90647

Notes: This table presents summary statistics for the variables used in the analysis. The underlying panel contains up to 90,988 firm-year observations from U.S. publicly traded non-financial and non-utility firms over the study period, with the number of available observations varying across individual variables. Cash Holdings is measured as cash and short-term investments divided by total assets. CapEx is capital expenditures divided by total assets. Total Payout is the sum of cash dividends and share repurchases scaled by total assets. $\ln(\text{Z-Score})$ is the natural logarithm of the Altman Z-score. Equity Volatility is measured as the annualized standard deviation of monthly stock returns within a fiscal year. ROA is net income divided by total assets. Firm Size is the natural logarithm of total assets. Market-to-Book Ratio is the ratio of the market value of equity to the book value of equity. Leverage Ratio is total debt divided by total assets. Net Working Capital equals current assets minus current liabilities, scaled by total assets. Cash Flow Ratio is operating cash flow divided by total assets. Tangibility is net property, plant, and equipment divided by total assets. Dividend Payer Dummy is an indicator equal to one if a firm pays cash dividends and zero otherwise.

Source: Authors' calculations using Stata 18.

The average value of $\ln(\text{Z-Score})$ is 1.222, indicating substantial cross-sectional variation in firms' financial stability. The mean Equity Volatility is 0.519, reflecting considerable variation in market risk across firms. The average Return on Assets (ROA) is -10.4%, indicating that the sample contains a substantial number of loss-making firm-year observations. Overall, the descriptive statistics reveal substantial variation in firms' liquidity positions, investment activities, financial stability, market risk, and operating performance, providing an appropriate setting for examining the resilience benefits associated with corporate cash holdings.

Cash Holdings and Corporate Resilience During Monetary Tightening

Table 2 reports the baseline difference-in-differences estimates examining whether firms with high cash holdings exhibit greater resilience during monetary tightening cycles.

The coefficient of interest is the interaction term High Cash $\times$ Tightening, which captures the differential response of high-cash firms relative to lower-cash firms during Federal Reserve interest-rate hiking periods.

Table 2. Cash holdings and corporate resilience during monetary tightening cycles

Variables	Corporate Resilience Dimensions				
	Investment Resilience	Payout Stability	Financial Stability	Market Risk	Operating Performance
	(1)	(2)	(3)	(4)	(5)
	CapEx	Total Payout	<i>ln</i> (Z-Score)	Equity Volatility	ROA
High Cash × Tightening	0.005*** (0.000)	0.002*** (0.007)	0.091*** (0.000)	-0.021*** (0.000)	0.018*** (0.000)
Firm Size	0.000 (0.339)	-0.009*** (0.000)	0.039*** (0.000)	-0.040*** (0.000)	0.021*** (0.000)
Market-to-Book Ratio	0.003*** (0.000)	0.004*** (0.000)	0.261*** (0.000)	0.007*** (0.000)	-0.005*** (0.000)
Leverage Ratio	-0.017*** (0.000)	0.002 (0.495)	-2.211*** (0.000)	0.172*** (0.000)	-0.127*** (0.000)
Net Working Capital	0.009*** (0.000)	-0.010*** (0.000)	1.253*** (0.000)	-0.096*** (0.000)	0.146*** (0.000)
Cash Flow Ratio	-0.000 (0.971)	0.033*** (0.000)	1.463*** (0.000)	-0.022** (0.030)	1.001*** (0.000)
Tangibility	0.127*** (0.000)	0.004 (0.311)	-0.779*** (0.000)	0.049*** (0.007)	-0.068*** (0.000)
Dividend Payer Dummy	0.003*** (0.000)	0.047*** (0.000)	0.077*** (0.000)	-0.072*** (0.000)	-0.001 (0.658)
Constant	0.008** (0.012)	0.064*** (0.000)	0.865*** (0.000)	0.728*** (0.000)	-0.165*** (0.000)
Observations	87,100	81,006	72,217	86,531	87,183
R-squared	0.684	0.470	0.817	0.517	0.880
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: High Cash is an indicator equal to one if a firm's lagged industry-adjusted cash holdings are in the highest quartile of the industry-year distribution and zero otherwise. Industry-adjusted cash holdings are calculated as the difference between a firm's cash ratio and the median cash ratio of firms within the same industry-year. Tightening equals one for the Federal Reserve monetary tightening periods 2004–2006, 2015–2018, and 2022–2023, and zero otherwise. All specifications include the baseline control variables together with firm and year fixed effects. Standard errors are clustered at the firm level, and p-values are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' calculations using Stata 18.

Column (1) presents the results for Capital Expenditures. The coefficient on High Cash × Tightening is positive and statistically significant at the 1% level ($\beta = 0.005$), indicating that high-cash firms maintain higher capital expenditures during monetary tightening periods than firms with lower cash holdings. The findings suggest that firms with substantial liquidity reserves are better able to

sustain investment despite rising borrowing costs and tighter credit conditions.

These results support Hypothesis 1 and are consistent with the financial flexibility argument that internal liquidity helps firms continue investing when external financing becomes more costly.

Column (2) reports the results for Total Payout. The interaction coefficient is positive and statistically

significant ($\beta = 0.002$), indicating that high-cash firms maintain higher shareholder payouts during monetary tightening periods than firms with lower cash holdings.

The findings suggest that liquidity reserves enable firms to sustain cash distributions despite restrictive financing conditions. Accordingly, the results support Hypothesis 2.

Column (3) examines financial stability using $\ln(Z\text{-Score})$. The coefficient on High Cash $\times$ Tightening is positive and highly significant ($\beta = 0.091$), indicating that high-cash firms exhibit stronger financial stability during monetary tightening periods than firms with lower cash holdings. Because the logarithmic transformation excludes observations with non-positive Altman Z-scores, this finding applies specifically to the positive-Z-score subsample and should not be generalized to the excluded observations.

The results suggest that firms with greater liquidity reserves are better positioned to maintain financial health when financing conditions become more restrictive.

Column (4) evaluates market risk using Equity Volatility. The interaction coefficient is negative and highly significant ($\beta = -0.021$), indicating that high-cash firms experience lower equity volatility during monetary tightening periods than firms with lower cash holdings. Lower equity volatility reflects lower market risk and suggests that investors perceive high-cash firms as better able to withstand restrictive financing conditions. Collectively, the results for $\ln(Z\text{-Score})$ and Equity Volatility indicate that greater liquidity is associated with stronger financial resilience, reflected in higher financial stability and lower market risk during monetary tightening cycles. The evidence therefore provides strong support for Hypothesis 3.

Column (5) reports the results for Return on Assets (ROA). The coefficient on High Cash $\times$ Tightening is positive and statistically significant ($\beta = 0.018$), indicating that high-cash firms achieve operating performance superior to that of firms with lower cash holdings during monetary tightening periods. The findings suggest that firms with substantial liquidity reserves are better positioned to maintain profitability when access to external financing becomes more limited. These findings

support Hypothesis 4. Collectively, the results indicate that firms with substantial liquidity reserves exhibit stronger investment activity, maintain higher shareholder payouts, achieve greater financial stability, experience lower market risk, and sustain superior operating performance during monetary tightening cycles.

These findings provide consistent support for the view that corporate liquidity serves as an important source of financial flexibility, enabling firms to better withstand restrictive monetary conditions.

Robustness Analysis

Table 3 presents the results of the entropy-balancing analysis used to address potential differences in observable characteristics between high-cash and lower-cash firms. Entropy balancing reweights the control observations to match the covariate means of the treated firms, thereby improving comparability between the two groups.

Panel A reports the entropy-balanced difference-in-differences regression results. The estimated coefficients remain economically and statistically significant across all five measures of corporate resilience. Specifically, high-cash firms continue to exhibit higher capital expenditures, higher total payouts, stronger financial stability, lower market risk, and better operating performance during periods of monetary tightening. The persistence of these findings after entropy balancing suggests that the baseline results are less likely to be driven by the observable firm characteristics included in the balancing procedure.

Panel B reports the covariate means before and after entropy balancing. The post-balancing means show that the reweighted control group closely matches the treated group across all covariates, indicating successful covariate balance.

Panel C reports the corresponding variances and skewness as supplementary distributional diagnostics. These statistics are presented for descriptive purposes only and were not imposed as balancing constraints during the entropy-balancing procedure.

Table 4 reports robustness tests using an alternative measure of high cash holdings based on excess cash holdings.

Table 3. Entropy balancing analysis

Panel A. Entropy-balancing results

Variables	Corporate Resilience Measures				
	Investment Resilience	Payout Stability	Financial Stability	Market Risk	Operating Performance
	(1)	(2)	(3)	(4)	(5)
	CapEx	Total Payout	ln(Z-Score)	Equity Volatility	ROA
High Cash × Tightening	0.005*** (0.000)	0.003*** (0.005)	0.098*** (0.000)	-0.024*** (0.000)	0.020*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	87,100	81,006	72,217	86,531	87,183
R-squared	0.688	0.479	0.796	0.504	0.897
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Panel B. Covariate means before and after entropy balancing

Variables	Pre-Balancing		Post-Balancing	
	Treated	Control	Treated	Control
Firm Size	5.429	6.587	5.429	5.429
Market-to-Book Ratio	2.619	2.048	2.619	2.619
Leverage Ratio	0.166	0.257	0.166	0.166
Net Working Capital	-0.019	0.024	-0.019	-0.019
Cash Flow Ratio	-0.098	0.02	-0.098	-0.098
Tangibility	0.201	0.262	0.201	0.201
Dividend Payer Dummy	0.215	0.352	0.215	0.215

Panel C. Covariate distribution diagnostics before and after entropy balancing

Variables	Pre-Balancing				Post-Balancing			
	Treated		Control		Treated		Control	
	Variance	Skewness	Variance	Skewness	Variance	Skewness	Variance	Skewness
Firm Size	4.037	0.39	4.879	0.05	4.037	0.39	4.641	0.371
Market-to-Book Ratio	5.184	2.193	2.595	3.021	5.184	2.193	5.347	2.233
Leverage Ratio	0.052	1.847	0.054	1.178	0.052	1.847	0.039	1.737
Net Working Capital	0.038	-0.833	0.036	-0.733	0.038	-0.833	0.053	-0.929
Cash Flow Ratio	0.156	-2.138	0.083	-3.306	0.156	-2.138	0.181	-2.221
Tangibility	0.05	1.422	0.061	1.122	0.05	1.422	0.049	1.571
Dividend Payer Dummy	0.169	1.39	0.228	0.621	0.169	1.39	0.169	1.389

Notes: High Cash equals one when a firm's lagged industry-adjusted cash holdings are in the highest quartile of the industry-year distribution and zero otherwise. Tightening equals one for the Federal Reserve monetary tightening periods 2004–2006, 2015–2018, and 2022–2023, and zero otherwise. In Panel A, the dependent variables are CapEx, Total Payout, ln(Z-Score), Equity Volatility, and ROA. The reported interaction term is High Cash × Tightening. The regressions include the baseline firm-level controls together with firm and year fixed effects, with standard errors clustered at the firm level. Entropy-balancing weights are constructed by matching the first moments of the baseline covariates. Panel B reports covariate means, whereas Panel C reports variance and skewness as supplementary distributional diagnostics; the latter were not imposed as balancing constraints. *p*-values are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' calculations using Stata 18.

Table 4. Robustness test using an alternative measure of high cash holdings

Variables	Corporate Resilience Measures				
	Investment Resilience	Payout Stability	Financial Stability	Market Risk	Operating Performance
	(1)	(2)	(3)	(4)	(5)
	CapEx	Total Payout	ln(Z-Score)	Equity Volatility	ROA
High Cash × Tightening	0.006*** (0.000)	0.003*** (0.000)	0.067*** (0.000)	-0.008** (0.031)	0.014*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	76,552	71,461	63,363	76,407	76,597
R-squared	0.693	0.495	0.828	0.536	0.890
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: High Cash is defined using lagged excess cash holdings, estimated as residuals from a cash-holdings regression including firm size, market-to-book ratio, leverage ratio, net working capital, cash flow ratio, capital expenditures, dividend payer status, and year fixed effects. Firms in the highest quartile of the industry-year distribution of lagged excess cash holdings are classified as High Cash. Tightening equals one for the Federal Reserve monetary tightening periods 2004–2006, 2015–2018, and 2022–2023, and zero otherwise. All specifications include the baseline control variables together with firm and year fixed effects. Standard errors are clustered at the firm level, and p-values are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' calculations using Stata 18.

The interaction coefficient remains positive and statistically significant for Capital Expenditures, Total Payout, Financial Stability, and Return on Assets, while remaining negative and statistically significant for Equity Volatility. The consistency of the results indicates that the documented associations are

robust to an alternative classification of high-cash firms.

Table 5 reports the results using two-way clustered standard errors at the firm and year levels to account for both serial correlation and cross-sectional dependence in the error terms.

Table 5. Robustness test using two-way clustered standard errors

Variables	Corporate Resilience Dimensions				
	Investment Resilience	Payout Stability	Financial Stability	Market Risk	Operating Performance
	(1)	(2)	(3)	(4)	(5)
	CapEx	Total Payout	ln(Z-Score)	Equity Volatility	ROA
High Cash × Tightening	0.005*** (0.000)	0.002** (0.019)	0.091*** (0.000)	-0.021*** (0.000)	0.018*** (0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	87,100	81,006	72,217	86,531	87,183
R-squared	0.684	0.470	0.817	0.517	0.880
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Two-Way Clustering	Yes	Yes	Yes	Yes	Yes

Notes: This table reports robustness tests of the baseline difference-in-differences (DiD) model using two-way clustered standard errors. High Cash is an indicator equal to one if a firm's lagged industry-adjusted cash holdings are in the highest quartile of the industry-year distribution and zero otherwise. Tightening is an indicator equal to one during Federal Reserve monetary tightening periods (2004–2006, 2015–2018, and 2022–2023) and zero otherwise. The dependent variables are capital expenditures scaled by total assets (CapEx), Total Payout (measured as the sum of cash dividends and share repurchases scaled by total assets), the natural logarithm of the Altman Z-score (ln(Z-Score)), Equity Volatility, and Return on Assets (ROA). The interaction term, High Cash × Tightening, captures the differential association between high cash holdings and the dependent variable during periods of monetary tightening. All regressions include the baseline control variables (firm size, market-to-book ratio, leverage, net working capital, cash flow, tangibility, and a dividend payer indicator), as well as firm and year fixed effects. Standard errors are two-way clustered by firm and year, and p-values are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' calculations using Stata 18.

The estimated coefficients remain positive and statistically significant for Capital Expenditures, Total Payout, Financial Stability, and Return on Assets, while remaining negative and statistically significant for Equity Volatility. The consistency of these findings suggests that the baseline results are not sensitive to the choice of covariance estimator and remain consistent with the conclusion that firms with greater liquidity reserves exhibit stronger resilience during periods of monetary tightening.

Figure 1 presents the event-study estimates used to examine the validity of the parallel-trends assumption underlying the difference-in-differences (DiD) framework. The figure plots the estimated coefficients for the interaction between High Cash and the event-time indicators relative to the year immediately preceding the onset of monetary tightening (event -1, omitted). The vertical bars represent 95% confidence intervals.

The displayed pre-treatment estimates provide limited evidence of systematic differential trends between high-cash and lower-cash firms, although the result for financial stability warrants caution. For four of the five outcome variables, the Lead 2 coefficient (event -2) is statistically indistinguishable from zero. Although the corresponding coefficient for $\ln(\text{Z-Score})$ is statistically significant, the overall evidence remains broadly supportive of the identifying assumption underlying the difference-in-differences framework. Overall, the event-study results are broadly consistent with the identifying assumption underlying the difference-in-differences framework, although the statistically significant pre-treatment coefficient for $\ln(\text{Z-Score})$ requires cautious interpretation.

Following the onset of monetary tightening, the estimated post-onset coefficients generally move in the expected direction. The estimated coefficients are positive for capital expenditures, total payout, financial stability, and return on assets and negative for equity volatility, consistent with lower market risk. For capital expenditures, the estimated coefficients remain relatively stable throughout the post-onset period.

The positive estimated coefficients for Total Payout and ROA are largest immediately following the onset of monetary tightening and gradually diminish over time, with wider confidence intervals in the later periods reflecting greater estimation uncertainty.

A similar pattern is observed for $\ln(\text{Z-Score})$. The estimated coefficient is largest at the onset of monetary tightening, indicating a stronger differential in financial stability between high-cash and lower-cash firms at that point. The estimated coefficients subsequently decline toward zero, and the confidence intervals widen in the later post-onset periods, suggesting that the financial-stability advantage becomes less pronounced over time. Nevertheless, the estimated coefficients remain positive during the early post-onset periods and are consistent with the baseline evidence that firms with greater liquidity reserves are better positioned to withstand restrictive monetary conditions.

A comparable pattern is evident for Equity Volatility. The estimated coefficients become negative following the onset of monetary tightening, indicating that high-cash firms experience lower market risk than firms with lower cash holdings during restrictive monetary conditions. The reduction in equity volatility is most pronounced during the early post-onset periods and gradually attenuates over time as the estimated coefficients move toward zero and the confidence intervals widen. Nevertheless, the estimated coefficients remain negative during the early post-onset periods, providing additional support for the baseline finding that greater liquidity reserves are associated with lower firms' exposure to market uncertainty during monetary tightening.

Overall, the event-study estimates are broadly consistent with the baseline DiD specification, although the pre-treatment result for $\ln(\text{Z-Score})$ limits the strength of the parallel-trends claim. For most outcomes, the displayed pre-treatment estimate does not indicate a statistically significant differential trend, while the financial-stability outcome requires more cautious interpretation; the post-onset estimates generally show stronger resilience among high-cash firms.

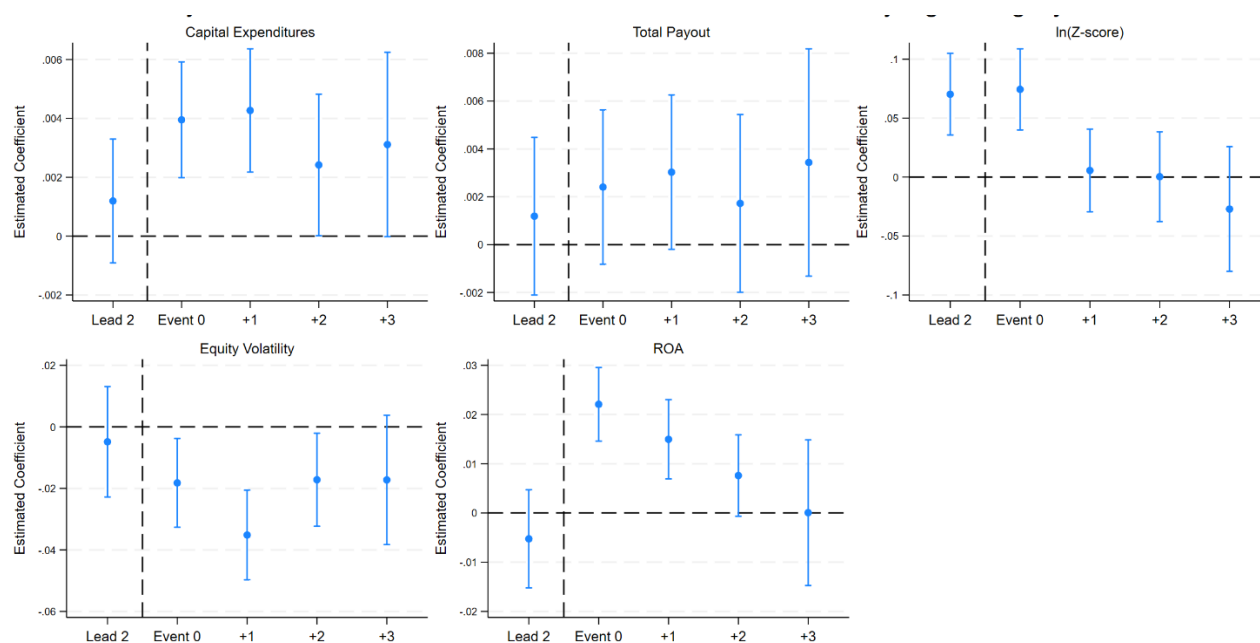


Figure 1. Event-study estimates around Federal Reserve monetary tightening cycles

Notes: This figure presents event-study estimates for the interaction between High Cash and event-time indicators around Federal Reserve monetary tightening cycles. Event -1 is the omitted reference period. 'Lead 2' corresponds to event -2. Points represent estimated interaction coefficients, and vertical bars denote 95% confidence intervals. The five panels report estimates for CapEx, Total Payout, ln(Z-Score), Equity Volatility, and ROA.

Source: Authors' calculations using Stata 18.

Taken together, the baseline and robustness analyses consistently show that higher cash reserves are associated with stronger firm resilience during periods of monetary tightening. High-cash firms sustain higher levels of investment and shareholder payouts, exhibit stronger financial stability, experience lower market risk, and maintain operating performance superior to that of comparable firms with lower cash holdings. The consistency of these findings across alternative model specifications, robustness tests, and the event-study analysis provides additional support for the empirical patterns documented above and motivates the broader interpretation and theoretical implications discussed in the following section.

DISCUSSION

The findings of this study provide new evidence that corporate liquidity is systematically associated with stronger firm resilience during periods of monetary tightening. Rather than simply confirming that cash holdings are associated with favorable corporate outcomes, the results indicate that internal

liquidity buffers are particularly valuable when restrictive monetary policy increases borrowing costs and limits firms' access to external financing. By simultaneously examining investment activity, shareholder payouts, financial stability, market risk, and operating performance, this study provides a multidimensional perspective on how corporate outcomes differ with firms' liquidity positions under tightening financial conditions.

The first major finding is that firms with substantial cash holdings maintain significantly higher investment levels during monetary tightening cycles. This result is consistent with the financial flexibility literature, which has argued that internal liquidity enables firms to continue financing profitable investment opportunities when external capital becomes costly or unavailable (DeAngelo & DeAngelo, 2007; Denis, 2011). The findings also support the financing hierarchy proposed by Myers (1984) and Myers and Majluf (1984), according to which firms prefer internal financing over external debt or equity because it avoids information asymmetry and issuance costs. During periods of rising interest rates, this financing advantage

becomes more pronounced, allowing cash-rich firms to continue investing while firms with limited liquidity reduce capital expenditures. The present evidence also agrees with [Almeida et al. \(2004\)](#), who argued that liquidity facilitates investment under financing constraints, and with [Das et al. \(2024\)](#), who reported that firms with stronger internal financial resources experienced smaller reductions in investment during periods of financial disruption. Unlike these earlier studies, however, the present research provides evidence that the investment advantages associated with liquidity also extend to deliberate monetary tightening episodes driven by central-bank policy.

The second important finding concerns shareholder payout decisions. Firms with greater liquidity reserves maintain significantly higher total shareholder payouts during tightening cycles. This finding is consistent with [Brav et al. \(2005\)](#), who demonstrated that managers place substantial importance on maintaining stable payout policies because unexpected reductions are often interpreted negatively by investors. This study extends current literature by showing that liquidity reserves help sustain both cash dividends and share repurchases even when financing conditions deteriorate because of restrictive monetary policy. Rather than relying solely on external financing to support shareholder distributions, firms with substantial cash reserves appear capable of maintaining payout policies through internally generated financial resources.

The third finding relates to firms' financial stability and market risk. Firms with high cash holdings exhibit significantly higher $\ln(Z\text{-Score})$ and lower equity volatility during monetary tightening periods. These results are consistent with [Acharya et al. \(2007\)](#), who argued that cash serves as an effective hedge against financing shocks, particularly when access to external capital becomes constrained. Similarly, [Denis and Sibilkov \(2010\)](#) demonstrated that cash holdings reduce financial vulnerability by allowing firms to continue financing valuable activities despite financing frictions.

The present findings further support the precautionary savings theory developed by [Opler et al. \(1999\)](#) and [Han and Qiu \(2007\)](#), which proposed that firms accumulate liquidity to protect themselves

against future uncertainty and financing constraints. By jointly examining an accounting-based measure of financial stability and a market-based measure of risk, this study provides broader evidence that liquidity enhances firms' financial resilience by improving solvency while reducing investors' perceptions of risk during restrictive monetary environments.

The final empirical finding indicates that firms with stronger liquidity positions achieve superior operating performance during periods of monetary tightening. This result suggests that financially flexible firms are generally better positioned to sustain operations during periods of economic stress. The findings also complement [Islam and Maruf-Ul-Alam \(2021\)](#), who documented a positive association between prudent financing decisions and firm performance. The present study extends these earlier contributions by showing that the operational advantages associated with liquidity remain evident when firms experience policy-induced increases in financing costs rather than broader macroeconomic crises. Furthermore, the event-study analysis indicates that the operating-performance differential emerges following the onset of monetary tightening; however, given the limited displayed pre-treatment evidence, this result should be interpreted as supportive rather than conclusive.

Taken together, these findings contribute to several important streams of research. First, whereas much of the existing literature evaluates the benefits of cash holdings through individual corporate outcomes such as investment, firm value, or financing decisions ([Azar et al., 2016](#); [Amess et al., 2015](#)), the present study adopts a multidimensional perspective by simultaneously examining investment continuity, shareholder payouts, financial stability, market risk, and operating performance. This broader framework shows that corporate resilience is better assessed across multiple financial and operational dimensions than through a single indicator.

Second, the findings extend the literature on monetary policy transmission. Previous research has primarily emphasized how higher interest rates affect corporate borrowing costs and financing constraints through the balance-sheet and bank-lending channels ([Bernanke & Gertler, 1995](#); [Gertler](#)

& Gilchrist, 1994; Kashyap & Stein, 2000). The present evidence suggests that corporate liquidity moderates these transmission mechanisms by reducing firms' dependence on external capital markets. Consequently, firms with stronger liquidity buffers appear less vulnerable to restrictive monetary policy, indicating that internal financial resources influence the extent to which monetary policy affects corporate investment, shareholder payouts, financial stability, market risk, and operating performance.

More broadly, these findings reinforce the view that corporate liquidity represents a strategic financial resource rather than idle or unproductive capital. The evidence presented here suggests that maintaining adequate liquidity provides important economic benefits during periods of restrictive monetary policy. Although some studies argued that large cash balances may reflect agency conflicts or managerial discretion, the implications of cash holdings depend on firms' governance structures and the economic environment in which they operate (Kusnadi, 2011). In periods of rising financing costs and tighter credit conditions, liquidity enables firms to preserve investment opportunities, sustain shareholder payouts, strengthen financial stability, reduce market risk, and maintain operating performance. Collectively, these findings suggest that the value of corporate cash holdings is highly contingent on the macro-financial environment, becoming particularly important when external financing is costly and access to credit is constrained.

Overall, the discussion indicates that the present findings are largely consistent with the theoretical predictions of financial flexibility, precautionary savings, and financing-constraint theories while extending the empirical literature in several important respects. Specifically, the study shifts attention from financial crises and recessionary environments to deliberate monetary tightening episodes, adopts a multidimensional framework for measuring corporate resilience, and identifies corporate liquidity as an important firm-level mechanism through which restrictive monetary policy influences corporate behavior. The robustness analyses and event-study evidence provide additional support for these conclusions, subject to

the limitations of the observational design and the noted pre-treatment result for financial stability. In doing so, the study provides a more comprehensive understanding of how firms adapt to changing financing conditions and highlights the strategic importance of internal liquidity during periods of elevated interest rates.

CONCLUSIONS

This study examines whether corporate liquidity enhances firm resilience during periods of Federal Reserve monetary tightening. Using a comprehensive sample of publicly traded U.S. non-financial and non-utility firms over the period 2002–2024, this study employs a difference-in-differences framework to compare firms with high cash holdings and firms with lower liquidity reserves during three major monetary tightening cycles. Corporate resilience is evaluated across five complementary dimensions: investment activity, shareholder payouts, financial stability, market risk, and operating performance.

The empirical evidence indicates that firms with substantial liquidity reserves are better able to withstand restrictive monetary environments. Relative to firms with lower cash holdings, cash-rich firms maintain higher capital expenditures and shareholder payouts, exhibit stronger financial stability through higher $\ln(Z\text{-Score})$, experience lower market risk through reduced equity volatility, and achieve superior operating performance during monetary tightening periods. These findings remain broadly consistent across multiple robustness analyses, including entropy balancing, an alternative measure of corporate liquidity, two-way clustered standard errors, and event-study evidence that is generally consistent with the identifying assumptions of the difference-in-differences framework, subject to the noted pre-treatment result for financial stability. The study makes several contributions to the corporate finance literature. First, it extends the literature on corporate liquidity and financial flexibility by demonstrating that the value of cash holdings extends beyond financing decisions and firm valuation to encompass firms' ability to remain resilient during restrictive monetary policy. Whereas previous studies have

primarily examined cash holdings in the context of financial crises, recessions, or firm-specific financing constraints, this study provides evidence from deliberate monetary tightening episodes in which financing conditions deteriorate because of policy-induced increases in interest rates.

Second, the study contributes to the literature on corporate resilience by adopting a multidimensional perspective. Rather than evaluating resilience through a single corporate outcome, the analysis simultaneously examines investment continuity, shareholder payouts, financial stability, market risk, and operating performance. This comprehensive framework treats corporate resilience as a multidimensional construct encompassing financial and operational outcomes, thereby providing a broader assessment of how firms adapt to restrictive financing environments.

Third, the findings contribute to the literature on monetary policy transmission by identifying corporate liquidity as an important firm-level mechanism through which monetary policy affects corporate behavior. The results suggest that internal liquidity buffers are associated with greater resilience to higher borrowing costs and tighter credit conditions, helping firms sustain productive investment, preserve shareholder payouts, strengthen financial stability, reduce market risk, and maintain operating performance. These findings provide new evidence linking firms' balance-sheet strength to heterogeneity in the transmission of monetary policy across firms.

The findings also have important practical implications. For corporate managers, the results suggest that maintaining adequate liquidity should be viewed as a strategic component of long-term financial policy rather than merely a short-term precaution. Cash reserves provide firms with the flexibility to continue investing, sustain shareholder payouts, and withstand financing shocks when external capital becomes more expensive.

For investors and creditors, corporate liquidity represents an important indicator of firms' capacity to navigate periods of restrictive monetary policy. For policymakers, the findings imply that firms with stronger internal liquidity buffers may be less vulnerable to interest-rate increases, potentially

reducing the adverse effects of monetary tightening on corporate investment, financial stability, market risk, and overall economic activity.

Like all empirical studies, this research has several limitations. Although the difference-in-differences framework, extensive robustness analyses, and the event-study evidence strengthen confidence in the validity and consistency of the findings, the observational nature of the data precludes definitive causal inference. The annual classification of monetary-tightening periods also approximates Federal Reserve cycles that began or ended within individual calendar years. In addition, the financial-stability analysis is restricted to observations with positive Altman Z-scores because the dependent variable is logarithmically transformed; this sample-selection feature should be considered when interpreting the corresponding findings.

In addition, the analysis focuses on publicly traded U.S. firms and therefore may not fully capture the experiences of privately held firms or firms operating in countries with different financial systems and institutional environments. Furthermore, corporate liquidity is measured using cash holdings, which represent only one dimension of financial flexibility.

Future research may examine whether alternative sources of financial flexibility, such as unused debt capacity, committed credit lines, or broader financial flexibility indices, provide similar resilience benefits during restrictive monetary environments. Future studies may also investigate whether the value of liquidity differs across industries, financing constraints, corporate governance structures, firm life-cycle stages, or alternative monetary policy regimes.

Overall, this study provides evidence that corporate liquidity serves as an important source of financial flexibility associated with stronger firm resilience during monetary tightening cycles. By supporting firms' ability to sustain investment and shareholder payouts, strengthen financial stability, reduce market risk, and maintain operating performance when financing conditions become more restrictive, internal liquidity emerges as an important firm-level correlate of resilience to

restrictive monetary policy. Collectively, these findings contribute to a deeper understanding of how firm-level financial policies shape corporate resilience and influence the transmission of monetary policy to the real economy.

Author Contributions

Conceptualization: M.M.U.A., T.N., M.A.U.A.; data curation: M.M.U.A., T.N., M.A.U.A.; formal analysis: M.M.U.A., M.A.U.A.; investigation: M.A.U.A., T.N.; methodology: M.A.U.A., T.N.; project administration: M.A.U.A.; resources: M.M.U.A., T.N., M.A.U.A.; software: M.M.U.A., T.N., M.A.U.A.; supervision: M.A.U.A.; validation: T.N.; visualization: M.M.U.A., T.N., M.A.U.A.; writing – original draft: M.M.U.A., T.N., M.A.U.A.; writing – review & editing: M.M.U.A., T.N., M.A.U.A.

Conflict of Interest

The authors declare no conflicts of interest.

Statement on the Use of AI Tools

ChatGPT (GPT-5.6) was used for language editing and stylistic refinement of the manuscript. The tool was not used to generate or modify the research data, perform statistical analyses, fabricate results, or determine the scientific conclusions. The authors retain full responsibility for the accuracy, integrity, interpretations, conclusions, and overall scholarly content of the manuscript, as well as for its compliance with academic and publication standards.

Data Availability Statement

The empirical analyses are based on proprietary Compustat and CRSP data obtained through the Wharton Research Data Services (WRDS) platform under institutional license. Because these data are subject to licensing restrictions, they cannot be publicly redistributed. Researchers with authorized WRDS access can reconstruct the analytical dataset by following the procedures described in the publicly available replication guide. The replication guide supporting this study is available in the Open Science Framework repository ([Alam, 2026](#)).

Informed Consent Statement

Not applicable.

References

1. Acharya, V. V., Almeida, H., & Campello, M. (2007). Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of Financial Intermediation*, 16(4), 515–554. [[CrossRef](#)]
2. Ahn, J., Bae, E., & Zhou, J. (2024). The role of corporate cash holdings in the transmission of monetary policy tightening. *IMF Working Paper*, 2024(245). [[CrossRef](#)]
3. Akhter, A., & Maruf-Ul-Alam, M. (2019). Determinants of optimal capital structure: An empirical study on manufacturing companies in Bangladesh. *Journal of Banking & Financial Services*, 11(2), 225–252. [[Link](#)]
4. Alam, A. U. (2026). Replication guide for “Corporate liquidity and firm resilience during monetary tightening cycles”. Open Science Framework. [[CrossRef](#)]
5. Alam, M. A. U., Alam, M. M. U., & Nazrul, T. (2025). Founder CEOs and utility firms' financial choices. *Journal of Risk and Financial Management*, 18(10), 531. [[CrossRef](#)]
6. Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *The Journal of Finance*, 59(4), 1777–1804. [[CrossRef](#)]
7. Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, 23(4), 589–609. [[CrossRef](#)]
8. Amess, K., Banerji, S., & Lampousis, A. (2015). Corporate cash holdings: Causes and consequences. *International Review of Financial Analysis*, 42, 421–433. [[CrossRef](#)]
9. Angrist, J. D., & Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press. [[CrossRef](#)]
10. Azar, J. A., Kagy, J.-F., & Schmalz, M. C. (2016). Can changes in the cost of carry explain the dynamics of corporate “cash” holdings? *The Review of Financial Studies*, 29(8), 2194–2240. [[CrossRef](#)]
11. Bernanke, B. S., & Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, 9(4), 27–48. [[CrossRef](#)]
12. Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1), 249–275. [[CrossRef](#)]

13. Blinder, A. S. (2023). Landings, soft and hard: The Federal Reserve, 1965–2022. *Journal of Economic Perspectives*, 37(1), 101–120. [\[CrossRef\]](#)
14. Board of Governors of the Federal Reserve System. (2023). *Financial stability report* (October 2023). [\[Link\]](#)
15. Board of Governors of the Federal Reserve System. (2024). *Financial stability report* (April 2024). [\[Link\]](#)
16. Board of Governors of the Federal Reserve System. (n.d.). *Open market operations*. [\[Link\]](#)
17. Brav, A., Graham, J. R., Harvey, C. R., & Michaely, R. (2005). Payout policy in the 21st century. *Journal of Financial Economics*, 77(3), 483–527. [\[CrossRef\]](#)
18. Campello, M., Giambona, E., Graham, J. R., & Harvey, C. R. (2011). Liquidity management and corporate investment during a financial crisis. *The Review of Financial Studies*, 24(6), 1944–1979. [\[CrossRef\]](#)
19. Das, B. C., Hasan, F., & Sutradhar, S. R. (2024). The impact of economic policy uncertainty and inflation risk on corporate cash holdings. *Review of Quantitative Finance and Accounting*, 62(3), 865–887. [\[CrossRef\]](#)
20. DeAngelo, H., & DeAngelo, L. (2007). *Capital structure, payout policy, and financial flexibility* (Marshall School of Business Working Paper No. FBE 02-06). Social Science Research Network. [\[CrossRef\]](#)
21. Deng, Y., & Yao, H. (2021). Corporate cash holdings and monetary shocks: A test of the credit channel theory. *Review of Financial Economics*, 39(2), 203–222. [\[CrossRef\]](#)
22. Denis, D. J. (2011). Financial flexibility and corporate liquidity. *Journal of Corporate Finance*, 17(3), 667–674. [\[CrossRef\]](#)
23. Denis, D. J., & Sibilkov, V. (2010). Financial constraints, investment, and the value of cash holdings. *The Review of Financial Studies*, 23(1), 247–269. [\[CrossRef\]](#)
24. Duong, H. N., Nguyen, J. H., Nguyen, M., & Rhee, S. G. (2020). Navigating through economic policy uncertainty: The role of corporate cash holdings. *Journal of Corporate Finance*, 62, 101607. [\[CrossRef\]](#)
25. Farre-Mensa, J., Michaely, R., & Schmalz, M. C. (2014). Payout policy. *Annual Review of Financial Economics*, 6, 75–134. [\[CrossRef\]](#)
26. Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity*, 1988(1), 141–206. [\[CrossRef\]](#)
27. Gertler, M., & Gilchrist, S. (1994). Monetary policy, business cycles, and the behavior of small manufacturing firms. *The Quarterly Journal of Economics*, 109(2), 309–340. [\[CrossRef\]](#)
28. Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method. *Political Analysis*, 20(1), 25–46. [\[CrossRef\]](#)
29. Han, H., & Wang, X. (2023). Monetary policy uncertainty and corporate cash holdings: Evidence from China. *Journal of Financial Stability*, 67, 101138. [\[CrossRef\]](#)
30. Han, S., & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance*, 13(1), 43–57. [\[CrossRef\]](#)
31. Islam, R., & Maruf-Ul-Alam, M. (2021). Capital structure and firms' performance: Evidence from manufacturing sector of Bangladesh. *Journal of Business Studies*, 9(1–2), 61–90. [\[Link\]](#)
32. Javadi, S., Mollagholamali, M., Nejadmalayeri, A., & Al-Thaqeb, S. A. (2021). Corporate cash holdings, agency problems, and economic policy uncertainty. *International Review of Financial Analysis*, 77, 101859. [\[CrossRef\]](#)
33. Kashyap, A. K., & Stein, J. C. (2000). What do a million observations on banks say about the transmission of monetary policy? *The American Economic Review*, 90(3), 407–428. [\[CrossRef\]](#)
34. Kusnadi, Y. (2011). Do corporate governance mechanisms matter for cash holdings and firm value? *Pacific-Basin Finance Journal*, 19(5), 554–570. [\[CrossRef\]](#)
35. Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance*, 39(3), 574–592. [\[CrossRef\]](#)
36. Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221. [\[CrossRef\]](#)
37. Opler, T., Pinkowitz, L., Stulz, R. M., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, 52(1), 3–46. [\[CrossRef\]](#)