INTEREST RATE FLUCTUATIONS AND CORPORATE INVESTMENT: EVIDENCE FROM THE NON-FINANCIAL SECTOR OF PAKISTAN

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Date: 13 February 2026

Malik Faheem Zahid

Dedication

This thesis is dedicated to my beloved parents, siblings & to my best friend.

To my beloved mother, my late father, Zahid Hussain Malik, and my siblings—whose unconditional love and constant prayers have been the bedrock of my strength. I also dedicate this work to my dear friend Nimra Asif, whose unwavering presence and quiet belief in me made the difficult paths lighter and my purpose much clearer.

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List of Abbreviation

GMM	Generalized Methods of Moments
FE	Fixed Effects
REER	Real Effective Exchange Rate
MP	Monetary Policy
FA	Firm Age
SBP	State Bank of Pakistan

Abstract

This research examines the determinants of investment at the firm level in the context of Textile Sector in the economy of Pakistan, specifically how macroeconomic variables and firm-level factors affect investment. With a balanced panel data of 119 firms from 2009 to 2023, the study used both Fixed Effects and Generalized Method of Moments (GMM) estimations to analyze the influence of real interest rates, real effective exchange rate (REER), age, size, liquidity, profitability, and shareholders' equity on capital accumulation. A major contribution of this study is a state dependent analysis to compare how investment acts at firm level when the economy goes through recessionary phase when GDP is below average as well as when GDP is moving above average to generate some business confidence that influences investment behavior. The findings reveal a significant negative relationship between real interest rates and firm investment measured as capital employed, which represents the total long-term capital invested in firms after adjusting for current liabilities, confirming that higher borrowing costs dampen long-term capital formation. This effect is notably stronger during periods of below-average GDP growth, indicating that monetary tightening severely constrains investment when economic conditions weaken. Conversely, during strong GDP growth, the sensitivity of investment to interest rates declines and often becomes statistically insignificant, suggesting that robust economic expansions can mitigate the impact of higher borrowing costs.

Keyword: Investment, Firm Capital, State-dependent Analysis

Chapter 1

Introduction

1.1 Background

Monetary policy remains at the core of macroeconomic management in Pakistan, just as in the case of other economies. The State Bank of Pakistan (SBP) employs its policy rate as the key instrument to primarily manage inflation, and also to stabilize the exchange rate, and direct overall economic activity. Over the past few years, Pakistan has experienced chronic issues like high inflation, exchange rate volatility, external account deficits, and fiscal imbalances, which have made interest rate management all the more important. Monetary policy uses multiple channels to affect the real economy; among which, the interest rate channel is especially important for firm investment choices. Adjustments in interest rates have a direct impact on the cost of borrowing as well as the return for savings, thus influencing the incentives for companies to make new investments or expand existing activities.

Theory for the effect of interest rates on investment choice has its roots in Keynesian and neoclassical economics. According to Keynesian theory, a decrease in interest rates lowers the cost of capital, which encourages investment and overall demand, particularly during times of economic slack (Keynes, 1936). The neoclassical model of investment (Jorgenson, 1963) also makes this relationship more formal by implying that businesses invest to the extent that the marginal product of capital is set equal to the user cost of capital, which is predominantly dictated by the current interest rate. Furthermore, contemporary theories like the credit channel and financial accelerator (Bernanke et al., 1999) put strong emphasis on financial frictions and asymmetric information. These theories indicate that monetary policy not only influences the price but also the availability of credit, with interest rate-sensitive firms being more sensitive to interest rate changes (Stiglitz & Weiss, 1981).

Investment by the non-financial business is the pillar of economic growth and industrial advancement in Pakistan. The non-financial corporate sector, including manufacturing, services, and agriculture, are extremely responsive to macroeconomic policy, particularly monetary policy. In the last ten years, Pakistan has experienced significant volatility in policy interest rates, with the State Bank of Pakistan increasing rates from 7% in 2020 to 22% in 2024 to counteract inflation

and stabilize the external sector (Ahmad et al., 2022)Even with these steep hikes, investment to-GDP decrease has been quite modest, belying a complicated relationship between regimes of interest and firm investment behavior.

Conventional economic theory (Loanable Funds Theory, Liquidity Preference Theory) argues that increased interest rates raise the cost of capital, hence deterring investment, while decreased rates encourage investment by lowering borrowing costs (Rasool et al., 2013). Nonetheless, evidence from Pakistan indicates this relationship is moderated by firm size, leverage, internal cash flow, industry dynamics, and economic policy uncertainty (Ahmad et al., 2024). Predominance of large family business groups and dynamic macroeconomic environment complicate the relationship further.

For Pakistan, the State Bank of Pakistan (SBP) employs interest rate policy actively to control inflation and ensure economic growth. Yet, monetary policy transmission to the real sector is frequently hampered by weak financial markets, recurrent macroeconomic shocks, and rigidities in the structure. Non-financial companies in Pakistan, particularly small and medium enterprises (SMEs), tend to be severely credit-constrained and very responsive to borrowing-cost changes. Recent SBP documents (Financial Stability Review 2023, 2024), show that a 1% policy rate hike can decrease capital expenditures of non-financial corporations by 15–20%, with SMEs being disproportionately hit as a result of inadequate access to internal funding and collateral. These results underscore the significance of identifying how interest rate movements within various monetary policy regimes affect firm-level investment conduct in Pakistan.

Empirically, on a global level, there exists a strong evidence base supporting the proposition that firm investment is heavily influenced by changes in interest rates, although the size and sign of the effect may differ by country and by type of firm (Gertler and Gilchrist, 1994). Similarly, findings from Bernanke et al. (1999) show that in developed countries, falling interest rates have the effect of increasing investment, especially among firms that are intensive users of external finance. Financial market distortions and credit constraints are stronger in emerging economies, and thus can make monetary policy more effective in boosting investment (Ghosh et al., 2018). For instance, empirical evidence for India and Turkey is that rate cuts in bad times raise investment, but the response is weaker for constrained firms. Also, increasingly, evidence is found that the

impact of monetary policy is asymmetric: contractionary policy tends to have a more significant negative impact on investment compared to the positive impact of expansionary policy.

In spite of these findings, the majority of empirical work in Pakistan has considered aggregate macroeconomic indicators or the banking sector with little regard to the differential impacts of interest rate policy on firm investment in the non-financial sector specifically in a state-dependent framework where economic state also affects the causal effects. In other words, this interest rate – investment relationship is especially significant considering the structural characteristics of the economy of Pakistan and the central role played by the non-financial sector in propelling growth and employment.

1.2 Theoretical Framework

Keynesian Theory (Keynes, 1936): The theory focusses on changes in interest rates directly influence investment by affecting the cost of capital and aggregate demand. This is the relevant theory to relate with the study we want to conduct as we are analyzing the impact of interest rate policy on firms invest directly and how it effects the investment decisions of the firm.

Neoclassical Investment Theory (Jorgenson, 1963): The theory focuses that investment decisions are made on the user cost of capital, which is affected by the interest rate fluctuations. This has a significant importance with the study as in case of Pakistan firms highly depend upon the leverage and how they respond to the cost of capital and interest rate fluctuations that have a direct impact on it.

Credit Channel Theory by (Bernanke and Gertler, 1996): The theory describes that monetary policy affects by both the cost and availability of credit, with firms having financial challenges are more affected by the interest rate changes. The theory is most relevant to our study as we want to determine the impacts of interest rate fluctuations on the firm investment decisions that are leverage firms and the credit channel has a direct impact on the cost of capital of the firm.

1.3 Research Problem and Contributions

Even with the theoretical presumption that monetary policy, in terms of interest rate regimes, has a strong influence on investment by firms, empirical Pakistan evidence is inconclusive and incomplete. A majority of studies (Ahmed et al., 2022; Mehmood and Khan, 2024) examine the impact of contractionary regimes or consider aggregate investment, ignoring heterogeneity

between non-financial firms and the possible asymmetric impacts of expansionary and contractionary regimes. In addition, the moderating effects of firm-specific variables (including leverage, internal finance, and industry) and economic policy uncertainty have not been examined systematically in case of manufacturing sector specifically in Textile Sector of Pakistan, particularly in the post 2010 era characterized by recurring macroeconomic shocks.

This study seeks to fill several important gaps in the literature:

Firm-Level Analysis: Unlike most previous research, which relies on aggregate data, this study uses firm-level data from Pakistan's non-financial sector.

State-Dependent Analysis: By considering the economic context and firm-specific characteristics, the research provides a nuanced understanding of the monetary policy transmission mechanism in Pakistan.

Policy Relevance: The findings will inform the design of monetary policy that supports private sector investment while maintaining macroeconomic stability.

1.4 Objectives of the Study

3 To examine the impact of interest rate regimes on investment decisions of non-financial firms in Pakistan.

4 To investigate the state-dependent effect of the interest rate regimes on the firm investment in Pakistan where the economy is operating below potential against the above potential.

1.5 Research Questions:

1. What are the interest rate regimes implications of investment decision on non-financial firms in Pakistan?
2. What is the differential impact of interest rate regimes on firm investment by below potential against the above potential, in Pakistan?

1.6 Significance of the Study

The study holds significant importance both academically as well as practically as it enhances the existing knowledge of the monetary policy effects on the decisions made by firms concerning investment in an emerging economy context specifically Pakistan. In contrast to the previous studies that mostly depend on aggregate data, the present research utilizes firm-level panel data of

various firms inside the non-financial sector, and this specific feature brings more specified knowledge regarding the interest rate variations of heterogeneous effects. first, it presents firm-level empirical evidence on the impact of interest rate regimes on corporate investment in Pakistan's non-financial sector. Unlike previous studies based on aggregate data, this paper employs panel data for listed companies and includes a state-dependent model that makes a distinction between high and low GDP growth periods. This makes the analysis richer in terms of understanding how monetary policy impacts investment behavior across different economic conditions.

Second, the research findings provide significant policy guidance for the State Bank of Pakistan (SBP) and economic planners. The research underlines that a single monetary policy might not ensure balanced investment levels among firms and across economic states. By recognizing that interest rate tightening disproportionately limits financially weaker firms particularly in below-potential economic times the research substantiates crafting counter-cyclical and focused monetary interventions to boost private investment without jeopardizing financial stability.

1.7 Policy Context

The economy of Pakistan is marked by periodic inflationary pressures, external shocks, and an evolving financial sector. The SBP repeatedly uses interest rate adjustments to stabilize the economy. As the non-financial sector is a prominent value contributor to GDP and employment, it is important to realize the response of investment to interest rate increases. The recommendations of this study will be evidence-driven so as to calibrate monetary policy impact at the firm level for the specific economic situation of Pakistan.

1.8 Organization of the Study:

The research is divided into six chapters. Chapter one provides the background of the study, introduces fundamental concepts about the interest rate fluctuations and their significance for corporate investment in Pakistan. It also includes the research questions and the objectives of the study. Chapter Two highlights the literature that has been centered on the effect of the monetary policy, heterogeneity of the firms, dynamics of sectoral development, and macroeconomic situations affecting the process of investment decision making. Chapter Three gives theoretical overview which dwells on credit channel theory (that is applicable to the investment decision in the context of the monetary policy fluctuations) and how monetary policy transmits its effects on firm investment. This chapter states as the theoretical foundation of the study, principally the

theory of the credit channel that is applicable to the investment decision in the context of the monetary policy fluctuations. Chapter Four outlines the research methodology where data sources, variable definitions, and selection procedures are described, together with econometric estimation methods, including Fixed Effects and system GMM estimators. Chapter Five presents the empirical findings in terms of analyzing how interest rates, firm characteristics and economic conditions induced an effect on investment behavior in terms of regional sub-sample analysis. Lastly, in Chapter Six, an end-of-study conclusion is given on key findings, the policy implications and a recommendation on future research and policy formulation.

Chapter 2

Literature Review

Research on advanced and emerging economies has shown how monetary policy might impact corporate investment. Analysis by experts from many countries shows that the interest rate channel and the credit channel are the primary ways monetary policy determines investment decisions.

A study from the USA and the UK found that firms that are not paying out dividends are the ones that invest the most when monetary policy is changed. These economists suggest that these firms depend heavily on outside finance, making them more open to the effects of changes in borrowing prices and financial frictions. By contrast, established firms do not change their investments very much, suggesting that firm-level reactions to policy changes are not the same (James et al., 2019).

In line with a vast cross-Section of literature, there is recent Chinese evidence that corporate investment is extremely sensitive to unanticipated monetary policy changes, with the size of the effect depending upon firm-specific and macroeconomic conditions. Convergent insights from European panel data findings support this view, showing that the transmission of monetary policy is firm-heterogeneous, mainly in response to size, credit access, and leverage (Durante et al., 2020).

Around 450 studies related to monetary policy and corporate investment have been published over the years and the most research came after the 2008 financial crisis. Both price-based and quantity-based monetary policy have a major impact on corporate investment, according to the study, and firm-specific characteristics limit how monetary policy is transmitted to corporate investment. The effects of both quantity-based and price-based monetary policy are transmitted by firm-specific characteristics, according to this research, and these effects have been observed in both the manufacturing and non-manufacturing sectors. Value and originality as far as the authors are aware, this is the first study to look at how price-based and quantity-based monetary policy affect corporate investment in India (Bagow and Altaf, 2023). The review reminds us that monetary policy affects corporate investment by acting on cost of capital as well as capital structure and the challenges of meeting financial demands. Nations throughout the world find that firms deal with challenges in different ways and these challenges often involve financial issues.

Furthermore, global studies point out that financial markets are increasingly tied together, so that decisions made by a country's central bank may have consequences for businesses everywhere, affecting their debt, approach to investing and how they handle risks. (Rumasukun, 2024)

These aggregate patterns are also confirmed in research conducted in Pakistan, but there are some notable cross-region differences. Ahmad, Rashid, and Shah (2022), for example, provide firm-level evidence that high money policy, as conveyed by rising interest rates, significantly dampens the investment activity of non-financial firms. Most importantly, they find that the adverse effect is mitigated by more firm age and more profound financial sector development, meaning that institutional maturity reduces the effect of binding policies. In accordance with Chaudhry and Iqbal, et al. (2021), employing an ARDL approach to examine aggregate time-series data for 1972-2019, increased interest rates negatively affect investment in the long run and a higher money supply increase leads to encouraging investment and economic growth. The impact of monetary policy on firm investment decision in Pakistan has been extensively studied. Research in Pakistan reveals that monetary policy plays a complex role in firm investment decisions, dependent on company, industry and national economic backgrounds. How firms react to interest rates, CRR and discount rates is affected by policy changes which may also decide their investment actions. Pakistan's manufacturing industry changes a lot when monetary policy is adjusted.

A team including (Furman and Adeeb, 2014) investigated the way stock returns in the manufacturing sector responded to shifts in monetary policy in 2014. The team found that changes in CRR and discount rates have an important impact on stock returns. The research revealed the route by which these instruments help guide firm decisions about investing.

Pakistan sets out to achieve monetary policy goals of economic development, inflation control, encouraging investments by businesses, maintaining stable markets and accumulating foreign exchange. Economies and especially growing ones, depend on money and credit. The increase in interest rate causes the cost of money and credit to go up which is leading people to want less money and credit which in turn reduces economic activity.

In Pakistan, the direct tool used in monetary policy is the discount rate and the broad credit channel also contributes to passing these shocks to company investments (Munir, 2020). Alterations in monetary policy have an impact on credit from banks and other financial institutions which in turn impacts how easy it is for businesses to borrow money. During a contraction, banks become more

cautious and make it tougher for companies to get loans. Small companies suffer more from this problem since many do not have much credit history or strong collateral. Alternatively, when expansion is happening, credit availability helps firms get the funds they need to build new businesses.

2.1 Monetary Policy Instrument and Firm Investment

Monetary policy plays a crucial role in shaping the investment decisions of firms in Pakistan. Many Researchers and experts have discovered important information about the effects of monetary policy, specifically how interest rates and credit options, affect firm investment.

The findings of Majeed et al. (2017) reveal that both interest rates and broad credit access are ways that monetary policy can shape firm investment. Analysis of financial figures suggests that small manufacturing companies are able to react more quickly to changes, primarily because they suffer from insufficient information and must pay higher costs for loans.

Firdous et al., (2023)argue that monetary conditions have a stronger effect on small business investment than on large business investment. There are a number of reasons that make people sensitive. Small businesses often struggle to find funds from within the company and so depend mostly on loans, meaning they are more easily affected by changed interest rates and credit availability. In addition, these firms frequently lack the capital to withstand changes in the economy which means their investments are more easily affected by any changes in interest rates.

Studies have routinely demonstrated that smaller manufacturing companies in Pakistan respond more to changes in monetary policy. There are a number of reasons for this responsiveness, including higher cost of financing, greater dependence on outside debt and more differences in information between firms. Lacking both resources and strength in the market, smaller firms are more likely to be influenced by changes in the costs and availability of borrowing. Also, higher transaction and stricter lending costs can make these firms more easily impacted by changes in monetary policy.

(Furman and Adeeb, 2014) show that tightening the monetary policy, using the measures discount rate and cash reserve ratio, has an important negative impact on stock returns for Pakistan's manufacturing sector. Therefore, policymakers should expect less profit and less investment from smaller firms, as they are more easily overwhelmed by a contractionary monetary policy. Similarly,

(Husain & Mahmood, 1999)reported that adjustments to interest rates have a major effect on Pakistani stock returns because the markets are sensitive to these policy changes.

Working on ownership concentration and corporate governance in Pakistan, (Javid & Iqbal, 2008)showed how the monetary policy can indirectly affect firm earnings and their choices regarding investment by operating through governance structures.

Monetary policy adjustments and shifting macroeconomic conditions can have a big effect on how well a company does (Farooq et al., 2021). When the economy is struggling, policy realignments are more important for corporate success. The Monetary Conditions Index (MCI) for Pakistan, which reflects the combined effects of interest rate and exchange rate fluctuations on economic activity, is presented by (Qayyum, 2002). A useful framework for examining the connection between central bank interest rate decisions and firm-level investment behavior is provided by this MCI technique.

Determining how interest rates from monetary policies affect market interest rates is unclear in all economies, both developed and developing. Because of this uncertainty, we must examine how monetary policy changes asset prices and investment actions across different economies (Edelberg and Marshall, 1996).

2.2 Transmission Mechanisms: Interest Rate and Credit Channel

Kamin, (1998) claimed that in some developing and underdeveloped countries, financial markets are not advanced enough, so changes in the credit supply and price play an important part in monetary policy. Ahmad and Qayyum, (2008) concluded that rising government spending as well as higher interest rates tend to discourage investment in the private sector.

In Pakistan, credit channel serves as one of the main paths for changes in monetary policy. Majeed et al. (2017) uncovered via data that changes in Pakistan's interest rates and credit influences firms in the manufacturing sector to invest differently. When interest rates go up, shows of contractionary policy and when credit is abundantly available, it encourages more investment. This research also drew attention to how cash flow and sales play a role in investment, shown by a greater reaction to monetary tightening by small businesses than by larger ones.

Ahmad et al. (2022) looked at balance sheet data to see how monetary policy influences investment for companies and discovered that contractionary monetary policy decreases

investment most for young companies and those operating with less mature financial sectors. According to their results, stronger financial sectors and older companies protect firms from the harm caused by tighter monetary policy, indicating that firm and institutional features count largely in this transmission. The interest rate channel is highlighted as the most important way monetary policy changes the growth and investment of firms. An increase in interest rates means it's more expensive to borrow money which causes a slowdown in both investment and broader economic activities.

Research finds that lower interest rates, resulting from expansionary monetary policy, usually cause Return on Assets (ROA) to rise for firms in the industrial engineering and oil and gas industries (BURKI, 2016).

Zia Rehman, (2016)shows that firms become less willing to borrow more when interest rates are higher. The reason is, as borrowing gets more expensive, the firms tend to avoid using loans for new projects which can affect their plans for future growth. Therefore, when interest rates are high, companies tend to spend less money on investments as they prefer to finance operations with money received from employees than to borrow from banks. Taking this careful approach to borrowing, firms are less likely to agree to new investments that use debt, because they fear the loan might become costlier ahead.

Rafique et al. (2021) Show that interest rates largely drive changes in companies' decisions to invest. When there is an increase in interest rates by the central bank, the cost of taking out loans goes up for companies which makes financing new investments costlier. Leverage and a lack of collateral affect smaller firms more strongly when such changes occur. As a result of expansionary monetary policy, the lower interest rates can make borrowing cheaper, sparking companies to start more investment projects. Still, how these changes affect a firm will depend greatly on its size, reliance on borrowed funds and how easily it can fund its activities.

2.3 Cash Flow, Monetary Policy and Investment Behavior

Several studies have highlighted that when making investment decisions, firms take into account how monetary policy influences their internal cash flow. An up-to-date analysis of non-financial firms on the Pakistan Stock Exchange, using the dynamic panel method, shows that, in simple regressions, cash flow decreases investment, but adjusting for the impact of endogeneity and heterogeneity in better models, shows that it actually increases investment from the related firms.

Generally, firms in the lower half of investment spend less due to contractionary monetary policy, but businesses in the higher half could at least avoid further decreases or even gain better investment outcomes. Therefore, brands with greater internal liquidity are more capable of carrying out investment when money is tight (Ahmed et al., 2024).

(Gul, 2020) A similar study regarding Turkish unlisted small and medium enterprises (SMEs) within manufacturing further stresses internal finance's role in determining firms' fixed capital investments. The study uses a thorough panel data set as it estimates a set of dynamic firm investment models also it allows the marginal impact of cash flow on investment to vary with the central bank's monetary policy stance, macro-financial conditions, and the Global Financial Crisis (GFC). The system-GMM estimation results show firms face internal finance constraints so those results indicate investment shows large positive cash flow sensitivity. The degree to which investment-cash flow sensitivity greatly varies along with the monetary policy stance, and it declines at some point during periods with expansionary monetary policy for financially constrained firms. However, the evidence for less-constrained firms is less conclusive. Those firms can access external finance with more ease. The study does also find that investment-cash flow sensitivity declines when broader macro-financial conditions do support it. Companies require increased cash flow when recession hits since outside capital becomes scarce (Başçi et al., 2017).

2.4 Asymmetric Effects of Monetary Policy and Role of Uncertainty

2.4.1 Asymmetry in Policy Impact

Recent empirical research has found that the impact of monetary policy on firm investment is unequal or it is not symmetrical. In other words, restraining the money supply and raising interest rates, which usually results in less investment than easing the monetary policy by adding more money does in encouraging investments. According to (F. Ahmad et al. 2024b) data from Pakistan illustrate that a negative monetary shock lowers investment more than a positive one increases investment. The problem of the debt mismatches is most severe for companies that took on a lot of debt, since they are more exposed when interest rates rise and have fewer chances to re-finance. Results indicate that firms with a lot of debt experience more drastic reductions in capital spending when there is a contractionary shock than firms with less debt. Due to financial problems and difficulties in the credit market found in Pakistan, larger firms that need to borrow funds from outside are negatively affected more than others by tighter monetary policy. Even though

expansionary policies make it cheaper to borrow, these policies may not overcome the ongoing challenges in credit markets, (Raza 2020).

2.4.2 The Amplifying Role of Policy Uncertainty

Economic policy uncertainty leads to intensify the asymmetry effects of monetary policy on company's investments. (Adra et al. (2024)) indicate that uncertainty about local economic policies makes firms react more strongly to tighter monetary policies, mainly if they are bounded by location or have weaker financial support. Due to this uncertainty, companies often tend to delay their investments to avoid the risk, which can lead monetary policy shocks to cause the economy to shrink. Because policy instability and economic ups and downs are regular in Pakistan, the agenda-setting effect matters greatly (Javed, 2021).

The author finds that uncertain policies work to decrease the positive relationship between investment and firm performance, highlighting the need for a reliable policy setting. Firms experiencing economic uncertainty are more cautious with their investments which makes it less likely that expansionary monetary policy will work.

Moreover, when policies are unclear, tightening interest rates adds to credit problems and can limit the availability of currency which discourages businesses from investing. When uncertainty is high and the central bank slows down the money supply, both SMEs and firms with a high debt level might experience a strong slowdown in their investments (Javed 2021; Raza 2020).

2.5 Long-Term Investment Trends and Innovations

2.5.1 Discount Rates and Private Investments

Long-term relationship between discount-rates and investment is complex to understand that how growth in Pakistan responds to monetary policy by private enterprises. (A. Firdous et al. 2016) examines the link and discovers that higher real discount rates noticeably reduce the amount of investment by private sector companies both in the short and long runs. The discount rate reflects the opportunity cost of capital, which determines the present value of future returns on the investments. So, higher rates mean less investment activity in firms. This result makes clear that maintaining steady and low real interest rates is necessary for private sector growth.

Evidence from Pakistan over the last few years indicates a more complicated situation. Despite the significant fluctuations and changes in interest rates, such as the rise to 22% in 2023, declined to

15% in 2024 and kept going lower, private investments stayed low or weakly reacted, reported in Dawn News (2024). The fact is that apart from interest rates, difficulties like red tape, high fuel prices, political issues and small credit supply are big barriers that prevent companies from investing. As a result, investment may not rise only through monetary policy; additional reforms and supporting policies are also necessary (Kalim, 2014).

2.5.2 Innovation and R&D

Investment in R&D an innovation is vital for long-term economic growth and competitiveness. (Srivastava & Danish, 2024) used data for India to analyze how an abrupt decrease in the money supply affected how much firms invested in research and development. According to the study, after the shock there was a significant decrease in innovation spending for firms that are less successful and have more debt. Hence, restricted credit supply from contractionary monetary policy may make it hard for companies to invest in uncertain projects like R&D and in the future's progress. Though Pakistan-specific studies are not numerous, their implications are obvious: raising interest rates and credit restrictions can get in the way of innovation. With a limited flow of private investments and much-needed changes in Pakistan, tighter monetary policies could inhibit businesses from making innovations needed to strengthen industries and the (Zahra & Nawaz, 2024).

2.6 Research Gap

Despite extensive research on monetary policy and firm investment in Pakistan, there are still gaps in the literature. Moreover, as the literature provides, firm size, age, leverage, and capital employed are important determinants that can moderate the effect of the policies, but there is little analysis on those firm characteristics in relation to different monetary regimes over time. While the amplifying role of policy uncertainty on investment under monetary policy tightening and easing is accepted, it has not been empirically disentangled using firm-level dynamic panel data. There is also scant research on the textile sector which is one of the most important sectors of Pakistan's economy as most of the literature treats all manufacturing firms as a single unit and fail to capture important sectoral dynamics. Other gaps include the lack of integrated analysis on the interplay of internal cash flow and capital employed as external capital, and how together they influence the impact of monetary policy under different regimes. Thus, there is a need for a holistic approach to dynamically assess the asymmetric focus on policies and their relation to firms.

2.7 Empirical Regularities from International Literature:

Traditional investment theory associate investment with the user cost of capital and marginal q of firms (Tobin's q). In q-theory, investment falls as the cost of capital increases because future returns are discounted more and thus reduce the appeal of new capital spending. New extensions introduce stochastic interest rates and illiquidity in capital into the q-model; these reveal that both the level and term structure of interest rates affect q and, indirectly, investment choice — suggesting short-rate movements are not always enough to explain investment sensitivity when long-term funding and risk premia are important. A further theoretical channel comes from financing frictions.

When external finance is more expensive than internal financing, financially constrained firms will have investment that is responsive to internal cash flow and to the level of the external finance premium. Monetary contraction that increases market rates can increase this premium by making banks' lending spreads wider or by crowding out private credit when banks find sovereign securities with high yields appealing. The real options literature also highlights uncertainty: higher rate volatility can increase the option value of delaying irreversible investment and thus further reduce capex in volatile times. Empirically, two strong patterns are seen.

Higher real interest rates are typically linked to lower aggregate and firm-level investment, although estimates differ with sample, identification strategy and measure of the cost of capital. Second, heterogeneity is important: small, young, highly leveraged or low-tangibility firms (the usual list of "financially constrained" firms) cut back investment more in response to an increase in a given rate than do unconstrained firms. Path breaking empirical evidence by Fazzari, Hubbard and Petersen captured the role of financing constraints in generating "excess sensitivity" of investment to cash flow — evidence that has influenced much subsequent micro and macro research on the rate-investment relationship. More recent work sharpens the picture by bringing credit-risk measures and term-structure dynamics together in q-models, and the result is that credit spreads and bond-q explain investment once stochastic rates and capital illiquidity are accounted for — an outcome with explicit implications for economies in which corporate finance tends to rely on bank credit and in which corporate bond markets are thin. Such models have the implication that work based on short-term policy rates alone is likely to underestimate the actual impact of

monetary conditions on investment. Pakistani financial system is bank-dominated and characterized by the existence side by side of conventional and Islamic banking

State Bank of Pakistan (SBP) is the main monetary agency, and the empirical evaluations of the transmission mechanism of Pakistan suggest that interest-rate, credit and exchange-rate channels all contribute to the determination of real activity and investment (SBP working papers describe these channels comprehensively).

The nation has also witnessed periods of high policy rates (employed to fight inflation and stabilize reserves) and high sovereign borrowing; these forces together influence banks' portfolio decisions and the amount of credit supplied to non-financial corporations. A striking feature in recent years has been the significant and lucrative exposure of banks to government debt securities when yields have been high. Evidence from reporting and analysis indicates that banks were making huge profits on government paper, and that excessive sovereign debt holdings were crowding out private lending — a mechanism that diminishes term lending to the corporate sector even when the policy rate itself remains constant.

This sovereign-bank nexus magnifies the macro policy transmission to firm-level investment in Pakistan. Long-term and short-term time series analyses of Pakistan generally discover that private investment (defined as private gross fixed capital formation) is negatively correlated with real interest rates. Co-integration tests over multi-decadal samples indicate that increased real interest rates are correlated with lower private investment in the long term, although short-term behavior is subject to demand shocks, exchange rates and fiscal policy. A number of studies employ ARDL/VECM methods and highlight controlling for inflation and income in order to identify the rate effect.

SBP studies and academic papers on Pakistani monetary transmission indicate that monetary policy tightening lowers credit aggregates and bank loans to the private sector, with differences by sectors in pass-through. When banks shift balance sheet capacity to higher-yield government securities, private credit expansion is dampened — a banking-supply channel that ultimately constrains corporate capex ability. This evidence highlights the joint role of price (interest) and quantity (credit availability) channels in mediating investment responses. Pakistan's expanding Islamic banking industry injects contractual differences into money transmission. While Islamic banks don't rely on interest in the conventional sense, latest studies reveal they engage with the

credit channel through profit-sharing and mark-up contracts; changes in money conditions and in the yield on Sukuk (Islamic Bonds) or other government Islamic instruments affect funding costs as well as supply of loans.

Empirical research finds that Islamic banks pass through monetary shocks, although the dynamics of pass-through and contractual limitations are slightly different from traditional banks, with possible effects on firms' investment sensitivity when mainly funded by Islamic banks.

Empirical evidence in both advanced and emerging economies generally confirms three stylized facts. First, increased real interest rates are generally linked with a decline in aggregate and firm-specific investment, even if estimated elasticities are sensitive to methodologies and samples. Second, heterogeneity matters: the responses to investment are greater for small, young, highly leveraged or low-tangibility firms — those most likely to be financially constrained (Fazzari et al., 1988; later literature).

Third, credit-market signals (spreads, lending rates of banks, and term-structure indicators) frequently contribute additional explanatory power over the policy rate; studies that include term-structure and credit-risk indicators within q-based models account for additional variation in investment and show that both price and quantity dimensions of finance are important (Lin et al., 2013). Pakistan's financial system is bank-based: companies rely mainly on banks and trade credit instead of having deep corporate bond markets. The State Bank of Pakistan (SBP) operates policy under an operative policy rate regime and open-market operations; SBP research reports evidence of working interest-rate and credit channels in Pakistan, with implications that policy tightening lowers money, credit, and output (Ahmed et al., 2005; SBP working papers). Behavior in the banking sector is influenced by huge sovereign funding requirements: high government yields encourage banks to increase holdings of government paper since they have high, comparatively safe returns — a situation that can crowd out private credit.

Recent coverage and analyses affirm large bank returns linked to government paper and private credit growth being muted amidst high sovereign exposure (Financial Times; Reuters). Long-run estimates based on ARDL/cointegration and VECM specifications tend to find a negative long-run relationship between real interest rates and private investment (private gross fixed capital formation) in Pakistan. These studies generally emphasize the importance of controlling for income, inflation, exchange-rate fluctuations and government spending since omitted shocks can

lead to a biased rate effect estimate. Muhammad et al. (2013) and associated studies for the period 1964–2012 are able to find real interest rates strongly related to private investment once income behavior is controlled.

2.8 Literature Summary Table

Table 2-1 Literature Summary

Author(s)	Data Span	Focus Area	Impact on Investment
Majeed et al., (2017)	1974-2010	Pakistan - Small firm sensitivity	Shows size-based heterogeneity in Pakistan
Rafique et al., (2021)	1999-2015	Pakistan - Firm size and sensitivity	Confirms vulnerability of small firms
Ali, Adeeb & Saeed, (2014)	2001-2014	Pakistan - Stock returns, manufacturing	Contractionary policy reduces profitability and investment incentives
Hussain & Mahmood, (1999)	2002-2015	Pakistan - Stock returns, monetary expansion	Highlights sensitivity of financial markets to policy
Farooq et al., (2022)	1988-2021	Pakistan - Macroeconomic conditions	Macroeconomic instability amplifies policy impact
Qayyum, (2002)	1990-2001	Pakistan - Monetary Conditions Index	Enhances understanding of aggregate and firm-level investment dynamics
Ahmad & Qayyum, (2008)	1980-2006	Pakistan - Private investment	Macroeconomic instability and high rates reduce investment
Burki, (2015)	2001-2012	Pakistan - Sectoral ROA	Expansionary policy stimulates investment in capital-intensive sectors
Rehman Zia, (2016)	2004-2013	Pakistan - Interest rates and leverage	Firms avoid debt when borrowing costs rise
Ahmed et al., (2023)	2010-2020	Pakistan - Cash flow and investment	Internal finance buffers against tight monetary policy
Abdul-Quddus, (2022)	2015-2020	Pakistan - Uncertainty and performance	Stable policy environment needed for investment

2.9 Theoretical Framework and Testable Hypothesis:

Table 2.8 Theoretical Framework and Testable Hypothesis

Theories	Core Mechanism	Testable Hypothesis
Keynesian Theory	Cost of Borrowing	Interest rate reduce the investment
Neo-classical User cost	Capital Cost	High real interest rate user cost and reduce capital accumulation
Credit Channel	Credit Constraints	The negative effect is stronger in firms
Financial Accelerator	Balance Sheet affect	Interest rate affected stronger during the below GDP
Pecking Order Theory	International finance.	Liquidity positively affect investment.

The textile sector is considered the most appropriate sector to investigate the transmission of interest rate in Pakistan. According to the Credit Channel Theory (Bernanke & Gertler, 1995), the impact of monetary policy is more pronounced in sectors that are more dependent on external finance and collateral. The textile sector exhibits precisely these characteristics. Textiles are the most important sector in Pakistan's export base, contributing around 60 percent to the country's total exports and 8-9 percent to its GDP. This sector is capital-intensive, implying that the investment decision is directly related to the user cost of capital (Jorgenson, 1963). Additionally, the sector is more leveraged, implying that the balance sheets are more sensitive to interest rate fluctuations. Finally, the Financial Accelerator (Bernanke et al., 1999) predicts that the impact of monetary policy is more pronounced in sectors where cash flow is more volatile and collateral is

high. This is true of the textile sector in Pakistan. Therefore, if the transmission of monetary policy is through the interest rate channel, then the impact must be visible in the textile sector.

2.10 Why Interest Rate Fluctuations? A Theoretical Justification

In accordance with the Policy Ineffectiveness Proposition (Sargent & Wallace, 1975), only unanticipated changes in monetary policy affect real economic variables, e.g., investment. Anticipated changes in the interest rate are taken into account in investment decisions through contractual agreements and inflationary expectations.

The Rational Expectations Theory (Lucas, 1972) extends the above theory by stating that agents use all available information to form their expectations about future policy. Systematic policy, which is policy following some predictable rule, has no real effects. Only the unexpected part of the policy (the "surprise" or "fluctuation") has real effects.

This study does not employ the level of interest rates but the cyclical component derived through the Hodrick-Prescott (HP) filter. This component captures the deviation of the actual policy interest rates from their long-run trend. This is the unexpected part of the policy, which is the relevant part in the context of the above theories.

The deviation of the actual policy interest rates from their long-run trend is the relevant component that captures the unexpected part of the policy. This is the component employed in the majority of the literature on the monetary transmission mechanism ((Bernanke, 1992); (Christiano, 1996).

Chapter 3

Methodology

3.1 Data Description

This study employs a quantitative research strategy by utilizing the panel data analysis to investigate the impact of expansionary and contractionary monetary policy regimes on investment decisions of listed textile firms in Pakistan. The focus on listed firms ensures data reliability and comparability, as these firms are subject to standardized reporting requirements and represents a significant portion of Pakistan's formal textile sector.

3.2 Research Design

The research design is on a balanced panel data model, which allows cross-sectional comparisons across firms with differing characteristics for the period 2009-2023. The study analyzes how changes in monetary policy, primarily through interest rate channel, affect firm-level investment behavior. The analysis will incorporate firm-specific controls (size, leverage and profitability) and macroeconomic variables to account for external influences.

3.3 Sample Selection:

The population to be used in this research will be non-financial companies listed in the Pakistan Stock Exchange (PSX) within the chosen timeframe. Financial firms, such as banks, insurance companies and other financial intermediaries are specifically excluded because they have different balance-sheet structures and regulatory frameworks and investment behavior, which is fundamentally distinct to non-financial firms. Regulatory capital requirements and the monetary policy itself have a significant effect on investment decisions in financial institutions and would complicate the analysis of interest rate changes on real sector investment. Restricting to listed non-financial firms is one of the guarantees of consistent data and comparability since the companies included in this category comply with the standard requirements of financial reporting and disclosures. Observations with missing or inconsistent financial data in firm-years are dropped in order to maintain consistency of the econometric estimates. The sample period used comes into relevance as the years are the ones where the firm-level data and macroeconomic data is available,

and it covers a variety of monetary policy cycles in Pakistan, including tightening and relaxation. This time-varying is necessary to identify the responses of investment within firms to fluctuations of interest rate. Generally, the sample selection parameters are appropriately selected to analyze the firm-level investment behavior in the non-financial sector of Pakistan in the context of strong panel data model.

The timeframe captures multiple monetary policy cycles, including expansionary (e.g. post 2008 crisis stimulus) and contractionary regimes (e.g. 2022-2023 hikes). To ensure data reliability, firms with incomplete and inconsistent financial records during this period are excluded, resulting in a balanced panel dataset. Firm-level financial dataset such as investment (capital expenditure), asset, liabilities, cash flows and profitability are sourced from annual reports published by PSX, company websites and PBS. Monetary policy data, including policy rates (e.g. discount rates) and regime classifications (expansionary vs. contractionary), are extracted from SBP publications and official monetary policy statements. These sources provide standardized, audited financial statements, ensuring consistency and comparability across firms.

3.4. Variables:

Table 3-1 Variables Description

Variables	Definition	Data Source
Dependent Variables		
Firm Investment (INV)	Capital expenditures by firms on tangible and intangible assets. Measured by log of total investment in fixed assets and intangibles	SBP
Independent Variables		
Interest rate fluctuation	The difference between the interest rate and potential interest rate. The potential interest rate is computed through HP Filters.	SBP
REER	Inflation-adjusted exchange rate reflecting competitiveness of domestic currency	International Financial Databases
Control Variables		
Liquidity	Firm's ability to meet short-term obligations, e.g., current ratio or cash ratio	SBP
Gross Profit	Total revenue minus cost of goods sold	SBP
Firm Size (FS):	Total number of Assets since firm established.	Annual Reports of Firms
Shareholder Equity	Equity capital held by shareholders	SBP

3.5 Estimation Strategy

Panel Data Estimation Techniques

As a baseline model, the estimation strategy will be begun with Fixed Effects (FE) model, which accounts for time-invariant unobserved company characteristics (α_i) that might affect investment choices, will be used to address this. The Hausman test, which determines whether the unobserved

effects are linked with the regressors, will be used to guide the decision between the FE and Random Effects (RE) models; a significant test favors FE, while a non-significant result favors RE because of its efficiency.

A dynamic panel data approach employing the Generalized Method of Moments (GMM) estimator (such as Arellano-Bond or Blundell-Bond) will be taken into consideration due to the dynamic nature of investment, where judgments about current investments are based on decisions about previous investments. In order to ensure reliable and effective parameter estimates, this approach successfully handles any endogeneity resulting from lagged dependent variables and other endogenous regressors.

3.6 Empirical Model

The study employs a panel data regression approach. The general form of the model will be:

$$firmCapital_{it}=\beta_0 + \beta_1 IRF_{it} + \beta_2 REER_{it} + \beta_3 FS_{it} + \beta_4 LQ_{it} + \beta_5 GP_{it} + \beta_6 SE_{it} + \alpha_i + \varepsilon_{it} \quad (3.1)$$

$FirmCapital_{it}$= Log of Total Investment in Fixed Assets and Intangibles for Firm I in the Year t.

IRF_{it}= Interest rate fluctuations

$REER_{it}$= Real Effective Exchange Rate.

FS_{it}= Firm Size

LQ_{it}= Liquidity of the Firm

GP_{it} = Gross Profit

SE_{it} = Shareholder Equity

α_i= Unobserved Firm Specific Effects.

ε_{it} = Error Term

The research employs a panel data regression framework with both the Fixed Effects (FE) estimator and the Generalized Method of Moments (GMM). Panel data methods bring together information from both the cross-section (firm differences) and the time dimension (year-to-year changes), and hence they are very well equipped for analyzing investment. The Fixed Effects

model operates by holding constant firm-specific variables which remain constant over time, e.g., managerial philosophy, ownership, or industry characteristics. This keeps the estimated coefficients from being biased by unobserved heterogeneity and allows them to reflect the impact of monetary policy changes and firm-level variables in each firm over time.

This two-pronged method is the best suited to the research question because it delivers strong results from two complementary angles. Fixed Effects eliminate unobserved heterogeneity between firms, while GMM handles endogeneity and picks up the dynamic process of investment adjustment to monetary policy shocks. Relative to basic cross-sectional or time-series models, panel estimators provide more precise, consistent, and policy-utility estimates by taking advantage of both data dimensions and acknowledging that firms react differently and dynamically to policy changes.

With the data sources, variables, and the estimation strategy used in this paper outlined, it is necessary to put the crucial role of the monetary policy in influence making of the corporate investment decisions into context. The discussion of this connection enables one to place a background on explaining the following empirical findings.

Justification of using Fixed Effects and GMM Model:

To test the connection between interest rate variation and firm-level investment in Pakistan's non-financial sector, this analysis uses both the Fixed Effects (FE) and Generalized Method of Moments (GMM) estimation methods. The Fixed Effects model is chosen since it efficiently accounts for unobserved firm-specific attributes that are time-invariant, like management style, ownership profile, capacity of production, and organizational culture, which would otherwise distort the analysis. By emphasizing within-firm differences, the FE model records the way different variations in such variables as interest rate, liquidity, profitability, and shareholders' equity affect investment choices over time while eliminating the impact of time-invariant traits. The Hausman test verified the suitability of the Fixed Effects model vis-a-vis the Random Effects option, as differences between firms were found to be correlated with the explanatory variables and hence must be treated as fixed and not random.

Aside from the FE model, the analysis uses the Generalized Method of Moments (GMM) method to capture the dynamic nature of investment behavior. Investment choices are not one-time decisions; they are affected by past investment behavior as a result of adjustment costs, planning

horizons, and financing constraints. The GMM methodology permits the use of lagged investment as an explanatory variable, which accounts for this persistence and accounts for the gradual adjustment of capital stock to its desired level. This approach is especially appropriate for examining firm-level panel data with a relatively brief time dimension and a wider cross-sectional dimension, such as in this study. Utilizing both FE and GMM estimators, the analysis yields a complete picture of how monetary policy variables and firm-specific variables affect investment both statically and dynamically. Such a dual methodology ensures that the findings are consistent, reliable, and representative of actual firm behavior in the economic and financial environment of Pakistan.

The selection of these estimation methods is also in line with theoretical investment and monetary policy transmission foundations. Based on neoclassical investment theory (Jorgenson, 1963) and Keynesian monetary transmission mechanisms, the level of investment by firms depends on adjustments for changes in the cost of capital, interest rates, and internal financing conditions. The Fixed Effects model captures short-run reactions by determining how firm-specific financial measures respond to changes in money over time, whereas the GMM approach infers the dynamic adjustment process outlined in investment theory whereby firms adjust slowly towards an optimal level. Collectively, these models lend empirical basis to test whether interest rate changes, liquidity, profitability, and size of the firm determine investment behavior through the interest rate, credit, and internal finance conduits of monetary transmission. The combined application of FE and GMM is therefore not only econometrically suitable but also theoretically consistent with the aim of the study to investigate how monetary policy affects firm investment behavior in Pakistan's non-financial sector.

Investment as Dependent Variable:

Following (Fazzari, Hubbard & Petersen, 1988) and (Kaplan & Zingales, 1997), firm-level capital expenditure (defined as change in capital employed) is conventionally used as dependent variable in investment-cash flow sensitivity literature. Alternative instruments used in literature are:

Tobin's Q (market to book ratio) - which is missing for many Pakistani firms

Sales growth - used for robustness check

Industry-level investment - used as an external instrument for firm-level investment

In this study, lag investment is used as an internal instrument, which is in line with dynamic panel literature. Future research may include external instruments such as sectoral demand shocks and/or global interest rates."

3.7 Monetary Policy and Corporate Investment:

Monetary policy has a central role to play as far as impact on the decision of companies as to whether they should make an investment or not because it affects the general environment of the firms and their finances. The price elasticity of capital investment is directly linked to changes in benchmark interest rates imposed by the central bank, like the policy rate used by the State Bank of Pakistan, which have repercussions in terms of the costs of borrowing funds by the firms and issues in the motivation to invest in capital projects. Recorded monetary policy which is expansive in nature due to low interest rates do increase liquidity, lower financing costs and motivate firms into making new investments or to expand on projects of existing ones. On the other hand, contractionary monetary policy increases the cost of borrowing and limits the supply of credit, forcing the company, particularly firms requiring external finance, to reduce investment plans. Also, monetary policy affects the real economy by influencing expectations and asset prices and thus the corporate confidence and strategic action.

Given the relative underdevelopment of financial markets and the limited ability of firms in the non-financial sector in Pakistan to raise external funds, the monetary policy to investment transmission is important in terms of learning what happens to capital formation. This attention to monetary policy instruments and firm-level attributes also gives an integrated perspective on the effects of macroeconomic policy instruments on microeconomic firm-level investment behavior, and emphasizes the importance of stable and accommodative policy environment to allow long-term corporate investment and growth.

Building on this conceptual foundation, the next chapter shall elaborate the empirical results that demonstrate how fluctuations in monetary policy, together with firm-specific effects, considerably affect investment behavior in the non-financial sector in Pakistan.

Chapter 4

Result and Discussion

In this chapter, we evaluate the panel data to discuss the effect of interest rate fluctuations on the investment of corporations in Pakistan's non-financial sector. We start by showing the descriptive statistics and correlation matrix to get familiar with the basic characteristics and correlation among the variables. Next, we utilize both Fixed Effects and Random Effects models in order to mitigate the issue of unobserved heterogeneity of firms. Lastly, to solve possible endogeneity problems, we fit a dynamic panel model by utilizing the Generalized Method of Moments (GMM) method to ensure robustness in the results.

4.1 Descriptive Statistics

Table 4-1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total capital employed	1785	14.128	1.643	.588	18.455
Interest rate fluctuation	1785	2.398	0.986	.615	3.878
REER	1785	105.367	9.457	95.046	124.787
Firm Size	1785	14.254	2.175	5.288	18.77
Liquidity	1785	1.103	1.264	.002	28.112
Gross Profit	1785	789613.6	2034832.1	-1337258	28179886
Share Holder Equity	1785	2875783	7713924.6	-9317334	89764119

The sample consists of 1,785 firm-year observations. The mean value of Total Capital Employed is 14.13, standard deviation is 1.64 which suggest moderate firm-level variation, with a range from 0.588 to 18.455. The interest rate fluctuation, representing borrowing expenses, has an average of 2.39% and have a standard deviation of 0.98, with a range from 0.615% to 3.878%. The Real Effective Exchange Rate is at an average of 105.37, with fairly low dispersion (SD. = 9.46), indicating a moderately stable exchange climate.

Firm Size, a proxy for using log of total assets, has an average of 14.25 and a standard deviation of 2.18, indicative of moderate variation in firm size. Liquidity, which is a short-term measure of financial health, has a mean of 1.10 but a wide range (0.002 to 28.11), which indicates large disparities in firms' ability to meet current liabilities. Gross Profit varied widely for different firms

where mean is 789,614; Std. Dev. is 2,034,832. Some firms reported losses (minimum = -1.34 million) and other firms reported handsome profitability (maximum = 28.18 million).

Finally, Shareholders' Equity displays high variability (Mean = 2.88 million; Std. Dev. = 7.71 million), including negative values (min = -9.31 million), which could signal financial distress or accumulated losses for some firms, while others maintain very strong equity positions (max = 89.76 million)

4.2 Correlation Matrix

The correlation matrix is used tell us about the correlation between the variables used in the study. Total Capital, which is the dependent variable in the base models, has high and statistically significant positive correlations with the majority of the explanatory variables like firm size (FS, 0.84*), gross profit (GP, 0.570*), and shareholders' equity (SHE, 0.588*). These correlation indicate that higher levels of these monetary measures are correlated to larger amounts of total capital used.

Table 4-2 Matrix of Correlation

Variables	TC	IRF	REER	FS	LQ	GP	SHE
TC	1.000						
IRF	-0.169*	1.000					
REER	-0.019	0.169*	1.000				
FS	0.842*	-0.076*	-0.025	1.000			
LQ	0.603*	-0.206*	-0.064*	0.608*	1.000		
GP	0.570*	-0.178*	-0.116*	0.544*	0.851*	1.000	
SHE	0.588*	-0.151*	-0.025	0.505*	0.729*	0.757*	1.000

**** p<0.01, ** p<0.05, * p<0.1*

4.3 Hausman Test between FE and RE Models

Table 4-3 Hausman Test

Statistic	Value
Chi-square	41.44
Degrees of freedom (df)	6
p-value	0.0000
Interpretation	Reject H_0 → Use Fixed Effects

The Hausman test compares the fixed and Random Effects models to determine which is more appropriate. In this case, the test produced a chi-square statistic of 41.44 with a p-value of 0.0000,

which means that we can reject of the null hypothesis that the difference in coefficients is not systematic. This indicates that the Fixed Effects model is preferred.

4.4 Fixed Effects Model Result:

Table 4-4 Fixed Effects Estimation Result

VARIABLES	Logtotalcapital
IRF	-0.0476**
	(0.0186)
REER	0.00166
	(0.00135)
LQ	0.422***
	(0.0445)
GP	-0.0722*
	(0.0369)
FS	0.0396**
	(0.0170)
SHE	0.437***
	(0.0269)
Constant	2.855***
	(0.477)
Observations	1,242
Number of id	115
F-test	441.40***
F-Prob	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The findings from the Fixed Effects regression model reported in Table 4.4 test the determinants of log total capital employed by firms over1242 firm-year observations for 115 firms. The model is statistically significant at a general level as indicated by the F-statistic value of 441.40 and probability value is less than 0.05. Among the most interesting results, the interest rate fluctuation (IRF) has a statistically significant negative impact on total capital, with a coefficient of -0.0476 and probability is less than 0.01. This means that an increase in the IRF by 1 percentage point reduces total capital employed by a corresponding 4.767%, which means that increasing borrowing costs discourage companies from expanding or investing in capital. This finding is in accordance with the Oliner and Rudebusch (1996) work, which stressed that a tighter monetary stance and higher interest rates lower investment by raising the cost of capital. The real effective exchange rate has a positive and insignificant coefficient of 0.00165 and $p > 0.01$. Firm size also turns out

to be a good determinant with a positive coefficient of 0.4218 ($p < 0.01$), whereby large firms invest more in capital. This indicates economies of scale and improved access to funding, as conclusions derived by Beck, Demirgüç-Kunt, and Maksimovic (2005) also concluded that firm size has a significant impact on the ability to access finance and grow. On financial health, liquidity is strongly linked with capital formation (-.07216, $p < 0.01$), suggesting that more liquid firms can more easily fund their capital requirements internally. This is consistent with Fazzari, Hubbard, and Petersen's (1988) financing constraint theory whereby companies with less financial stress are likely to invest. Notably, gross profit (0.03964) does have a strong impact on capital, suggesting that short-term profitability by itself can be converted directly into capital growth. Conversely, shareholders' equity is positively related to capital employed, highlighting the contribution of internal equity finance to long-term investment.

Fixed Effects estimation in Table 4.4 shows that interest rate fluctuations has a statistically significant adverse effect on firm investment. This supports Keynesian theory (1936) and Neoclassical Investment Theory (Jorgenson, 1963) that point out that increasing interest rates increases the user cost of capital and reduces expenditure on investment. The negative coefficient verifies the functioning of the interest rate transmission channel, whereby tight monetary policy raises the cost of borrowing and reduces capital formation.

The significant positive and high coefficients on firm size and shareholders' equity confirm the credit channel (Bernanke & Gertler, 1996). Larger firms and firms with greater equity have more access to external finance and internal funds and are less sensitive to monetary tightening. The positive significant impact also reflects the internal finance (cash flow) channel, in which financially unconstrained firms can maintain investment even in the face of higher borrowing rates (Fazzari, Hubbard & Petersen, 1988).

Table 4-4 illustrates that the impact of interest rate fluctuation (IRF) is negative and significant on corporate investments measured as the logarithm of the total capital employed. In terms of economic interpretation, the value of the coefficient of –0.0476 suggests that for every unit increase in interest rate fluctuation, there is approximately a 4.8 percent reduction in the level of capital employed by firms, all else remaining constant. In the backdrop of the bank-based financial system of Pakistan, where the high level of interest sensitivity of corporate borrowing suggests that variations or volatility in interest rates may encourage firms to put off expansion and

investments related to new machinery and capacity enhancement, it may result in lower levels of corporate investments even if the levels of interest rates are not high. The rest of the coefficients presented in Table 4-4 illustrate key firm-specific channels that drive continued investments. Liquidity (LQ) and shareholder`s equity (SHE) display large and positive coefficients, suggesting that firms with greater financial strength tend to exhibit higher levels of capital employed. This confirms the pecking order theory and financial accelerator theory since firms with greater internal investments are less exposed to monetary shocks. Firm size (FS) is positively related to investments, suggesting that scale economies and better access to credit increase investments. The coefficient on growth prospects (GP), however, is negatively related, implying that lower macroeconomic environments lower firms' incentives for investing. From Table 4-4, it is clear that interest rate fluctuations has a significant economic effect on investments made by firms in Pakistan, and achieving financial strength is pivotal in managing this variable.

Overall, the findings indicate that monetary contraction decreases firm investment primarily through increased financing expenses, and financially healthy firms offset this effect through internal funds and bigger size.

Computation of Below GDP and Above GDP:

The potential GDP is estimated instead with a long-term average because of limitations on data. Though this approach measures cyclical variations nicely, it fails to account for potential output fully. Other filtering techniques like the Hodrick-Prescott filter may prove better.

The below GDP and Above GDP are computed by taking the average of the GDP. After that, if GDP is below the average GDP then it will be Below GDP and above GDP is above the average values.

$$Below\ GDP = GDP < Average\ GDP\ (3.6\%)$$

$$Above\ GDP = GDP > Average\ GDP\ (3.6\%)$$

4.5 Hausman Model between FE and RE for Below Average GDP

Table 4-5 Hausman Test

Statistic	Value
Chi-square	5.65
Degrees of freedom (df)	6
p-value	0.4640
Interpretation	Do not Reject H_0 → Use Random Effects

The Hausman test compares the fixed and Random Effects models to determine which is more appropriate. In this case, the test produced a chi-square statistic of 5.65 with a p-value of 0.4640, which mean we do not reject of the null hypothesis that the difference in coefficients is not systematic. This indicates that the Random Effects model is preferred, as it better accounts for individual-specific heterogeneity.

4.6 Random Effects Estimation for Below GDP

Table 4-6 Random Effects Estimation Result for Below Average GDP

VARIABLES	**Logtotalcapital**
Real Interest rate	-0.0311
	(0.0267)
Reer	0.00385
	(0.00783)
Firm Size	0.210***
	(0.0695)
Liquidity	0.0727
	(0.0614)
Gross Profit	0.0421
	(0.0296)
Shareholders' equity	0.557***
	(0.0407)
Constant	1.822**
	(0.888)
Observations	614
Number of id	115
Wald-test	1518.33
Prob>Chi2	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Random Effects regression results of Table 4.6 present an examination of the determinants of log total capital employed for below-national-GDP-average firms using 614 firm-year

observations from 115 firms. The total importance of the model is established by a strongly significant Wald-statistic, indicating that the predictors collectively account for variation in capital levels across firms over time. Among the prominent findings, the real interest rate has a negative and insignificant at $p < 0.1$ coefficient of -0.104, indicating that an increase of 1 percentage point in the real interest rate is related to a fall in capital investment by firms below the average GDP of about 10.4%. This is claimed to imply that more expensive financing discourages investment more in these comparatively smaller or weaker companies, as argued by Fazzari, Hubbard, and Petersen (1988) who highlighted that financially constrained companies are more responsive to interest rates. The actual effective exchange rate (REER), while having a positive sign, is significant statistically, suggesting that movements in the exchange rate can have weak or inconsistent effects on underperforming firms' capital investment, perhaps because of their limited international market exposure or imported capital goods exposure. Firm size is very significant (0.643, $p < 0.01$) and indicates that a 1% rise in firm size increases capital employed by 0.643%, confirming the hypothesis that bigger firms under the GDP limit enjoy economies of scale and better access to funding over smaller counterparts. Liquidity has positive influence(0.0727, $p > 0.01$), implying that companies with improved short-term capital positions tend to invest in capital. This once more proves the theory of financial constraint whereby internal funds play a key role among companies with poor external financing opportunities. Gross profit do not have statistically significant influences on capital employed. Additionally, shareholders' equity is positively and significantly related with total capital, which suggests that internally generated equity continues to be an essential source of financing capital for these companies.

The estimates for the firms that fall below average GDP level indicate that interest rate changes are negatively correlated with investment, albeit insignificantly. The sign is in accordance with theory — when the economy runs below potential, the interest rate channel is more active because firms experience tighter financial conditions and less access to credit. This is supportive of the financial accelerator mechanism (Bernanke et al., 1999), where recessions reinforce the negative effect of higher cost of borrowing on investment. The positive and large coefficients on shareholders' equity and firm size support the balance sheet and credit channels, suggesting that financially robust firms are less sensitive to monetary policy contraction. The findings also confirm that liquidity is a key investment determinant in line with pecking order theory (Myers & Majluf, 1984), which contends that firms tend to use internal funds when external finance is costly.

Therefore, in recessionary or low-GDP times, monetary policy tightening restricts investment mainly through restricted credit availability and poorer internal financing.

4.7 Hausman Model between FE and RE for Above Average GDP

Table 4-7 Hausman Test between FE and RE for Above average GDP

Statistic	**Value**
Chi-square	73.25
Degrees of freedom (df)	6
p-value	0.0000
Interpretation	Reject H_0 → Use Fixed Effects

The Hausman test compares the fixed and Random Effects models to determine which is more appropriate. In this case, the test produced a chi-square statistic of 38.99 with a p-value of 0.0000, leading to a rejection of the null hypothesis that the difference in coefficients is not systematic. This indicates that the Fixed Effects model is preferred, as its better accounts for individual-specific heterogeneity.

4.8 Fixed Effects Estimation for Above Average GDP

Table 4-8 Fixed Effects Estimation Result for Above Average GDP

VARIABLES	(1) Logtotalcapital
Real Interest rate	-0.0431***
	(0.0154)
Reer	0.00226**
	(0.00103)
Firm Size	0.484***
	(0.0367)
Liquidity	-0.121***
	(0.0297)
Gross Profit	0.0376***
	(0.0142)
Shareholders' equity	0.437***
	(0.0227)
Constant	2.624***
	(0.403)
Observations	628
Number of id	103
R-squared	0.890

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Fixed Effects regression model findings in Table 4.8 test the determinants of log total capital used for firms that are above the national GDP average, using 628 firm-year observations of 103 firms. The model presents an R-squared value of 0.890, which means that around 89.% of the within-firm variation in capital buildup is explained by the independent factors. While lower than the R^2 seen in the below-GDP group, overall findings still reveal useful information regarding how capital investment choice varies for more economically stable companies.

Among the variables, the real interest rate has a negative coefficient of 0.0431, albeit statistically significant. This implies that for the companies over the GDP line, investment in capital is relatively sensitive to interest rates, possibly as a result of improved access to credit or diversified sources of financing. This is in contrast to companies under GDP (Table 4.6), where interest rate impacts were present, consistent with the credit market segmentation theory described by Fazzari, Hubbard, and Petersen (1988). In the same fashion, the real effective exchange rate (REER) is positive and significant, suggesting exchange rate fluctuations have little direct effect on capital

invested in these companies—most likely because of their better capacity to hedge currency risks or lower reliance on imported capital goods.

Firm size continues to be a strong and positive driver of capital investment, with evidence that an increase of 1% in firm size corresponds to an increase of 0.484% in capital employed. This indicates the hypothesis that larger firms have scale efficiencies and better capital buffers, encouraging additional investment. This is in line with Beck, Demirgüç-Kunt, and Maksimovic (2005) where they stressed that firm size has a positive effect on access to long-term funding and investment potential. Likewise, liquidity is equally negative significant, implying that firms with more solid short-term financial standing are in a better position to allocate capital towards long-term investments, reinforcing the theory of internal finance being the prime driver of expenditure of capital.

Other financial indicators of the firm at the firm level like gross profit has a positive and statistically significant, although some of them exhibit expected directional impacts. For example, although export sales net and number of employees possess negative coefficients, their non-significance suggests that the variables do not exert a strong or consistent impact on capital accumulation for firms larger than GDP. This is in contrast to below-GDP firms, where the employment number exerted a strong negative influence, perhaps indicating that above-GDP firms make more effective use of capital-labor relationships.

A notable result is the positive and strongly significant impact of shareholders' equity on total capital. This confirms that internal equity financing continues to be an important source of capital investment, even for relatively more performing companies. Companies with higher retained earnings or built-up equity tend to re-invest in their businesses, an indication of the work of internal capital markets in maintaining growth.

During times of higher-than-average GDP growth, interest rate fluctuations is still negative but statistically insignificant, implying that the interest rate channel becomes weaker when the economy is growing. Companies are probably faced with stronger cash flows and improved credit availability, dampening the impact of a rise in interest rates. This is consistent with the state-dependent transmission hypothesis in which monetary policy impacts are asymmetric over the business cycle.

The highly significant positive coefficients on firm size, gross profit, and shareholders' equity confirm the internal finance and balance sheet channels, suggesting that at high-growth periods, investment is financed primarily through retained earnings and built-up equity instead of external debt. The negative and highly significant impact of liquidity indicates that companies with too much cash might have conservative investment policies, favoring short-term liquidity management over capital growth.

Overall, results indicate that in expansionary states, firm-specific financial strength dominates the role of monetary policy, confirming the reduced sensitivity of investment to interest rate changes in strong economic conditions.

4.9 Generalize Method of Moment

Table 4-9 GMM Estimation Results

VARIABLES	Logtotalcapital
L.logtotalcapital	-0.00248
	(0.00927)
IRF	-0.128***
	(0.0113)
REER	-5.35e-05
	(0.000519)
FS	0.337***
	(0.0266)
LQ	-0.144***
	(0.0191)
GP	0.0124
	(0.00840)
SHE	0.442***
	(0.0153)
Constant	5.760***
	(0.310)
Observations	993
Number of id	108
AR(1)	[0.0342]
AR(2)	[0.9218]
Sargan Test	[0.9452]
Hansen Test	[0.8293]

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Generalized Method of Moments (GMM) estimates shown in Table 4.9 provide a dynamic panel data test of the determinants of log total capital employed over 993 firm-year observations for 108 firms. The findings reveal that the model is statistically sound, with a number of main

variables displaying significant relationships with the investment of capital. The coefficient of lag of dependent variable is positive and statistically significant. . It means that capital influence by their previous year information or current capital affected by the previous year capital. This result is consistent with dynamic investment theory and empirical research like Arellano and Bond (1991), which points out that historical investment patterns significantly affect decisions today given adjustment costs, learning curves, and strategic planning. The real interest rate is negative and statistically significant at the 1% or 5% level, which ensures that higher borrowing costs deter firms from investing in capital. Even though the size is lesser than Fixed Effects results, the sign is the same. This result corroborates the hypothesis by Fazzari, Hubbard, and Petersen (1988) that real interest rates may be a binding constraint for investment, particularly for firms that are dependent on external finance.

Another important determinant is the firm size , which carries a positive coefficient of 0.360 and implies that older firms are more likely to invest in capital. This can be explained by the potential for pooled experience, improved credit access, and greater reputational capital that allow older firms to perform larger or more stable investment projects. This is consistent with other literature, e.g., Evans (1987) and Jovanovic (1982), that emphasizes the beneficial contribution of age to growth in firms and to capital accumulation. Liquidity has a negative and Shareholder equity has a positive and significant influence on the capital.

The dynamic GMM estimation reveals that lagged investment has a positive correlation with current investment, capturing investment persistence and adjustment costs as postulated by Jorgenson's neoclassical theory and q-theory of investment (Tobin, 1969). The significant and negative interest rate coefficient once more confirms the interest rate transmission channel, which holds that increased borrowing costs reduce capital accumulation.

The shareholders' equity and firm size variables have large positive coefficients, supporting the fact that richly capitalized and large firms can sustain investment during monetary policy tightening. The negative sign of the liquidity variable is as expected in cash flow theory and implies that over-liquid firms would rather hold liquidity buffers rather than make long-term investment in the face of uncertainty.

Based on the diagnostic statistics that have been reported, the model is adequately specified and the GMM estimation is valid. The p-value of the AR(1) test is 0.0342 which is statistically significant and this indicates that the differenced residuals have first-order serial correlation. This is why it is supposed to happen in dynamic panel GMM models, and it does not discredit the findings. By contrast, AR(2) test has a p-value of 0.9218 that is very insignificant which proves that there is no second-order serial correlation, which is a necessary condition to the consistency of the estimator.

With regards to instrument validity, the p-value of both the Sargan ($p = 0.9452$) and the Hansen ($p = 0.8293$) test is insignificant, which means that one cannot reject the null hypothesis that the instruments are valid. This implies that the instruments are exogenous and specified well. Nevertheless, the extremely large p-values particularly those in the Sargan test can also be an indication of instrument proliferation, which undermines the power of such tests. Thus, the overall results confirm the adequacy and viability of the model, though one might consider it possible to verify and, in case of need, reduce the number of instruments to optimize the performance of the model. That is why the results of the diagnostic tests indicate that the model is well-specified and the estimation is of good quality.

This dynamic proof reinforces the conclusion that monetary policy influences investment by price (interest) and credit availability channels, and long-run adjustment behavior is represented by the persistence of capital accumulation.

The diagnostic tests for the entire GMM model show that the estimation is robust, as concerns over endogeneity and simultaneity are addressed appropriately. From the AR(1) diagnostic test, the p-value is 0.0342, which is statistically significant, confirming the existence of first-order serial correlation in the differenced residuals. This is, however, expected in dynamic panel GMM estimation, and there are no issues with this result. More importantly, from the AR(2) diagnostic test, the p-value is 0.9218, which is highly insignificant, confirming the absence of second-order serial correlation in the residuals. This is a key requirement of the GMM framework, and this result validates the choice of lagged instruments appropriately. With regard to instrument validity, both tests, namely, the Sargan test with a p-value of 0.9452 and the Hansen test with a p-value of 0.8293, indicate a high p-value, which is statistically insignificant, suggesting that the null hypothesis of

instrument exogeneity cannot be rejected, which in turn indicates that the instrument is valid and uncorrelated with the error term, thereby supporting the argument that endogeneity and simultaneity problems have been addressed in the model appropriately. However, a high p-value may suggest a problem of instrument proliferation, which may undermine these tests in some manner. Therefore, the results indicate that the GMM estimation is valid, and the instrument and model are appropriately specified.

4.10 Generalize Method of Moment for below average GDP

Table 4-10 GMM Estimation Results below Average GDP

VARIABLES	Logtotalcapital
L.logtotalcapital	-0.00378
	(0.01000)
IRF	-0.143***
	(0.0338)
Reer	-0.000728
	(0.00156)
FS	0.178***
	(0.0431)
LQ	-0.103***
	(0.0346)
GP	0.0311***
	(0.0118)
SHE	0.469***
	(0.0314)
Constant	6.902***
	(0.542)
Observations	398
Number of id	107
AR(1)	[0.0042]
AR(2)	[08720]
Sargan Test	[0.7821]
Hansen Test	[0.7290]

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The GMM estimation in Table 4.10 explores the determinants of log total capital employed for firms below the national GDP average, using 398 firm-year observations from 107 firms. The dynamic panel model includes lagged capital and mitigates possible endogeneity, omitted variable bias, and firm-level heterogeneity and hence is appropriate in explaining investment conduct among more economically advanced firms. The lagged dependent variable coefficient is -

0.000378, but statistically insignificant. This indicates that, in contrast to the overall sample, capital accumulation in the higher-GDP firms is less long-lasting over time, perhaps due to their higher flexibility in revising investment plans or greater sensitivity to external conditions. This may also be due to more efficient reallocation mechanisms of capital within these firms, in which earlier levels of capital do not have strong influence on current investment activity.

The interest rate fluctuation is still a negative and weakly significant determinant is -0.08313, further confirming that even financially successful companies are sensitive to the cost of borrowings to some extent. This is in accordance with previous research (e.g., Fazzari, Hubbard & Petersen, 1988) that an increase in real interest rates will suppress investment even in companies that are relatively more financially independent. Firm Size appears as the dominant determinant, where the coefficient is positive and significantly high. It implies that older firms invest more in capital, which may result from accumulated credibility, easier credit access, or strategic stability. The interaction between investment behavior and firm maturity is in line with the selection and learning theories of Jovanovic (1982) and Evans (1987) in which older firms are more effective and have the ability to increase capital assets. Interestingly, REER turns statistically significant within this subgroup, suggesting that appreciation of the exchange rate induces capital investment for firms above the average GDP. This may be the case because these companies are more engaged in importing capital goods or gain more from exchange rate stability. It corroborates with research by Servén, (2003) who observed that appreciation of the exchange rate can spur private investment by lowering import prices of capital inputs. Liquidity has a negative impact on the capital. Gross Profit has a positive and significant influence on the total capital.

One of the most important findings is the positive and significantly high value of shareholders' equity, indicating that internal financing is still paramount even for more robust firms. The contribution of equity in motivating capital investment validates the applicability of the pecking order theory, wherein companies would prefer internal funding to external sources, as discussed in Myers and Majluf, (1984).

For below-average GDP firms, changes in interest rates have a greater and statistically significant negative influence on investment, which verifies the asymmetrical effect of monetary policy. The outcome is in accordance with the financial accelerator model (Bernanke et al., 1999), which

indicates that negative shocks have larger impacts during recessions as a result of weakened balance sheets and more stringent credit conditions.

The positive impact of firm size, gross profit, and shareholders' equity confirms that firms with better internal financing and profitability are more robust — validating the credit channel as well as pecking order theory. In contrast, the negative impact of liquidity could be due to firms' aversion to invest and instead hold cash during slack times, aligning with precautionary liquidity motives.

These observations indicate that in times of economic slack, investment is primarily limited by external financing costs and uncertainty but that strong internally resourceful firms can offset partially the contractionary impact.

The AR(1) test has a p-value of 0.0042 that is statistically significant meaning that there is first-order serial correlation in the differenced residuals. This is anticipated in dynamic panel GMM estimation, which is not an issue in the validity of the model. Conversely, the AR(2) test denotes the p-value that is extremely insignificant at 0.8720, which proves the lack of the second-order of serial correlation. This is a significant condition and its satisfaction implies that moment conditions of the model are specified appropriately.

In addition, both Sargan test ($p = 0.7821$) and the Hansen test ($p = 0.7290$) have insignificant p-values, which implies that it is not possible to reject the null hypothesis of instrument validity. This means that the estimation instruments are suitable and they are not associated with the error term. On the whole, such findings support that these problems of autocorrelation of the model are even beyond the desired AR(1), and the selected instruments are valid and the GMM estimates are strong and reliable.

In the diagnostic tests carried out on the GMM model with GDP as the dependent variable, it is evident that the model is well specified and effectively controls for the endogeneity problem. From the AR(1) diagnostic test, the p-value is 0.0042, which is statistically significant. This shows the existence of first-order serial correlation in the differenced residuals. As discussed earlier, this is expected in the context of the GMM model. More importantly, the diagnostic tests carried out to ascertain the validity of the moment conditions and the lagged instruments show the p-value to be 0.8720. As discussed earlier, this is highly insignificant, showing the absence of second-order

serial correlation. Additionally, the results show the p-value for the Sargan test to be 0.7821 and the p-value for the Hansen test to be 0.7290. As discussed earlier, these tests show the p-value to be insignificant. This shows that the null hypothesis is not rejected, and the results show the validity of the instrument. It can thus be concluded that the GMM model is successful in controlling the endogeneity problem.

4.11 Generalize Method of Moment for above GDP

Table 4-11 GMM Estimation Results above Average GDP

VARIABLES	Logtotalcapital
L.logtotalcapital	.02009
	(0.019323)
IRF	-.09134***
	(0.0210318)
REER	0.00030
	(0.0008351)
FS	0.4607***
	(0. 0354584)
LQ	-0.18826***
	(0.0266797)
GP	-0.00529
	(0. .0113889)
SHE	0.40338***
	(0.019304)
Constant	4.9648***
	(0.44436)
Observations	595
Number of id	100
AR(1)	[0.0012]
AR(2)	[0.7258]
Sargan Test	[0.6292]
Hansen Test	[0.5630]

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the sub-sample where GDP is above the average, the results show that the interest rate fluctuations has a negative but statistically significant effect on corporate investment, indicating that during periods of strong economic growth, interest rate fluctuations significantly influence investment decisions. Similarly, the lagged value of total capital employed is also insignificant, suggesting that past investment does not have a strong effect on current investment in high-growth periods. The lagged measure of total capital (L.logtotalcapital) has a coefficient of 0.02009 but is

not statistically significant, indicating that previous levels of capital have no material impact on existing capital investment choices in low-GDP environments. The interest rate fluctuation has a statistically significant but negative impact, suggesting that borrowing costs have a significant influence on firms' capital accumulation in this regard. Firm size, however, is positive and significantly related to total capital, suggesting that older firms accumulate more capital, perhaps because of their stability and resources over time.

The interesting finding is that the actual effective exchange rate has a highly insignificant and negative impact on capital employed, suggesting that the appreciation of the exchange rate deters the investment of capital. This may be due to the decreased competitiveness of the export or higher prices of imported capital goods in such a scenario. Liquidity has a negative impact on the capital. In addition, shareholder equity is also found to significantly and positively impact capital, implying that greater internal financing improves firms' capacities to invest in capital. The constant term of the model is also significant, which captures other unobservable effects on capital. With 550 observations from 100 firms, the estimation verifies that internal firm attribute and macroeconomic determinants particularly exchange rate fluctuations are key drivers of capital.

The reported results of diagnostic tests show that the model used is economically justified and has no significant issues in terms of specifications. The p-value of the AR(1) test is 0.0012, and it is statistically significant thus indicating that there is a first-order serial correlation in the differenced residuals. This is normal in dynamic panel models, especially in GMM estimators and does not reflect an issue. On the contrary, AR(2) test presents a p-value of 0.7258, which is not statistically significant, which suggests that there is no second-order serial correlation. This is a very important condition to the validity of the model and its fulfilment proves that the moment conditions are properly given.

Moreover, the Sargan test ($p = 0.6292$) and the Hansen test ($p = 0.5630$) have insignificant p-values, and the null hypothesis of valid instruments cannot be rejected. This is to indicate that the instruments employed in the model are exogenous and lack any correlation with the error term. In general, the results obtained here indicate that the model is correctly modeled, the instruments are valid and the GMM estimation are sound and robust.

During above-GDP times, interest rate fluctuations also retains a negative and statistically significant linkage with investment, though now smaller in magnitude relative to low-GDP times. This indicates that while borrowing costs remain an influence on investment, the interest rate channel is less binding when macroeconomic confidence and profitability are good. Businesses with more robust balance sheets and external credibility can better absorb financing costs.

The powerful positive impacts of firm size and shareholders' equity support the balance sheet and internal channels of finance, demonstrating that investment is more influenced by firm fundamentals than monetary policy. The lack of significance of the lagged investment term shows flexible behavior of investment when it is favorable economically. The minor and unimportant role of REER indicates restricted exchange-rate exposure among big textile companies, whereas the adverse impact of liquidity is in line with companies' tendency to use retained earnings in comparison to idle cash reserves for capital growth.

Generally, in fast-growing states, monetary transmission becomes weaker and investment relies more on firm-specific internal strength than on policy rates.

The diagnostic tests for the GMM estimation in the below-GDP group indicate that the model has been correctly specified, and the results are reliable. The AR(1) test has a p-value of 0.0012, which is significant. This is due to the first-order serial correlation in the differenced residuals. However, this is not a problem in the context of dynamic panel estimation. What is more significant is the AR(2) test, which has a p-value of 0.7258. The p-value is not significant, which means there is no serial correlation of order two. This confirms the use of lag variables in the estimation of the model. Furthermore, the Sargan test has a p-value of 0.6292, and the Hansen test has a p-value of 0.5630. The p-values for these tests are not significant, implying that the null hypothesis of instrument validity cannot be rejected. This means that the instruments are exogenous and not correlated with the error term. All these tests confirm that the GMM estimation has successfully addressed the problems of endogeneity and simultaneity. The results for the below-GDP group are reliable.

Chapter 5

Conclusions and Recommendation

5.1 Conclusions

This study aimed at examining the determinants of investments in firms in economically heterogeneous areas, specifically real interest rates, real effective exchange rate (REER), and firm-level variables like firm size, liquidity, firm age, profitability, and shareholders' equity. With the use of strong panel data econometric methods such as Fixed Effects and Generalized Method of Moments (GMM) estimations, the research was able to accomplish its targets by studying both the overall effect of all variables and their differential effects among companies in higher-than-average and lower-than-average GDP areas.

The results provide solid empirical evidence that firm-specific variables, most importantly firm age and shareholders' equity, always and greatly affect investment in all models and subgroups. This highlights the crucial importance of internal firm maturity and capital adequacy in investment choices. Companies with longer years of operation and more dominant equity positions are likely to spend on fixed capital, which supports theoretical predictions based on pecking order theory and models of firm growth (e.g., Myers & Majluf, 1984; Jovanovic, 1982).

Macroeconomic variables, on the other hand, have subtler impacts. Although the interest rate is seen to have a small negative impact on investments in the overall sample and in below GDP areas, it becomes statistically insignificant in above GDP regions which suggesting that monetary policy will not be as effective in high-income economic pockets where companies are facing structural constraints. The REER has a large negative effect on firms in regions below-GDP, implying that appreciation of the exchange rate reduces capital investment, possibly because of low competitiveness and rising capital good costs.

In addition, the lagged investment (capital employed) explanatory variable is statistically significant in the complete sample but not in regional subsamples, suggesting that capital investment persistence is more meaningful at the aggregate level as opposed to within an individual economic stratum. This suggests the importance of employing disaggregated analyses when designing policy interventions.

In conclusion, the study presents strong evidence that firm-level forces and regional economic conditions collectively determine capital development, and that a single-fits-all policy response is unlikely to work. These findings are especially relevant for emerging economies such as Pakistan, where firm heterogeneity and regional disparity are still prevalent.

5.2 Limitation

This current research does not include sector-specific policy variables such as tax rebates, electricity tariffs, and textile-specific export incentives. These are sector-year-level variables and are not firm-year-level variables. These are also not necessarily found in firm-level financial statements. Leaving these variables out may cause bias in the coefficients if these are correlated with interest rates.

5.3 Recommendation

- SBP should follow counter cyclical monetary policy, lower interest rate during low GDP encourage capital investment.
- Introduce the leading program for capital intensive industries (i.e. textiles) during tightening periods.
- Improve communication between SBP and private sectors to reduce uncertainty.
- Different Credit guarantee scheme to reduce collateral requirement.
- Provide tax incentives for firm to reinvest earning into the fixed capital.
- Urge financial institutions to come up with liquidity-linked lending products that incentivize companies with accessible liquidity to leverage them for growth.
- Energize equity-based financing through:
- Alleviating tax bias towards debt compared to equity.
- Granting tax credits or lower tax rates to companies recycling earnings.
- Increasing equity listing incentives on the PSX, particularly for mid-sized industrial companies.
- This will minimize debt reliance and improve the balance sheet channel of investment growth.

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