

## Banks' Performance and Capital Formation in Pakistan

Mehwish Darakhshan Zia<sup>1</sup>, Prof. Dr. Saghir Pervaiz Ghauri<sup>2</sup>, Sumera Mehmood<sup>3</sup>

<sup>1</sup> Ph.D. Scholar, Jinnah University for Women

<sup>2</sup> Associate Professor, Jinnah University for Women

<sup>3</sup> Lecturer Finance, Iqra University

### Abstract

Capital formation is a key determinant of economic growth in developing economies, and it is influenced by financial intermediation and macroeconomic conditions. This study investigates the determinants of Gross Fixed Capital Formation (GFCF) in Pakistan using annual data from 1991–2023. The analysis incorporates Bank Credit to the Private Sector (BCPS), Banks' Profitability (BP), National Savings (NS), Interest Rate (IR), and Inflation (INF) within a Vector Autoregression (VAR) and Vector Error Correction Model (VECM) framework. Unit root tests confirm that all variables are integrated of order one, while Johansen cointegration results establish a stable long-run equilibrium relationship among the variables. The long-run estimates reveal that bank credit to the private sector and banks' profitability positively influence capital formation. In contrast, inflation and national savings exert a significant negative effect on GFCF. However, the short-run dynamics and Granger causality analysis indicate that only lagged changes in private-sector credit significantly stimulate capital formation, whereas variables such as banks' profitability and interest rates exhibit weak, transitory effects. Furthermore, the error correction term is negative and statistically significant, confirming a moderate speed of adjustment toward long-run equilibrium following structural disturbances. The findings highlight the central role of credit availability over domestic savings in driving investment and suggest that enhancing credit allocation efficiency and maintaining macroeconomic stability are essential for strengthening capital formation in Pakistan.

**Keywords:** *Capital Formation, Vector Autoregression (VAR), Vector Error Correction Model (VECM), Cointegration, Banking Sector Performance*

### Introduction

Banks play a fundamental role in capital formation by mobilizing savings from surplus units and allocating credit to deficit sectors, thereby supporting investment and long-term economic growth (Ogar & Oba, 2017; Vogel, 2021). However, in developing economies such as Pakistan, structural inefficiencies, limited financial deepening, and weak institutional frameworks often hinder the effective transformation of financial resources into productive investment (Maturu, 2021; Mahesar et al., 2023). Pakistan continues to face persistent challenges, including low domestic savings, high consumption patterns, and weak depositor confidence, which constrain the availability of loanable funds for investment in productive assets such as machinery, infrastructure, and technology (Ishrat Hussain, 2023; Ketteni & Kottaridi, 2019).

The relationship between banking sector performance and capital formation is inherently dynamic and interdependent. Deposit mobilization influences credit availability, while macroeconomic variables such as inflation and interest rates simultaneously shape investment decisions and financial behavior. These interactions involve feedback mechanisms that cannot be adequately captured through conventional single-equation approaches. Despite the growing literature on the finance–investment nexus, most existing studies either focus on developed economies or employ static econometric techniques that overlook dynamic relationships among variables (Ehigiamusoe, 2021). Moreover, empirical evidence for Pakistan remains

limited, particularly regarding the short-run dynamics and long-run equilibrium relationships between banking sector performance, macroeconomic factors, and Gross Fixed Capital Formation (GFCF).

## Research Questions

This study seeks to address the following research questions:

1. Does bank credit to the private sector (BCPS) influence gross fixed capital formation in Pakistan?
2. How does the interest rate (IR) affect capital formation in Pakistan?
3. What is the impact of national savings (NS) on capital formation in Pakistan?
4. Does banks' profitability (BP) contribute to capital formation in Pakistan?
5. How does inflation (INF) affect gross fixed capital formation in Pakistan?

## Research Objectives

The main objective of this study is to examine the impact of banking sector performance and macroeconomic factors on capital formation in Pakistan.

1. Analyze the effect of bank credit to the private sector (BCPS) on gross fixed capital formation in Pakistan.
2. Examine the impact of the interest rate (IR) on capital formation in Pakistan.
3. Evaluate the role of national savings (NS) in promoting capital formation in Pakistan.
4. Assess the influence of banks' profitability (BP) on capital formation in Pakistan.
5. Investigate the effect of inflation (INF) on gross fixed capital formation in Pakistan.

## Literature Review

Capital formation, the net accumulation of physical assets like machinery, infrastructure, and industrial equipment, is a critical driver of long-term economic capacity and productivity (Bakare, 2011; Lopez et al., 2020). Rather than merely reflecting savings behavior, it embodies the tangible transformation of financial resources into real investment, linking the financial sector with the real economy to generate employment and sustained development (Beddies, 1999). In developing countries like Pakistan, this process remains heavily constrained by structural inefficiencies, low domestic savings, high consumption patterns, and underdeveloped financial systems, making the role of banking intermediation particularly critical (Ishrat Hussain, 2023; Mahesar et al., 2023).

The theoretical debate surrounding this finance–investment nexus is anchored in contrasting paradigms. Keynesian perspectives emphasize aggregate demand, investment expectations, and interest rates, arguing that financial markets under uncertainty may fail to allocate resources efficiently. Conversely, the financial liberalization perspective suggests that efficient banking systems and market-based reforms optimize savings mobilization and credit allocation to stimulate investment. Empirically, however, the evidence remains highly inconclusive. While some studies report that financial intermediation and private sector credit positively stimulate growth (Hussain et al., 2020), others argue that institutional weaknesses, political instability, and regulatory uncertainty significantly disrupt this relationship in developing states like Pakistan (Jahan et al., 2022).

This ambiguity extends to specific performance and macroeconomic indicators. For instance, higher bank profitability can reflect efficiency and expand credit capacity (Farooq et al., 2021), yet an excessive profit orientation can trigger risk-averse lending, reducing financing for productive sectors under uncertain conditions. Concurrently, macroeconomic variables introduce complex layers of friction. The policy interest rate directly dictates borrowing costs, where higher rates suppress investment and lower rates catalyze economic activity (Jacob et al., 2019; Egilsson, 2020). Similarly, inflation introduces instability into the economic environment, eroding the real value of returns and systematically dampening investor

confidence.

In Pakistan, despite the banking system serving as the primary source of private sector financing, the efficient transformation of financial resources into productive investment is hindered by limited financial deepening, low depositor confidence, and heavy credit concentration in large firms (Ketteni & Kottaridi, 2019). Existing domestic empirical literature offers fragmented insights. Static or ARDL-based models (e.g., Ilyas et al., 2023) generally report a significant long-run relationship. However, these traditional single-equation techniques fail to capture the reality that the interactions between credit availability, savings, inflation, and interest rates are inherently dynamic, non-linear, and bidirectional. Because changes in investment activity trigger feedback loops across the entire system, static models suffer from endogeneity and reverse causality bias.

Consequently, three critical gaps persist in the literature: the analytical isolation of financial and macroeconomic variables, a reliance on unidirectional static models, and fragmented country-specific evidence for Pakistan regarding short-run dynamics and long-run equilibrium adjustments. To address these limitations, this study employs a VAR/VECM framework to examine the short-run dynamics and long-run equilibrium relationship between banking sector performance and Gross Fixed Capital Formation (GFCF) in Pakistan.

## Hypotheses Development.

Based on the theoretical framework and empirical literature, the following hypotheses are formulated:  
**H1:** There exists a **dynamic relationship** between bank credit to the private sector (BCPS) and gross fixed capital formation (GFCF).

**H2:** Interest rate shocks have a **significant impact** on capital formation.

**H3:** National savings have a **significant role** in the dynamics of capital formation.

**H4:** Banking sector performance significantly influences capital formation over time.

**H5:** Inflation has a **significant** effect on capital formation.

## Research Methodology

The study employs the VECM framework to examine the long-run and short-run relationships among the variables. Annual data for all variables were obtained from the State Bank of Pakistan (SBP) and the Pakistan Bureau of Statistics (PBS). Model reliability is assessed through diagnostic tests, including serial correlation, heteroskedasticity, and stability tests, along with impulse response, variance decomposition, and Granger causality analyses.

The model includes Gross Fixed Capital Formation (GFCF), Bank Credit to the Private Sector (BCPS), Banks' Profitability (BP), National Savings (NS), Interest Rate (IR), and Inflation (INF) in a multivariate framework

$$Y_t = (GFCF_t, BCPS_t, BP_t, NS_t, IR_t, INF_t)$$

$$\Delta Y_t = \alpha + \sum \beta_i \Delta Y_{t-i} + \lambda ECT_{t-1} + \varepsilon_t$$

Where  $Y_t = (GFCF_t, BCPS_t, BP_t, NS_t, IR_t, INF_t)$  represents a vector of endogenous variables, Gross Fixed Capital Formation (GFCF) is used as a proxy for investment. BCPS captures credit availability in the banking sector, BP reflects banking sector performance, NS represents domestic savings, IR denotes the cost of borrowing, and INF captures macroeconomic stability. The selected variables are supported by empirical literature and are considered key determinants of capital

formation. The VAR/VECM framework enables the analysis of their dynamic interactions and adjustment mechanisms within the system.

## Results and Discussion

**Table I: Descriptive statistics of variables**

|             | <b>GFCF</b> | <b>BP</b> | <b>INF</b> | <b>NS</b> | <b>IR</b> | <b>BCPS</b> |
|-------------|-------------|-----------|------------|-----------|-----------|-------------|
| Mean        | 19.05       | 2.84      | 9.45       | 22.68     | 9.52      | 4.65        |
| Median      | 18.24       | 2.51      | 9.06       | 21.15     | 9.55      | 4.65        |
| Maximum     | 43.38       | 5.55      | 28.88      | 48.10     | 21.82     | 5.97        |
| Minimum     | 7.44        | 0.56      | 2.85       | 6.08      | 1.86      | 3.10        |
| Std. Dev.   | 10.53       | 1.65      | 5.56       | 13.30     | 3.71      | 0.74        |
| Skewness    | 0.77        | 0.25      | 1.64       | 0.36      | 0.95      | 0.10        |
| Kurtosis    | 2.58        | 1.55      | 6.47       | 1.92      | 5.41      | 2.06        |
| Jarque-Bera | 3.63        | 3.31      | 32.25      | 2.39      | 13.32     | 1.30        |
| Probability | 0.16        | 0.19      | 0.00       | 0.30      | 0.00      | 0.52        |
| Obs         | 33          | 33        | 33         | 33        | 33        | 33          |

The descriptive statistics indicate moderate variability across variables. GFCF and NS show higher dispersion, reflecting investment fluctuations. Inflation and interest rates exhibit high volatility and positive skewness, indicating instability. Most variables are normally distributed except for inflation and interest rate. Overall, the data suggests macroeconomic uncertainty influences capital formation dynamics in Pakistan.

**Table II: stationarity test results with ADFs & Phillips-Perron**

| <b>ADF</b>  |                  |       |                       |       | <b>Phillips Perron</b> |       |                       |       |
|-------------|------------------|-------|-----------------------|-------|------------------------|-------|-----------------------|-------|
|             | <b>Intercept</b> |       |                       |       | <b>Intercept</b>       |       |                       |       |
|             | <b>level</b>     |       | <b>1st Difference</b> |       | <b>level</b>           |       | <b>1st Difference</b> |       |
| <b>GFCF</b> | 2.228            | 1.000 | -6.185***             | 0.000 | 1.939                  | 1.000 | -5.622***             | 0.000 |
| <b>BCPS</b> | -1.781           | 0.383 | -5.882***             | 0.000 | -1.782                 | 0.383 | -5.882***             | 0.000 |
| <b>BP</b>   | -2.342           | 0.166 | -3.103***             | 0.036 | -1.419                 | 0.561 | -3.260***             | 0.026 |
| <b>NS</b>   | -0.122           | 0.939 | -5.149***             | 0.000 | 0.978                  | 0.995 | -6.606***             | 0.000 |
| <b>INF</b>  | -1.504           | 0.519 | -6.323***             | 0.000 | -1.686                 | 0.429 | -6.304***             | 0.000 |
| <b>IR</b>   | -0.900           | 0.776 | -4.288***             | 0.002 | -1.346                 | 0.596 | -4.189***             | 0.003 |
|             |                  |       |                       |       |                        |       |                       |       |

*Note: ADF = Augmented Dickey-Fuller; PP = Phillips-Perron. \*\*\*, \*\*, \* indicate significance at 1%, 5%, and 10% levels, respectively.*

The stationarity of the variables was examined using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. The results indicate that all variables are non-stationary at level but become stationary after first differencing. Both ADF and PP tests consistently reject the null hypothesis of a unit root at first difference ( $p < 0.05$ ) for GFCF, BCPS, BP, NS, INF, and IR. Therefore, all variables are integrated of order one, I(1), justifying the use of the VECM approach.

## Johansen Cointegration Test

Since all variables are integrated of order one, cointegration techniques such as Johansen are

appropriate for analyzing long-run relationships.

**Table III. Johansen Cointegration Test**

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | Prob.     | Max-Eigen Statistic | Prob.     |
|---------------------------|------------|-----------------|-----------|---------------------|-----------|
| None (r = 0)              | 0.8280     | 165.1745        | 0.0000*** | 52.8093             | 0.0011*** |
| At most 1 (r ≤ 1)         | 0.7593     | 112.3652        | 0.0000*** | 42.7317             | 0.0034*** |
| At most 2 (r ≤ 2)         | 0.6309     | 69.6335         | 0.0001*** | 29.8979             | 0.0248**  |
| At most 3 (r ≤ 3)         | 0.5597     | 39.7356         | 0.0026*** | 24.6095             | 0.0155**  |

*Notes:* \*\*\* indicates significance at the 1% level. The lag length was selected based on the Akaike Information Criterion (AIC). Both the Trace and Maximum Eigenvalue statistics confirm the existence of multiple long-run cointegrating relationships among the variables. For long-run interpretation, the study focuses on the cointegrating equation normalized on Gross Fixed Capital Formation (GFCF).

The Johansen cointegration results confirm the existence of multiple long-run equilibrium relationships among GFCF, BCPS, BP, NS, IR, and INF. Both the Trace and Maximum Eigenvalue statistics reject the null hypothesis of no cointegration at the 1% significance level. Although several cointegrating vectors are identified, this study focuses on the cointegrating equation normalized on GFCF to examine the long-run determinants of capital formation in Pakistan. These findings justify the application of the Vector Error Correction Model (VECM) to investigate both the long-run equilibrium relationship and the short-run adjustment dynamics among the variables.

$$\Delta Y_t = \alpha + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-1} + \varepsilon_t$$

**Table IV. Long-Run Cointegrating Relationship (GFCF)**

| Variable | Coefficient | t-stat | Interpretation              |
|----------|-------------|--------|-----------------------------|
| BCPS     | 12.581      | 4.76   | Positive significant effect |
| BP       | 3.679       | 4.57   | Positive significant effect |
| INF      | -0.998      | -4.40  | Negative significant effect |
| IR       | 0.927       | 2.05   | Positive significant effect |
| NS       | -2.336      | -13.15 | Negative significant effect |

*Notes:*\*\*\*, \*\*, \* indicate significance at 1%, 5%, and 10% levels respectively. The equation is normalized on GFCF.

$$GFCF-12.581BCPS-3.679BP+0.998INF-0.927IR+2.336NS=0$$

The normalized long-run cointegrating equation is estimated with Gross Fixed Capital Formation (GFCF) as the dependent variable. The results indicate that bank credit to the private sector (BCPS) and banks' profitability (BP) have a positive long-run relationship with capital formation, suggesting that improved financial intermediation and banking sector performance support investment activity in Pakistan. Inflation exhibits a negative relationship with GFCF, implying that macroeconomic instability discourages long-term investment. Interest rate shows a weak positive association with capital formation, which may reflect the monetary policy structure and financial market characteristics of Pakistan. National savings display a negative long-run relationship with GFCF, indicating possible inefficiencies in transforming domestic savings into productive investment.

## Vector Error Correction Model

The error correction term (ECT) represents the speed at which deviations from long-run equilibrium are corrected in the system. A negative and statistically significant ECT coefficient indicates convergence towards long-run equilibrium

$$\begin{aligned}\Delta GFCF_t = & \alpha_1 + \sum_{i=1}^{p-1} \beta_{1i} \Delta GFCF_{t-i} + \sum_{i=1}^{p-1} \beta_{2i} \Delta BCP S_{t-i} + \sum_{i=1}^{p-1} \beta_{3i} \Delta BP_{t-i} \\ & + \sum_{i=1}^{p-1} \beta_{4i} \Delta N S_{t-i} + \sum_{i=1}^{p-1} \beta_{5i} \Delta I R_{t-i} + \sum_{i=1}^{p-1} \beta_{6i} \Delta I N F_{t-i} \\ & + \lambda ECT_{t-1} + \varepsilon_t\end{aligned}$$

**Table V: Vector Error Correction Model**

| <i>Dependent Variable</i> | <i>ECT Coefficient</i> | <i>t-Statistic</i> |
|---------------------------|------------------------|--------------------|
| $\Delta GFCF$             | -0.4712**              | -2.39              |

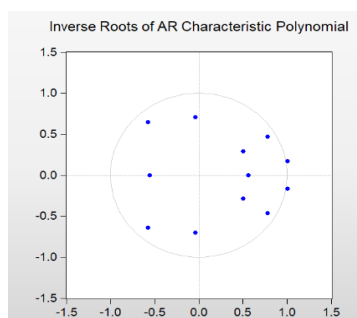
Notes: \*\* indicates significance at the 5% level.

The error correction term (ECT) for Gross Fixed Capital Formation (GFCF) is negative and statistically significant, confirming the existence of a stable long-run equilibrium relationship among the variables. The coefficient of -0.4712 indicates that approximately 47% of short-run disequilibrium is corrected within one period, suggesting a moderate speed of adjustment toward long-run equilibrium following economic shocks.

**Table VI. Diagnostic Tests for VAR/VECM Model**

| Diagnostic Test                     | Test Statistic               | Probability | Decision              |
|-------------------------------------|------------------------------|-------------|-----------------------|
| Residual Serial Correlation LM Test | 34.922                       | 0.519       | No Serial Correlation |
| White Heteroskedasticity Test       | 558.944                      | 0.341       | No Heteroskedasticity |
| Lag Length Selection (AIC/FPE)      | Lag = 2                      | —           | Optimal Lag Selected  |
| Stability Condition (Inverse Roots) | All Roots Inside Unit Circle | —           | Model Stable          |

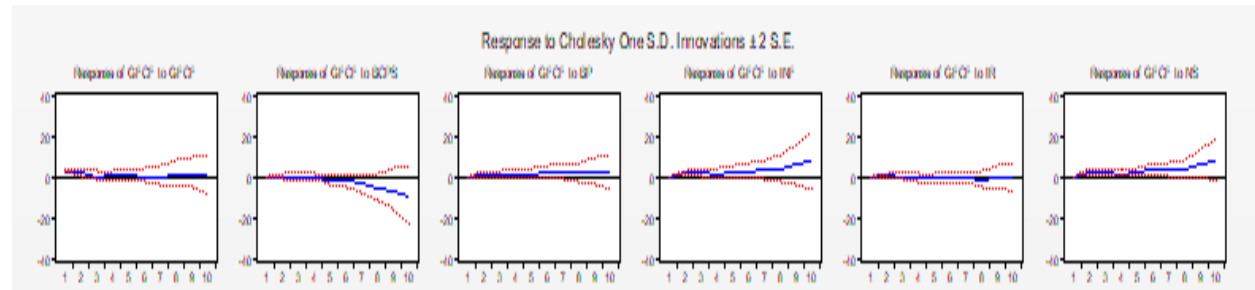
The LM test confirms the absence of serial correlation in the residuals. The White heteroskedasticity test indicates constant variance of residuals. Lag length 2 was selected based on the Akaike Information Criterion (AIC) and Final Prediction Error (FPE). Furthermore, all inverse roots lie within the unit circle, confirming the stability of the estimated VAR/VECM model.



**Figure 1: Inverse Root Polynomial for Stability Test**

The stability condition of the model is satisfied, as all inverse roots of the characteristic polynomial lie within the unit circle, confirming that the model is dynamically stable. This indicates that the estimated VAR/VECM system does not exhibit explosive behavior and that shocks to the variables dissipate over time. Consequently, the model generates reliable and consistent dynamic responses, supporting the validity of the impulse response and variance decomposition analyses.

## Impulse Response Function



**Figure 2: Impulse Response Analysis**

The impulse response analysis indicates that a positive shock to bank credit to the private sector (BCPS) generates a positive and persistent response in Gross Fixed Capital Formation (GFCF), highlighting the importance of financial intermediation in promoting investment. Shocks to banks' profitability (BP), inflation (INF), and national savings (NS) also influence capital formation over the forecast horizon, although the magnitude and direction of these responses vary across periods. In contrast, interest rate (IR) shocks exert a relatively weak and short-lived influence on GFCF. Overall, the impulse response functions gradually converge toward equilibrium, confirming the dynamic stability of the estimated VAR/VECM system.

## VEC Granger Causality

**Table VII: VEC Granger Causality Table**

| Dependent Variable | Excluded Variable | Chi-square | df | Probability | Result             |
|--------------------|-------------------|------------|----|-------------|--------------------|
| D(GFCF)            | D(BCPS)           | 8.9959     | 2  | 0.0111      | Significant        |
| D(GFCF)            | D(BP)             | 0.9456     | 2  | 0.6232      | Insignificant      |
| D(GFCF)            | D(INF)            | 0.4771     | 2  | 0.7878      | Insignificant      |
| D(GFCF)            | D(IR)             | 2.3234     | 2  | 0.313       | Insignificant      |
| D(GFCF)            | D(NS)             | 1.405      | 2  | 0.4953      | Insignificant      |
| D(GFCF)            | All               | 16.0802    | 10 | 0.0974      | Weakly Significant |

The results reveal a unidirectional short-run causal relationship from BCPS to GFCF, highlighting the importance of financial intermediation in promoting investment activity. No significant causal effects are

observed from BP, INF, IR, or NS on capital formation. Overall, the variables jointly exert a weak influence on GFCF.

## Variance Decomposition

**Table VIII: Variance Decomposition of GFCF (%)**

| Period | GFCF   | BCPS  | BP   | INF   | IR   | NS    |
|--------|--------|-------|------|-------|------|-------|
| 1      | 100.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |
| 5      | 12.05  | 40.44 | 2.48 | 16.79 | 2.13 | 26.11 |
| 10     | 26.01  | 45.89 | 3.22 | 9.01  | 2.11 | 13.76 |

The variance decomposition results indicate that GFCF is initially explained entirely by its own shocks, reflecting strong persistence in investment behavior. Over time, BCPS emerges as the largest contributor to variations in GFCF, highlighting the importance of financial intermediation in promoting capital formation. National savings and inflation exert moderate influence, whereas banks' profitability and interest rates contribute relatively little to investment fluctuations. Overall, the findings suggest that capital formation in Pakistan is driven primarily by credit availability rather than domestic savings.

## Conclusion & Policy Implication

The long-run results confirm that bank credit actively drives gross fixed capital formation (GFCF) in Pakistan, whereas inflation significantly undermines long-term investment. Crucially, national savings exhibit an unexpected negative relationship with GFCF, rejecting H3 and exposing critical structural bottlenecks in the savings–investment transmission mechanism. Consequently, these findings underscore that boosting investment requires more than just increasing the volume of savings; policymakers must prioritize stabilizing inflation and implementing structural financial reforms to ensure that banking institutions efficiently channel domestic resources into productive real-sector capital.

Overall, the findings highlight the importance of efficient banking sector performance and macroeconomic stability in fostering sustainable investment growth in Pakistan.

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