Macroeconomic Fundamentals and External Sector Balances as Determinants of Exchange Rate Dynamics: Cross-Country Panel Evidence

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Abstract

This study examines the macroeconomic and external sector determinants of exchange rate movements using panel data from six major economies—India, China, the United States, the United Kingdom, Australia, and South Africa for 19 years from 2005 to 2023 . These countries represent diverse economic structures, exchange rate regimes, and degrees of financial openness, allowing for a comparative assessment of how monetary conditions and Balance of Payments (BoP) dynamics influence foreign exchange prices.

The analysis employs a Fixed Effects (FE) panel regression framework to control for unobserved country-specific heterogeneity. Two empirical models are estimated. Model 1 investigates the impact of macroeconomic fundamentals—GDP, inflation, and interest rates—on exchange rates, while Model 2 incorporates key BoP components, including the current account, capital account, net financial account, errors and omissions, and the overall BoP surplus or deficit. Correlation and trend analyses complement the regression results by examining the direction and strength of relationships among variables.

The results indicate that monetary variables dominate exchange rate dynamics. Interest rates exert the strongest and most statistically significant influence on currency movements, consistent with interest parity and capital flow theories. Inflation is also significant, reflecting the interaction between price stability, monetary credibility, and investor expectations. GDP growth exhibits a weaker and negative effect, suggesting that growth in these economies is often import-intensive and associated with widening trade deficits. BoP variables show mixed effects: improvements in the overall BoP balance support currency appreciation, while large gross flows in the current account, capital account, and financial account are associated with depreciation and increased volatility. Correlation results confirm that interest rates are more strongly linked to exchange rates than external account components.

Overall, the findings suggest that exchange rate behavior is shaped primarily by monetary conditions and capital mobility rather than by real output or trade balances alone. The study highlights the importance of inflation control, credible monetary policy, and stable external financing for exchange rate stability and provides policy-relevant insights for managing foreign exchange risk in an increasingly integrated and volatile global financial environment.

Background and Context

Exchange rate movements in the twenty-first century are influenced by a complex interaction of macroeconomic factors, external sector balances, capital flows, financial markets, and geopolitical developments. Traditional exchange rate theories such as Purchasing Power Parity (PPP) and Interest Parity were developed under assumptions of stable trade patterns and limited financial integration. However, in today's globalised economy, characterised by integrated supply chains, rapid capital movements, and frequent global shocks, these models alone are no longer sufficient to explain currency behaviour.

The foreign exchange market has become highly financialised, and exchange rates increasingly behave like asset prices. They respond not only to inflation and interest rate differentials, but also to market expectations, risk perceptions, and cross-border investment flows. As a result, currencies react quickly to changes in monetary policy, financial conditions, and global uncertainty.

Recent years have seen a divergence in monetary policy across major economies. While the United States maintained relatively tight monetary conditions, Europe and Japan adopted more accommodative approaches. These differences created interest rate gaps that influenced capital flows and exchange rate movements. Emerging market economies faced additional challenges, as early interest rate cuts and weaker external balances led to capital outflows and currency pressures in several countries.

At the same time, global trade patterns have changed due to post-pandemic disruptions, geopolitical tensions, and industrial policy shifts. These changes have affected export competitiveness, import dependence, and external balances across countries, further influencing exchange rate behaviour. Growth, productivity, and inflation dynamics have also diverged across regions, adding to currency volatility.

Geopolitical tensions and global uncertainty have further increased exchange rate fluctuations by affecting investor confidence and triggering shifts in capital towards safer assets.

In this context, understanding exchange rate behaviour requires a combined analysis of macroeconomic fundamentals, external sector conditions, financial flows, and global risk factors. This study adopts such an integrated approach to examine how macroeconomic variables and Balance of Payments components jointly influence exchange rate movements across countries during a period of heightened global uncertainty.

Literature review :

Prior studies confirm that exchange rate movements are closely linked to macroeconomic fundamentals and external sector conditions. Simpson, Ramchander, and Chaudhry (2005) show that foreign exchange markets respond more strongly to monetary and inflation-related news than to general growth indicators, highlighting the role of expectations and policy signals. Hadi (2006) and Ramasamy and Abar (2015) find that interest rates and inflation are significant determinants of exchange rates, supporting monetary models of currency valuation.

Mussa (2013) theoretically links exchange rates with balance of payments and macroeconomic policy, arguing that persistent external imbalances necessitate currency adjustment. Patrick (2023) provides empirical evidence that exchange rate movements affect the balance of payments, particularly trade and capital flows. Kolte et al. (2021) show that sustained current account deficits and volatile capital flows increase the risk of balance of payments crises and exchange rate instability in developing economies. Nagarajan et al. (2017) add that currency futures and financial market activity also influence exchange rate volatility.

Despite this, the literature remains fragmented: most studies are country-specific, examine macroeconomic and balance of payments variables separately, and rely on short-term or single-country data. This creates a need for integrated, cross-country, long-term analysis of how macroeconomic fundamentals and balance of payments jointly influence exchange rate dynamics.

Research methodology:

This study aims to provide an empirical understanding of how macroeconomic and Balance of Payment components influence forex prices. By analysing cross-country data for 19 years from 2005 to 2023, it seeks to uncover patterns, trends, and key drivers of exchange rate movements. The findings will help policymakers, investors, and financial analysts make informed decisions regarding forex risk management, international trade policies, and currency market strategies.

The objective of this study is to examine the impact of key macroeconomic variables, namely GDP, inflation, and interest rates, on foreign exchange rates across six countries using a panel data Fixed Effects model. It also aims to analyze how major Balance of Payments components, including the current account, capital flows, the net financial account, net errors and omissions, and the overall balance of payments position, influence currency movements in a cross-country setting. Further, the study seeks to interpret the direction and strength of the relationships between exchange rates and these economic indicators through cross-country correlation analysis to provide a comprehensive understanding of the macroeconomic and external sector determinants of exchange rate behavior

The study employs a quantitative panel-based econometric approach using annual data from India, China, the United States, the United Kingdom, Australia, and South Africa for 19 years from 2005 to 2023. Exchange rate (domestic currency per USD) serves as the dependent variable, while macroeconomic and Balance of Payments indicators constitute explanatory variables. Fixed-Effects panel regression was applied to control for country-specific unobserved heterogeneity, complemented by correlation analysis to detect variable interactions. Data were sourced from IMF, World Bank, OECD, and central bank databases. Two models were estimated: one focusing on GDP, inflation, and interest rates, and one incorporating current account balance, capital account, net financial flows, errors and omissions, and overall BoP surplus/deficit. Model assessment relied on R², F-statistics, information criteria, and Durbin–Watson diagnostics.

Model 1: Macroeconomic Determinants of Exchange Rate

$$EXR_{it} = \alpha_i + \beta_1 GDP_{it} + \beta_2 INT_{it} + \beta_3 INF_{it} + \varepsilon_{it}$$

Where:GDP_{it}= Gross Domestic Product / GDP growth,INT_{it}= Interest rate,INF_{it}= Inflation rate

This model captures how macroeconomic fundamentals affect exchange rates within and across countries using a Fixed Effects panel data framework.

Model 2: Balance of Payments Determinants of the Exchange Rate

$$EXR_{it} = \alpha_i + \gamma_1 CA_{it} + \gamma_2 KA_{it} + \gamma_3 NFA_{it} + \gamma_4 EO_{it} + \gamma_5 BOP_{it} + u_{it}$$

Where:CA_{it}= Current account balance,KA_{it}= Capital account balance,NFA_{it}= Net financial account,EO_{it}= Errors and omissions,BOP_{it}= Overall Balance of Payments surplus/deficit

This model evaluates how external sector (BOP) components explain variations in exchange rates across the six countries over time

Result analysis and Discussions:

Estimation Results: The Macroeconomic Determinants of Exchange Rates study examines the relationship between macroeconomic variables—Inflation, Exchange Rate & GDP on the foreign exchange market. The analysis is conducted using a Fixed Effects Panel Regression Model, incorporating data from six countries (India, China, the US, the UK, Australia, and South Africa) over multiple years.

The Fixed Effects model is appropriate for this study as it accounts for unobserved heterogeneity across countries, ensuring that country-specific effects (e.g., policy differences, institutional structures) do not bias the results.

Model 1: Fixed-effects model Panel Regression, using 113 observations

Dependent variable: Exchange Rate

	Coefficient	Std. Error	t-ratio	p-value	
const	−9.55024	3.26288	−2.927	0.0042	***
GDP	−7.36710e-013	2.68102e-013	−2.748	0.0070	***
Interest rate	4.87132	0.467753	10.41	<0.0001	***
Inflation	3.25176	0.652252	4.985	<0.0001	***

LSDV R-squared	0.693844		Within R-squared	0.599147
LSDV F(4, 108)	61.19022		P-value(F)	6.70e-27
rho	0.731042		Durbin-Watson	0.522941

$$EXR_{it} = -9.55024 - 7.37 \times 10^{-13} GDP_{it} + 4.87132 INT_{it} + 3.25176 INF_{it} + \alpha_i + \varepsilon_{it}$$

The Fixed Effects (LSDV) panel regression exhibits strong explanatory power, with an R^2 of 0.6938 and a within R^2 of 0.5991, indicating that a substantial proportion of within-country exchange rate variation is explained by the included macroeconomic fundamentals. The model is jointly significant (F = 61.19, p < 0.001), confirming the relevance of the regressors. The estimated rho (0.731) suggests that a large share of variation is attributable to unobserved country-specific effects, validating the use of a Fixed Effects specification. The low Durbin–Watson statistic (0.523) indicates the presence of positive serial correlation in the residuals, implying that future research may benefit from dynamic panel estimators such as system GMM or ARDL-based frameworks.

The coefficient estimates indicate that monetary variables exert a dominant influence on exchange rate movements. The interest rate exhibits a large, positive, and highly significant effect (β = 4.871, p < 0.0001), consistent with interest parity and capital flow theories, whereby higher interest rates attract foreign capital and induce currency appreciation. Inflation is also positive and statistically significant (β = 3.252, p < 0.0001). Although this result contrasts with standard purchasing power parity predictions, it likely reflects the role of credible monetary regimes in the sample economies, where moderate inflation coincides with tighter monetary policy and sustained capital inflows, resulting in net currency appreciation.

GDP displays a small but statistically significant negative coefficient ($\beta = -7.37 \times 10^{-13}$, p = 0.007), suggesting that higher output growth is associated with currency depreciation. This pattern is consistent with an import-intensive growth process and widening trade deficits, which exert downward pressure on the exchange rate through the external account.

Overall, the findings suggest that exchange rate dynamics are driven primarily by monetary conditions rather than real activity, while structural country-specific factors remain important. The results support a macro-financial interpretation of exchange rate determination, in which interest rates, inflation, and capital flows dominate output effects, although the presence of residual autocorrelation indicates scope for dynamic extensions to strengthen causal inference.

In sum, the evidence indicates that exchange rate movements across countries are predominantly shaped by monetary variables and capital mobility, with real output exerting a secondary influence, and that accounting for country-specific heterogeneity is essential for consistent estimation.

Estimation Results: Balance of Payments Determinants of Exchange Rates : Balance of Payments (BoP) accounts reflect trade flows, capital movements, financial transactions, and unrecorded transactions, all of which affect currency demand and supply. In open economies, capital inflows, remittances, FDI, trade surpluses, and financial transfers play a crucial role in determining currency value.

To capture these dynamics, Model 2 estimates the impact of five external sector components—current account, capital account, net financial account, errors and omissions, and BoP surplus/deficit—using a Fixed Effects panel model. The approach isolates within-country effects over time, controlling for unique structural factors such as currency regimes, export composition, capital controls, and institutional frameworks.

Model 2: Fixed-effects, using 114 observations

Dependent variable: Exchange Rate

	Coefficient	Std. Error	t-ratio	p-value	
const	10.4524	1.90786	5.479	<0.0001	***
Current Account	−0.00100383	9.83417e-05	−10.21	<0.0001	***
Capital Account	−0.00100383	9.83417e-05	−10.21	<0.0001	***
Net Financial Account	−0.00100383	9.83417e-05	−10.21	<0.0001	***

Errors and Omissions	−0.00100383	9.83417e-05	−10.21	<0.0001	***
BOP Surplus Deficit	0.00100383	9.83417e-05	10.21	<0.0001	***

LSDV R-squared	0.624824	Within R-squared	0.505391
LSDV F(6, 107)	29.69995	P-value(F)	1.01e-20
rho	0.632280	Durbin-Watson	0.685372

$$EXR_{it} = 10.4524 - 0.00100383CA_{it} - 0.00100383KA_{it} - 0.00100383NFA_{it} - 0.00100383EO_{it} + 0.00100383BOP_{it} + \alpha_i + \varepsilon_{it}$$

Model 2 estimates the effect of external sector variables on exchange rates using a Fixed Effects panel model across six countries. The model is statistically significant (F = 29.70, p < 0.0001) and explains a substantial proportion of exchange rate variation (R^2 = 0.6248; within R^2 = 0.5054), confirming the relevance of Balance of Payments (BoP) indicators in exchange rate determination.

The current account, capital account, net financial account, and errors and omissions all display negative and highly significant coefficients, indicating that increases in these gross external flows are associated with currency depreciation, likely reflecting import growth, capital flow volatility, or unrecorded outflows. In contrast, the overall BoP surplus/deficit exhibits a positive and highly significant coefficient, implying that an improvement in the net external position strengthens the domestic currency through improved external sustainability and investor confidence.

The significant rho (0.632) confirms the presence of country-specific effects, validating the Fixed Effects approach, while the low Durbin–Watson statistic (0.685) indicates persistence in exchange rate movements and suggests that dynamic specifications may be required in future research.

Correlation and Trend Analysis of Exchange Rate Determinants

Panel Correlation Matrix

	GDP	INTEREST RATE	INFLATION	Exchange Rate
GDP	1	-0.3207	-0.3571	-0.3772
Interest rate		1	0.4231	0.7712
Inflation			1	0.5705
Exchange Rate				1

The correlation matrix indicates that the interest rate has the strongest association with the exchange rate (r = 0.7712, > critical value 0.1848), implying that tighter monetary conditions are linked with currency appreciation through capital inflows. Inflation also shows a significant positive correlation with the exchange rate (r = 0.5705), suggesting that rising price levels are associated with currency depreciation pressures. GDP is negatively correlated with the exchange rate (r = −0.3772), indicating that higher output growth does not necessarily strengthen the currency, possibly due to higher imports or external financing needs. Overall, the results suggest that monetary variables exert a stronger influence on exchange rate movements than real output.
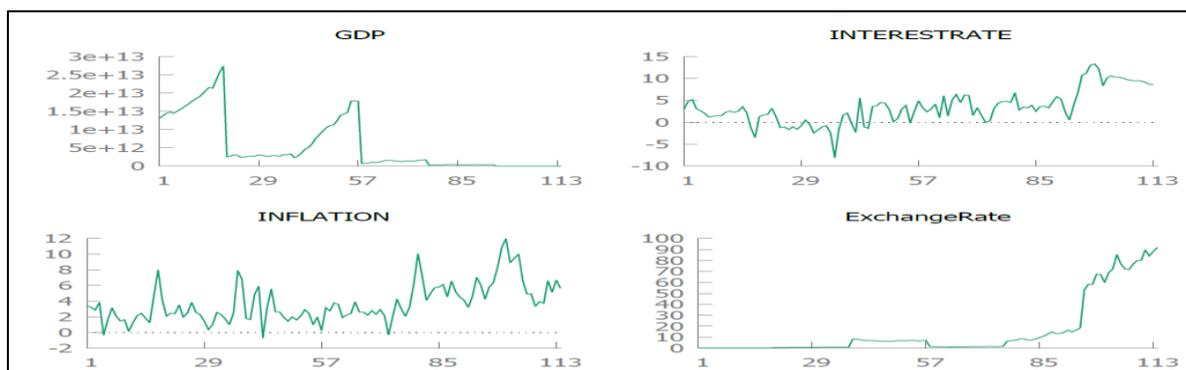
The time-series trends show high volatility in GDP, reflecting cyclical and structural fluctuations across countries. Interest rates exhibit frequent adjustments, consistent with active monetary policy responses to macroeconomic conditions. Inflation displays episodic spikes, indicating demand or supply-side shocks. The exchange rate shows a persistent upward trend, implying sustained currency depreciation over time. Collectively, the trends confirm that inflation shocks and interest rate changes are key drivers of exchange rate dynamics, while GDP plays a relatively weaker role.

Correlation Analysis of Balance of Payments Components and Exchange Rates coefficients,

Panel Correlation Matrix

	Current Account	Capital Account	Net Financial Account	Errors and omissions	BOP Balance	Exchange Rate
Current Account	1	-0.2071	-0.5756	-0.1007	0.0119	-0.1642
Capital Account		1	0.4959	-0.1635	0.4454	0.1862
Net Financial Account			1	-0.2259	0.7793	0.2392
Errors and Omissions				1	-0.0787	0.0605
BOP Balance					1	0.2004
Exchange Rate						1

The correlation matrix indicates that Balance of Payments (BoP) components have limited explanatory power for exchange rate movements. The current account balance is weakly and negatively correlated with the exchange rate ($r = −0.1642$), suggesting that trade surpluses do not systematically translate into currency appreciation, likely due to offsetting capital outflows or high import elasticity. The capital account shows a weak positive correlation ($r = 0.1862$), indicating that capital inflows provide only marginal support to currency stability. The net financial account exhibits a slightly stronger positive relationship ($r = 0.2392$), reflecting the role of portfolio and FDI inflows in increasing foreign currency demand and supporting the domestic currency. The overall BoP balance is also weakly positive ($r = 0.2004$), confirming that external sector equilibrium contributes to exchange rate support, but with limited magnitude.

In contrast, strong internal linkages exist among BoP components themselves. The net financial account is strongly correlated with the BoP balance ($r = 0.7793$), and the capital account is moderately correlated with both the net financial account ($r = 0.4959$) and the BoP balance ($r = 0.4454$), indicating that capital movements dominate overall external balance adjustments.

Time-series trends reinforce this interpretation. The exchange rate shows a persistent upward trajectory, indicating sustained currency depreciation. The current account displays prolonged deficits, exerting continuous depreciation pressure. The net financial account and capital account show sharp fluctuations, reflecting volatile capital flows that create short-term appreciation or stabilization episodes but do not reverse the long-run depreciation trend. The errors and omissions component shows large spikes and reversals, indicating unrecorded or speculative transactions that amplify exchange rate volatility.

Overall, the numerical evidence suggests that while external sector variables affect exchange rate behavior, their influence is weaker, unstable, and episodic ($|r| \leq 0.239$) compared to monetary variables such as interest rates (previously observed $r = 0.771$). Exchange rate dynamics are therefore better explained by financial conditions and capital mobility rather than by trade balances alone, highlighting the dominance of monetary transmission channels over real sector external balances in determining currency movements.
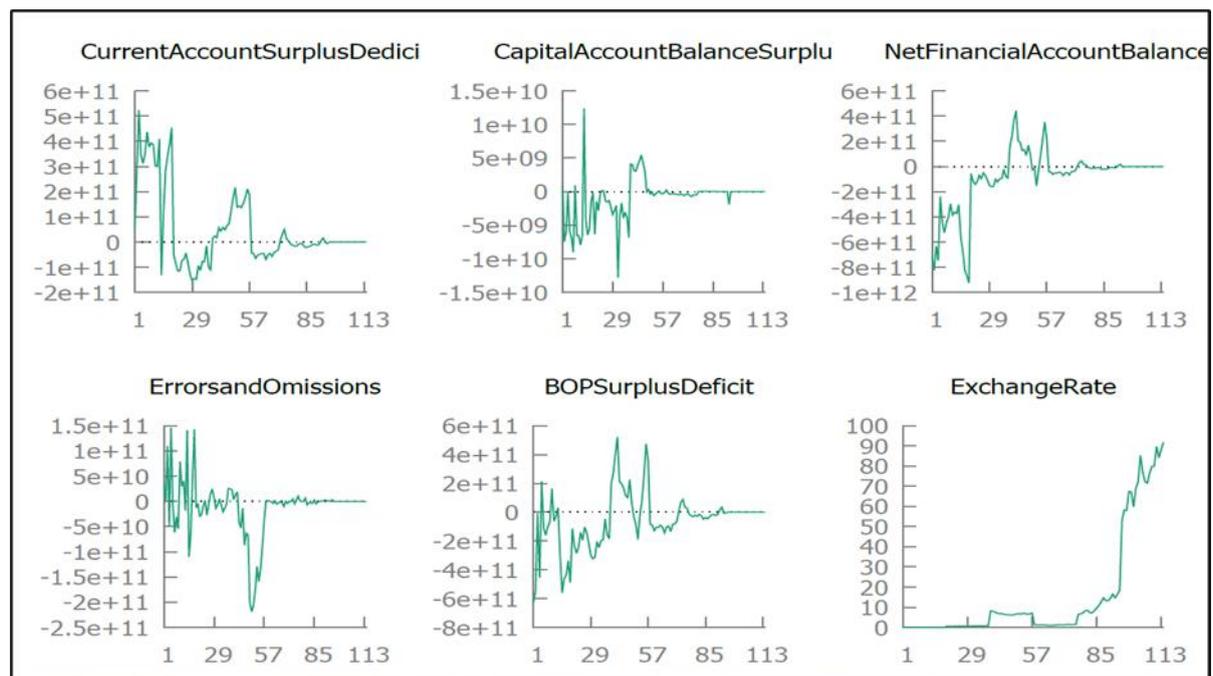
The Balance of Payments graphs show that external sector variables are highly volatile and closely linked to exchange rate movements. Persistent current account deficits weaken currency values, while periods of capital inflows and financial account surpluses provide temporary support. Sharp fluctuations in the net financial account and capital account indicate unstable investment flows, which increase forex volatility. Large deviations in the Errors and Omissions component reflect unrecorded transactions and speculative activities that further disrupt currency stability. Overall BoP surpluses tend to stabilize exchange rates, whereas deficits amplify depreciation pressures. These patterns confirm that external imbalances, capital flows, and unrecorded financial movements collectively drive exchange rate fluctuations across countries.

Conclusion

This study provides cross-country evidence that exchange rate movements are driven primarily by macro-financial forces rather than by real output or trade balances alone. Interest rates and inflation exert stronger and more consistent effects on currency values than GDP growth, indicating that exchange rates respond mainly to monetary conditions, capital mobility, and market expectations. External sector variables influence exchange rates primarily through the overall Balance of Payments position, while individual components such as the current account, capital account, and financial flows display weaker and more unstable relationships.

The findings support the interpretation of exchange rates as forward-looking financial prices that adjust to changes in macroeconomic signals and external sustainability rather than as simple reflections of trade competitiveness. At the same time, substantial country-specific effects and residual persistence highlight the importance of

structural characteristics and adjustment dynamics in shaping exchange rate behaviour across economies.

Overall, the results suggest that understanding exchange rate dynamics requires integrating macroeconomic fundamentals, external balances, and financial conditions within a unified empirical framework. Future studies can apply dynamic methods to better reflect how exchange rates adjust over time and respond to structural changes and market volatility.

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