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Determinants of Foreign Portfolio Investment Decline in India: A SARIMAX-Based Time Series Analysis (1984-2014)

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Abstract

India has been an attractive destination for parking foreign funds for many decades due to its large market and promising high potential, and it has attracted significant FDI and FPI over the last decade. But recently, there has been a noticeable decline in FPI inflows despite economic growth and India being the fourth-largest economy in the world by nominal GDP. The motivation of our study was to find out the reason behind this shift in the attitude of investors. The objective of the study was to investigate why India is losing its attractiveness as a destination for foreign portfolio investment and FDI, and also to identify the economic and financial determinants impacting these.

We have used a SARIMAX model as our methodology, using data from 1984 to 2014, and included both economic and financial indicators like GDP, inflation, tax structure, energy use, trade openness, SDR rates, etc. The findings of our research were that GDP, trade openness, stock market returns, and energy use have a positive and statistically significant impact on FDI inflows. Variables like taxation structure and SDR rates have a negative and statistically significant impact, and FPI net inflows remain statistically insignificant in influencing long-term FDI.

Through this research paper, we aim to fill a gap in literature by focusing on long-term FDI trends and their determinants, and offer a few policy suggestions to improve India's investment climate and regain foreign investor trust, again making India the most favourable destination for foreign funds

Keywords: SARIMAX model, Seasonal ARIMA with exogenous variables, Time series econometric modeling

1. Introduction

Over the past few decades, India has long been an attractive destination for global capital inflow due to its large consumer base, high growth potential, and ongoing economic reforms. Also, because of the popularity of the politicians and the Prime Minister in the past decade, India has been a major destination for foreign funds in the form of both FDI (Foreign Direct Investment) and FPI (Foreign Portfolio Investment). FDI and FPI have collaboratively been very helpful in shaping India's growth and development, as well as in shaping India's financial markets. FDI and FPI have a major stake in the shareholding of the financial markets in India.

However, in recent years, there has been a shift in investment patterns, and we have seen a noticeable decline or major fluctuations in FPI inflows. This is due to various concerns about fluctuations in India's policies, government and economic stability, global

competitiveness, and competition from various other developing economies.

This research paper aims to study why India is losing its appeal as a destination for foreign portfolio investment in the last few years. FDI, that is Foreign Direct Investment, is typically linked to long-term physical assets and infrastructure, whereas Foreign Portfolio Investment is investment in both short-term and long-term factors but is more influential in stock market returns, inflation, currency fluctuations, and interest rates. FPI investors enter and exit markets quickly, making them highly responsive to risk factors because of the nature of their investments.

In recent years, FPI investors have started reducing the amount of investment due to global tightening of financial conditions, rising interest rates in developing economies, and increased geopolitical uncertainty in many areas. Also, factors like high inflation, energy inefficiency, inconsistent taxation

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policies, high tax rates, and extreme stock market volatility in the Indian economy have contributed to this decline.

The significance of this study is to understand why India is losing its appeal as a destination for parking foreign portfolio investment funds, what the reasons behind this trend are, and how policymakers can address this in order to regain India's attractiveness for foreign investors.

The research focus of this paper is that the study uses time series data from 1984 to 2014 to explore both the economic and financial variables impacting FPI inflows. This paper highlights the weightage of both macroeconomic as well as financial variables. The key variables include inflation rate, energy consumption, internet penetration, access to electricity, exchange rates for SDR, USD, and Pound, GDP, trade openness, tax structure, REER, stock market returns in the form of Sensex volatility, Sensex returns, and net FPI inflows.

This paper aims to fill the research gap, especially focusing on long-term FPI trends and their determinants, as there is less emphasis in existing papers on the long-term FPI trends and their decline. The paper attempts to bridge this gap by providing a comprehensive empirical analysis. The objectives are to identify the key reasons why India is losing its attractiveness for FPI and to offer policy recommendations that can improve India's global investment position and again make it the most favourable destination for parking foreign funds.

2. Literature Review

Historically, Foreign Direct Investment (FDI) has long been known to catalyse economic development and growth of emerging world economies. In the Indian context, FDI has been analysed over long periods under multiple lenses- sustainability, macroeconomic determinants, regional and sectoral patterns, linkages with financial markets. Several studies converge on the idea that macroeconomic stability, policy liberalization, infrastructure, and institutional quality are key drivers of FDI inflows. This section presents brief literature review of publications that explore the factors influencing FDI inflows in various world economies-

Using panel data spanning over 32 developing countries over a period of 26 years the Munich Personal RePEc Archive (MPRA) paper uses Fully Modified Ordinary Least Squares (FMOLS) in order to analyse FDI determinants. According to the study, a basket of factors like- GDP growth, trade openness, exchange rates, and infrastructure showed significant influence on FDI inflows. Additionally, the study focuses on creating a stable and liberal economic environment that is investor-friendly to attract long-term foreign capital.

Behera and Sethi (2022) offer a detailed analysis of FDI inflows to India using Vector Autoregression (VAR) models, Granger causality tests, and impulse response functions between 1991 to 2020. The findings present a positive long-run relationship between FDI, GDP, trade openness, and infrastructure development. The study concludes that FDI forms a bidirectional relationship with Gross Domestic Product (GDP), suggesting that FDI is not just driven by, but also drives economic growth.

Taking a more nuanced regional and sectoral view, the FDI inflows to India have been studied by Mohanty and Sethi (2022) from 2000 to 2020 where they explore further the interlinkage of FDI inflows and financial markets. The analysis provides confirmation that regions which have improved infrastructure, industrial basis, and supportive policies, specifically in the manufacturing and services sector, are usually the ones that attract most foreign direct investment consistently. The study recommends localised and decentralised policy reforms in order to encourage broader regional participation in foreign investment. Due to their higher capital absorption capacity and deeper integration with financial systems FDI inflows are dominated by services and manufacturing sectors.

Both Hussain and Haque (2016) and Agrawal and Khan (2011) analyse the stock market relationship with FDI. In order to establish a long run and short run positive relationship between FDI and the stock market growth, Agrawal and Khan (2011) Use cointegration techniques to argue that developed financial markets are symbols of macroeconomic stability and the potential for investment and thereby help attract foreign capital consistently over long

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periods. Further reinforcing the idea, Hussain and Haque (2016) Analysed monthly data from 2002 to 2015 to find the significance of influence that FDI inflows have over BSE Sensex, with notable lagged effects. According to their study FDI plays an important role in helping shape the sentiment of investors and trajectories of the future market while responding to market fundamentals. Together, these studies underscore the bidirectional relationship between capital markets and foreign investment and thereby reinforce the importance of financial deepening in improving FDI inflows.

Presenting a unique angle, Sharma and Chatterjee (2023) created sustainable development integrators into the analysis of FDI inflows spanning Indian states from 2001 to 2020. In their analysis, they used panel regression techniques to identify strong positive correlations between FDI inflows and explanatory variables such as infrastructure quality, human development index (HDI), urbanization, and renewable energy use. This study successfully highlights that sustainability objectives and foreign investment attraction are strongly interlinked. Going beyond conventional financial factors, the study compares India's financial preparedness with the evolving global investment priorities that integrate ESG (Environmental, Social, and Governance) concerns into their investment decisions.

Contrastingly, Chakraborty and Nunnenkamp (2008) reveal in their findings that FDI inflows in India are influenced by regional policy dynamics and responsiveness as opposed to sectoral growth patterns which form the conventional supply-side narrative. Similarly, Sharma and Kaur (2013) highlight the state-wise disparities in India,

• Inflation Rate (Lag 1):

 $H_0: \beta_{Inflation \ rate} \geq 0 \quad v/s \quad H_A: \beta_{Inflation \ rate} < 0$

• Individuals Using the Internet (% of Population, Lag 1):

 $H_0: \beta_{Internet \%} \leq 0 \quad v/s \quad H_A: \beta_{Internet \%} > 0$

• Energy Use (kg of Oil Equivalent per Capita, Lag 1):

 $H_0: \beta_{Energy\ Use} \leq 0 \quad v/s \quad H_A: \beta_{Energy\ Use} > 0$

• Special Drawing Rights (SDR, Lag 1):

 $H_0: \beta_{SDR} \leq 0 \quad v/s \quad H_A: \beta_{SDR} > 0$

concluding that regions with better governance, industrial infrastructure, and proactive policy frameworks tend to attract greater FDI.

Finally, Singhania and Akshay (2010) investigate the determinants of FDI inflows to India using time series data between 1991 to 2008. Using multiple regression analysis, the study identifies key macroeconomic variables that have influence over FDI, including trade openness, inflation rate, exchange rate, GDP growth, and infrastructure availability. Their findings identified trade openness and exchange rate stability to be significant, having positive relationship with FDI inflows. Infrastructural development is also revealed to be a vital factor, establishing the idea that logistical capability and efficiency acts as a catalyst 4 sustained foreign capital. Therefore, economies that have a predictable currency valuation, stability, strong infrastructural prowess, and integration with global markets are preferred by foreign investors.

3. Hypothesis Setting

A SARIMAX (1,0,0) model was specified in order to empirically investigate the determinants of Foreign Direct Investment inflows in India between 1984 to 2014. A set of financial and macroeconomic explanatory variables have been defined above that have been historically deemed as significant in determining FDI inflows. The null and alternative hypotheses, for each variable included in the model, is defined to assess its statistical relevance in explaining variations in FDI inflows.

Let β_i denote the coefficient associated with the ith explanatory variable. The hypotheses are specified as follows:

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Gross Domestic Product (GDP, Lag 1):

$$H_0: \beta_{GDP} \leq 0 \quad v/s \quad H_A: \beta_{GDP} > 0$$

• Trade Openness (% of GDP, Lag 1):

$$H_0: \beta_{Trade\ Openness} \leq 0 \quad v/s \quad H_A: \beta_{Trade\ Openness} > 0$$

• Tax Structure (Lag 1):

$$H_0: \beta_{Tax \, Structure} \geq 0 \quad v/s \quad H_A: \beta_{Tax \, Structure} < 0$$

• Foreign Portfolio Investment (FPI) Net Inflow (Lag 1):

$$H_0: \beta_{FPI} \leq 0 \quad v/s \quad H_A: \beta_{FPI} > 0$$

• Stock Market Return (Sensex Annual ROI, Lag 1):

$$H_0: \beta_{Stock\ Market\ Return} \leq 0 \quad v/s \quad H_A: \beta_{Stock\ Market\ Return} > 0$$

Each hypothesis is tested using the z-statistic and corresponding p-value at a 5% level of significance. The purpose of the analysis is to ascertain the explanatory variables that are significant in determining the FDI inflows, as well as the nature of their relationship with the Foreign Direct Investment Inflows of India.

4. Research Methodology

4.1 About SARIMAX

A Seasonal AutoRegressive Integrated Moving Average with Exogenous Variables (SARIMAX) model was used to obtain the results for this study. SARIMAX was employed to examine the dependence of the foreign direct investment (FDI) inflows for India on a range of financial and macroeconomic explanatory variables. With the help of the statsmodels library in Python, this model analysis was implemented. SARIMAX model with 1 year lags was found to be most suitable due to its ability to simultaneously model time-dependent structures (autoregressive and moving averages), incorporate non-stationarity, as well as include exogenous predictors: a critical requirement for understanding the impact of policy and economic variables such as inflation, energy use, GDP, and financial flows on FDI behavior over a given timeframe. As opposed to standard OLS regression assuming independent and identically distributed into residuals, SARIMAX takes autocorrelation and seasonality in the dataset. The SARIMAX model is known to incorporate lagged

components, enabling it to account for dependencies over different time periods and delayed effects in time series data. Therefore, in macroeconomic modelling, where a majority of the policy changes or impacts unfold over time, SARIMAX turns out to be a valuable modelling alternative.

To capture this very delay in the effect of policy changes and shocks, a lag in the independent variables was introduced. Investment decisions often involve information delays, planning lags, and policy transmission gaps, which means that the impact of these variables typically manifests with a time lag. By incorporating these predictors at a one-period lag (t-1), the model reflects this delayed influence, improves explanatory power, and aligns with both economic theory and empirical precedent in time series analysis.

4.2 Model Variables Description

1. Inflation Rate

Inflation rate measures the general increase in price levels over time. Past evidence suggests that persistently high inflation rates disturb purchasing power and lower the real rate of interest for investors. The inflation rate introduces or instils macroeconomic instability and uncertainty, often causing a negative impact on FPI inflows.

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2. Individuals Using the Internet (% of population)

This acts as a proxy, suggesting or shedding light on digital infrastructure, digital growth and development, connectivity, and financial market access through the internet. A high value suggests broad market accessibility, smoother information flow, and an efficient investment environment. It also reflects confidence in technologically adaptive economies.

3. Energy Use (kg of oil equivalent per capita)

This represents energy consumption per person, indicating the scale of industrial activity in an economy. High energy use suggests productive economic engagement but may also raise concerns if energy efficiency is low. In developing economies, it is interpreted as a sign of growth and development.

4. Special Drawing Rights (SDR) Exchange Rate

This is a broad measure of currency valuation against global benchmarks. Depreciation of this rate reflects currency weakening, thereby reducing the attractiveness of domestic assets to foreign investors. Currency risk is obviously a major factor in FPI decision-making.

5. Gross Domestic Product (GDP)

GDP denotes the overall size and performance of the economy, including all goods and services produced in a financial year. Strong GDP and consistent GDP growth are positive factors and can lead to higher FPI inflows. It shows a direct positive correlation with investor confidence and FPI.

6. Trade Openness (% of GDP)

Trade openness is calculated as the sum of exports and imports as a percentage of GDP. It reflects an economy's integration into global trade and capital markets. Economies that are more open to trade are usually perceived as more welcoming for FPI, as there are fewer barriers to capital movement.

7. Tax Structure

Tax structure is reflected in the policy framework of direct and indirect taxes and how much FPI earnings are taxed in the country. Lower taxes, simplified procedures, and a more transparent tax regime are always preferred by foreign investors.

8. Foreign Portfolio Investment (FPI) Net Inflow (USD Million)

This is the dependent variable of the model and represents the net flow of capital from foreign institutional investors into equity and debt markets in India. It captures the response to all macroeconomic and financial variables taken in this research paper over the study period.

9. Stock Market Return (Sensex Annual ROI %)

This represents the annual return on the Sensex, which is the Bombay Stock Exchange's main stock index. It provides a clear idea of how the stock market has performed. Higher stock market returns attract more FPI, while volatility or underperformance can negatively impact investor decisions.

5. Model Diagnostics and Residual Tests

In order to assess the adequacy and the accuracy of the estimated SARIMAX(1, 0, 0) model and validate the reliability of its inference, a series of diagnostic tests were conducted on the residuals as well as the explanatory variables data points. Specifically, we tested for multicollinearity, autocorrelation, heteroskedasticity, and normality.

5.1 Autocorrelation

The Ljung-Box Q-statistic has been employed in the model to test for serial correlation in the residuals as estimated by the model. A Q-value of 0.01 was produced by the test with a corresponding p-value of 0.92, suggesting the inability to reject the null hypothesis that the explanatory variables are independently distributed at the 5% level of significance. This test value reveals that there is no strong evidence of autocorrelation, suggesting that

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the model captures the temporal dependence in the data with a satisfactory degree of accuracy.

5.2 Heteroskedasticity

Using the (H) statistic, Heteroskedasticity, the property of the error term having non-constant variance across different levels of the explanatory variables, was tested. The test yielded an (H) value of 0.015 with a p-value of 0.01, signifying rejection of the null hypothesis of a homoskedastic distribution of the residuals at the 5% level of significance. This depicts that the variance of the residuals is not constant at different values of the independent variables, and therefore, there is the presence of heteroskedasticity in the model. Heteroskedasticity does not typically bias the coefficient estimates; instead, it may affect their efficiency and inflate respective standard errors of the independent variables, thereby leading to smaller z-scores, impacting statistical significance.

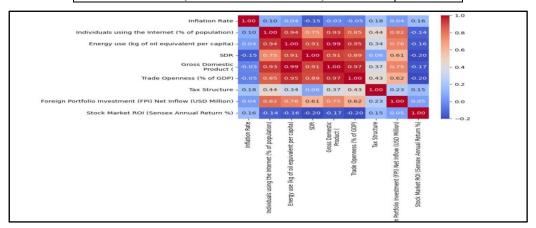
5.3 Normality

Using the Jarque-Bera (JB) test, the null hypothesis that the residuals follow a normal distribution was tested. The JB statistic was 3.30 for the model with a p-value of 0.19, indicating the failure to reject the null hypothesis of normality of residuals at the 5% significance level. Therefore, this implies that the residuals are approximately normally distributed, satisfying a key assumption for inference in linear time series models.

5.4 Multicollinearity

For testing multicollinearity in the model, the Variance Inflation Factor (VIF) was calculated for all the explanatory variables. As a standard rule of thumb, a Variance Inflation Factor value above 10 signals a strong multicollinearity among the variables. Economic variables often tend to be seriously correlated with one another which can also be seen in the table below:

Variable	VIF
Inflation Rate	2.11
Individuals using the Internet (% of population)	28.38
Energy use (kg of oil equivalent per capita)	174.70
SDR	27.16
Gross Domestic Product	308.56
Trade Openness (% of GDP)	38.98
Tax Structure	4.25
Foreign Portfolio Investment (FPI) Net Inflow	4.82
Stock Market ROI (Sensex Annual Return %)	1.38



These VIF and correlation coefficient values suggested strong multicollinearity, particularly among common macroeconomic indicators which often trend together in developing economies, like: GDP, trade openness, energy use and individuals using the internet. Upon analysis, a high correlation

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coefficient was also found between the Energy Use variable and the Individuals using the Internet variable. Therefore, we decided to drop the Individuals using the Internet variable, due to a better theoretical explanation of having Energy Use in the model.

5.5 Summary of Diagnostic Results

Test	Statistic	p-value	Decision	Conclusion
Ljung-Box (Autocorrelation)	0.01	0.92	Fail to reject Null Hypothesis	No autocorrelation in residuals
Heteroskedasticity (H Test)	0.15	0.01	Reject Null Hypothesis	Heteroskedasticity present
Jarque-Bera (Normality Test)	3.30	0.19	Fail to reject Null Hypothesis	Residuals approximately normal
Variance Inflation Factor (VIF)	_	_	_	Severe multicollinearity present

Overall, the SARIMAX model has both strengths and weaknesses. It successfully captures autocorrelated and maintains normality in residuals;

however, the presence of multicollinearity and heteroskedasticity warrants caution in the interpretation of individual coefficient estimates.

6. Results & Analysis:

	SARIMAX	Resul	ts						
Dep. Variable: Model: Date:	FDI Values SARIMAX(1, 0, 0) Thu, 03 Jul 2025	Log AIC	Observations: Likelihood	-68 138					
Time: Sample:	18:48:20 0 - 30	HQIC		1400.408 1391.017					
Covariance Type:	opg								
				coef	std err	z	P> z	[0.025	0.975]
Inflation Rate_L1 Energy use (kg of of SDR_L1 Gross Domestic	oil equivalent per c	apita)	_L1	5.564e+08 1.192e+08 -6.433e+08	14.801	6.27e+08 8.05e+06 -2.22e+08	0.000 0.000 0.000	1.19e+08	5.56e+08 1.19e+08 -6.43e+08
Product (_L1 Trade Openness (% o Tax Structure_L1 Foreign Portfolio I	of GDP)_L1 Investment (FPI) Net Sensex Annual Return			256.177 6.492e+08 -4.854e+09 L1 -2.343e+04 4.252e+07 0.0978 1.719e+19	0.449 2.65e+04 9.892	0.000 2 8.57e+08 -1.08e+10 -0.884 4.3e+06 0.426 4.99e+29	593.695 0.000 0.000 0.377 0.000 0.670 0.000	-4.85e+09 -7.54e+04 4.25e+07 -0.352	6.49e+08 -4.85e+09 2.85e+04 4.25e+07 0.548 1.72e+19
Ljung-Box (L1) (Q): Prob(Q): Heteroskedasticity Prob(H) (two-sided	(H):	0.01 0.92 0.15 0.01	Jarque-Bera (JB Prob(JB): Skew: Kurtosis:):	3.30 0.19 0.43 4.41				

This study uses annual time series data from 1984 to 2015. The data has been sourced from official economic databases and has been transformed to maintain consistency. All variables were lagged appropriately to reflect causality between the independent variables and FPI inflows.

1. **Inflation Rate** The regression coefficient is 556,365,919.67. This indicates that when the inflation rate increases by one unit, the mean predicted FDI inflows increase by approximately 556.37 million, keeping other variables constant. The p-value is 0.00, so it is

statistically significant at the 1% level, and hence we reject the null hypothesis.

2. **Energy Use** The regression coefficient is 119,175,713.60. This indicates that when energy use increases by one unit, the mean predicted FDI inflows increase by approximately 119.18 million, keeping other variables constant. The sign is positive, which is in conformity with economic theory. The p-value is 0.00, hence it is statistically significant and we reject the null hypothesis.

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- 3. **Special Drawing Rights (SDR)** The coefficient value is -643,325,462.15. This implies that when SDR increases by one unit, the mean predicted FDI inflows decrease by approximately 643.33 million. The p-value is 0.00, hence the variable is statistically significant and we reject the null hypothesis.
- 4. **Gross Domestic Product (GDP)** The coefficient is 3,095.79. This implies that when GDP increases by one unit, the mean predicted FDI inflows increase by 3,095.79 units, keeping other variables constant. The sign is positive, which is in line with economic theory, and the p-value is 0.00, so the result is statistically significant, and we reject the null hypothesis.
- 5. **Trade Openness** The coefficient is 649,162,157.06. This implies that when trade openness increases by one unit, the mean predicted FDI inflows increase by approximately 649.16 million, keeping other variables constant. The p-value is 0.00, so the variable is statistically significant, and we reject the null hypothesis.
- 6. **Tax Structure** The coefficient is 4,854,271,144.05. This implies that when taxes increase by one unit, the mean predicted FDI inflows decrease by approximately 4.85 billion, keeping other variables constant. The sign is negative, showing an inverse relationship, and the p-value is 0.00, so the variable is statistically significant, and we reject the null hypothesis.
- 7. **FPI Net Inflow** The coefficient is -23,427.79. FPI inflow is measured in USD million. This implies that when FPI increases by 1 million USD, the mean predicted FDI inflows decrease by approximately 23,427.79 USD. The sign is negative. The p-value is 0.377, which implies that the variable is statistically insignificant and hence we do not reject the null hypothesis.
- 8. Stock Market ROI (Sensex Annual Return%) The coefficient is 42,518,873.73. This implies that when the stock return increases by 1%, the mean predicted FDI inflows increase by approximately 42.52 million. The p-value is 0.00, hence it is

statistically significant and we reject the null hypothesis.

7. Conclusion & Policy Recommendations

India has been witnessing a declining trend in FPI appeal, and the reasons for this are rooted in both global and domestic factors. In this research paper, we have focused on both economic and financial factors — specifically macroeconomic and financial indicators — such as tightened financial conditions, rising interest rates, policy uncertainties, increasing tax complications, and high inflation.

In contrast, FDI inflows remain relatively more stable due to their long-term nature and association with infrastructure-linked commitments. Using the SARIMAX model, we found variables like GDP, trade openness, stock market returns, and energy use to be statistically significant, showing a positive correlation and impact on FDI.

On the other hand, tax structure and exchange rates had a negative and significant effect, indicating the sensitivity of FDI to a complicated tax burden and currency instability. FPI net inflows were found to be statistically insignificant in determining FDI, suggesting that short-term portfolio capital movement does not directly translate into long-term investment trust.

A notable economic observation was the presence of multicollinearity among several macroeconomic variables like GDP and energy use, hinting at overlapping development indicators in the country. The model also indicated heteroskedasticity but maintained no autocorrelation, and residuals were normally distributed, affirming the robustness of the time series interpretations.

In terms of interpretation and implications, this study shows that India's FDI inflows are highly sensitive to macroeconomic stability, openness, infrastructure strength, and clarity in fiscal policy. The decline in FPI has been largely due to domestic inefficiencies. There is a strong statistical relevance of trade openness and stock market returns in supporting a liberalised capital market and stable investor sentiment.

India's complex and high tax burden emerges as a primary obstacle in attracting smooth and sustained

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FDI inflows. The influence of SDR depreciation on FDI also highlights the major role of currency risk in investor decision-making. Although internet usage is theoretically important, it was dropped from the model due to multicollinearity, indicating a need for cleaner variable separation in future studies.

Based on these findings, the following policy recommendations are proposed: rationalise, simplify, and reduce the tax burden to facilitate freer capital flow; ensure exchange rate stability to mitigate currency risk; focus on increasing energy input and elevate internet infrastructure to match that of developed economies; and ensure greater policy predictability so that FDI can be channelled effectively.

India should continue pursuing its growth-driven economic agenda — which is already being carried out by the government — but with a greater focus on infrastructure reform, credible data, and openness to trade.

This study contributes meaningfully by focusing on long-term FPI trends, a topic underexplored in existing literature. The paper addresses this gap by using macroeconomic and financial indicators through a lag-based SARIMAX framework, providing a strong understanding of investor behaviour and FDI inflows over time. It also reflects the importance of time effects, information delays, and macroeconomic linkages — all critical for effective economic policy formulation.

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