Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 4 Issue 3 (2024)

The Effect of Macroeconomic Factors on Asset Prices: A Time-Series Approach

[1]Ms. Rajshree S, [2]Dr. M. Kethan
[1]Assistant Professor, Department of School of Commerce and Economics
Presidency University, Bengaluru, Email: rajshree.s@presidencyuniversity.in
[2]Associate Professor, Department of Management, IIBS, Bangalore, Email: dr.mkethan@iibsonline.com

Abstract

This study examines the relationship between macroeconomic factors and asset prices in India using a time-series approach. By focusing on key economic indicators such as inflation, interest rates, GDP growth, and exchange rates, the paper aims to understand how these variables influence the performance of assets traded on the National Stock Exchange (NSE). Utilizing secondary data from June 2023 to May 2024, sourced from the Reserve Bank of India (RBI) and NSE, the study employs econometric tools such as Vector AutoRegression (VAR), Granger Causality, and Cointegration tests to explore both short- and long-term dynamics. Previous literature highlights mixed results, with some studies suggesting a strong link between macroeconomic variables and asset prices, while others find limited effects. By identifying a research gap in the Indian market, this paper contributes to the ongoing debate and provides insights for investors, policymakers, and financial analysts. VAR model shows that inflation and lagged values of the Nifty 50 Index are strong predictors of short-term asset price movements, while the impact of interest rates and exchange rates is less significant. Inflation Granger causes the Nifty 50 Index and indicating that inflation can predict future movements in asset prices. GDP Growth Granger causes the Nifty 50 Index showing that economic growth also plays a role in predicting asset prices. There is no reverse causality from the Nifty 50 Index to inflation, GDP growth, or interest rates, indicating that asset prices do not significantly predict these macroeconomic variables in the short term.

1. Introduction

Background

The relationship between macroeconomic variables and asset prices has been a central theme in financial economics for decades. This link is crucial for policymakers, investors, and financial analysts as they attempt to predict market movements and make informed decisions. Macroeconomic indicators such as inflation, interest rates, exchange rates, and gross domestic product (GDP) growth are among the most important factors that influence the financial markets. These variables not only affect the valuation of assets but also determine investment strategies, portfolio management, and risk assessment. Understanding how asset prices respond to these indicators is critical for managing both systemic risk and individual financial risk.

Historically, researchers have explored this relationship in developed economies, where markets are generally more efficient and transparent. Studies like those by Fama (1981) and Chen, Roll, and Ross (1986) demonstrated that macroeconomic variables have a significant impact on asset prices, influencing both short-term fluctuations and long-term trends. These studies laid the groundwork for modern asset pricing models, which incorporate macroeconomic indicators as key determinants of asset value. However, emerging markets such as India present a unique case, where structural factors, market inefficiencies, and external shocks can lead to different dynamics between macroeconomic factors and asset prices. As India continues to grow economically and financially, understanding these dynamics has become increasingly relevant for investors both domestically and globally.

India’s financial markets have undergone substantial transformation in recent years. Since the liberalization of the Indian economy in the 1990s, the stock market has evolved significantly, becoming a hub for both domestic and foreign investments. The National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) have attracted capital from around the world, making them key drivers of India's economic growth. However, the Indian market remains highly sensitive to macroeconomic shifts. Recent developments, such as the COVID-19 pandemic, rising inflation, fluctuating interest rates, and the depreciation of the Indian rupee, have added complexity to the relationship between macroeconomic indicators and asset prices.

In this context, the study aims to explore the effects of key macroeconomic factors—namely, inflation, interest rates, exchange rates, and GDP growth—on asset prices in India. These variables are chosen due to their fundamental role in determining the overall economic environment, which directly or indirectly influences the stock market. Inflation, for instance, erodes purchasing power and affects consumer spending, which in turn impacts corporate earnings and stock valuations. Interest rates influence the cost of borrowing for companies and the discount rate used in stock valuation models, thereby affecting asset prices. Exchange rate fluctuations can have a direct impact on firms with substantial international exposure, altering their profitability and stock prices. Lastly, GDP growth serves as an indicator of the overall health of the economy, influencing investor sentiment and market trends.

2. Importance of the Study

The role of macroeconomic variables in determining asset prices has been widely recognized in academic literature, but there remains a gap in understanding these relationships within the Indian context. While several studies have examined the link between macroeconomic factors and asset prices in developed economies, relatively fewer have focused on emerging markets like India. Moreover, the existing literature on India is somewhat fragmented, with studies often concentrating on specific macroeconomic variables rather than providing a comprehensive analysis. Additionally, much of the research is outdated, failing to account for recent economic developments such as the global inflationary pressures, interest rate hikes by central banks worldwide, and the economic disruptions caused by the COVID-19 pandemic. This research aims to address these gaps by conducting a thorough and updated analysis of how macroeconomic factors influence asset prices in India.

For investors, understanding the relationship between macroeconomic factors and asset prices is essential for making informed investment decisions. In a volatile market like India's, where external shocks and domestic policy changes frequently occur, being able to predict how these variables will impact asset prices can provide a competitive edge. For policymakers, this study can offer insights into how changes in monetary and fiscal policy affect financial markets, which is crucial for managing market stability and promoting economic growth.

3. Macroeconomic Factors and Their Theoretical Links to Asset Prices

Each macroeconomic variable considered in this study plays a distinct role in shaping asset prices, and their effects have been explored extensively in financial theory.

- **Inflation**: Inflation impacts asset prices through multiple channels. Higher inflation typically reduces real returns on investments, as the purchasing power of future cash flows declines. According to the Fisher Effect (Fisher, 1930), nominal interest rates tend to rise with inflation expectations, which increases the cost of borrowing for companies and reduces corporate profitability. Consequently, asset prices, particularly equity prices, are negatively affected by rising inflation. However, the extent of this impact can vary based on the ability of companies to pass on increased costs to consumers, making inflation's effect on asset prices an area of ongoing research (Chaudhary et al., 2020).
- **Interest Rates**: Interest rates directly influence asset prices through their role in discounting future cash flows. The Discounted Cash Flow (DCF) model, one of the fundamental asset pricing models, demonstrates that higher interest rates lead to higher discount rates, which reduce the present value of future cash flows. As a result, rising interest rates are generally associated with declining asset prices. Moreover, higher interest rates increase the cost of capital for businesses, leading to reduced investment and lower expected future earnings (Patel & Mehta, 2021).
- **Exchange Rates**: Exchange rate fluctuations affect the value of assets, particularly for companies with international operations. A depreciation of the domestic currency makes exports cheaper and imports more expensive, benefiting export-driven companies while negatively impacting import-reliant firms. Exchange rate volatility can also lead to uncertainty in earnings projections, affecting investor confidence and asset prices. Studies have shown that exchange rate movements have a more pronounced impact on the asset prices of firms with significant foreign exposure (Ahmed & Ismail, 2021).
- **GDP Growth**: GDP growth is a key indicator of the overall health of an economy. Higher GDP growth is generally associated with increased corporate earnings, higher consumer spending, and a positive investment climate, all of which contribute to rising asset prices. Conversely, a slowdown in GDP growth signals economic distress, leading to reduced earnings expectations and falling asset prices. Kumar & Singh (2022) argue that the

relationship between GDP growth and asset prices is particularly strong in emerging markets, where economic growth is often a primary driver of investor sentiment.

4. Review of Literature

Bassin et al (2019) This study investigates the relationship between macroeconomic variables such as interest rates, inflation, and exchange rates on stock market returns in emerging markets, including India. The authors use a vector autoregression (VAR) model to explore the dynamic interactions between these variables. They conclude that inflation and interest rates have a significant negative impact on stock returns, while exchange rate fluctuations are more pronounced in the short term. However, the impact varies across industries, with export-oriented firms showing resilience against currency volatility.

Sharma and Jain (2020) examine the effects of inflation and interest rates on Indian stock prices from 2000 to 2018. Using the Granger causality test and cointegration analysis, they find that inflation has a long-term inverse relationship with asset prices, while interest rates negatively affect stock market performance. The study highlights the sensitivity of the Indian market to changes in monetary policy, emphasizing the importance of understanding inflationary trends for investors. They recommend diversification to hedge against inflation risks in emerging markets like India.

Kumar et al (2020) This paper explores the impact of global financial crises on Indian stock and bond markets, focusing on macroeconomic variables like GDP growth, inflation, and interest rates. The authors use event-study methodology and time-series data from 1990 to 2019 to assess how external shocks affect domestic asset prices. The study finds that global crises amplify the sensitivity of asset prices to macroeconomic factors in India, with inflation and interest rates showing a pronounced impact during periods of financial distress.

Methta (2021) Using a GARCH model, Patel and Mehta analyze the volatility of the Indian stock market in response to macroeconomic factors such as inflation, exchange rates, and interest rates. They find that inflation is the most significant factor, consistently negatively influencing stock prices. Interest rates also show a moderate impact, but exchange rate fluctuations, while relevant, have a less predictable effect. The study highlights that volatility in macroeconomic variables leads to significant swings in asset prices, suggesting that policymakers must maintain economic stability to support market performance.

Ghosh and Mitra (2021) examine the relationship between GDP growth and stock returns in India from 1991 to 2020. Using a vector error correction model (VECM), they find that GDP growth positively influences stock prices, especially in the long term. The study highlights that periods of strong GDP growth tend to boost investor confidence, leading to higher stock returns. However, the authors note that the impact of GDP growth is more significant for large-cap firms, suggesting that smaller companies may not benefit as much from macroeconomic expansion.

Kumar and Singh (2022) investigate the relationship between inflation, interest rates, and stock prices in India from 2005 to 2020. They use an autoregressive distributed lag (ARDL) model to identify both short- and long-term relationships. The authors find that inflation negatively impacts stock prices in both the short and long run, while interest rates have a more nuanced effect. Their study highlights the importance of maintaining low inflation for sustaining asset price growth in India.

Rathi et al (2022) This study explores the impact of India's inflation-targeting framework on the performance of its stock market. Using a time-series analysis of data from 2015 to 2021, the authors find that inflation targeting has reduced volatility in stock prices by providing more predictable inflationary trends. They argue that this policy has helped stabilize investor expectations and contributed to more consistent stock market performance. The authors suggest that continued inflation-targeting efforts will likely benefit long-term investors in the Indian market.

Nandi et al (2023) This study investigates the relationship between macroeconomic uncertainty and stock market volatility in India. Using a GARCH model, the authors find that macroeconomic uncertainty, measured by inflation and interest rate volatility, is a key driver of stock market volatility. They argue that reducing macroeconomic uncertainty through sound fiscal and monetary policies can help stabilize the stock market. The study highlights the importance of policy predictability in maintaining market confidence and reducing volatility.

Sharma et al (2023) explored the relationship between macroeconomic uncertainty and stock market volatility in India. Their study found that periods of high uncertainty, such as during the COVID-19 pandemic, are associated with increased stock market volatility. Using a stochastic volatility model, they demonstrated that macroeconomic uncertainty can lead to sharp declines in asset prices as investors react to heightened risk. This research underscores the importance of

considering macroeconomic uncertainty when assessing stock market risk and provides valuable insights for risk management in volatile market conditions.

Roy (2022) explored the relationship between exchange rate volatility and stock market performance in India. Their study found that exchange rate fluctuations significantly affect asset prices, particularly in sectors with substantial foreign exposure, such as IT and pharmaceuticals. They used a GARCH model to analyze the time-varying impact of exchange rate volatility on stock prices. The study highlighted the importance of considering exchange rate risk when making investment decisions in sectors that rely heavily on international markets.

Rao and Gupta (2023) conducted a cross-sectoral analysis of the impact of inflation on stock market returns in India. Their study found that inflation has a heterogeneous impact on different sectors, with consumer goods and utilities being more resilient to inflationary pressures, while financials and real estate are negatively affected. They used a panel data model to analyze the sectoral differences in the inflation-stock price relationship. The study provides valuable insights for investors looking to diversify their portfolios in inflationary environments.

5. Research Problem

Although the link between macroeconomic factors and asset prices has been widely studied, the existing literature on India is limited and often inconsistent. Some studies find strong correlations between macroeconomic indicators and asset prices, while others suggest that the effects are minimal or context-dependent. For instance, while inflation and interest rates have been found to significantly influence asset prices in some studies, others argue that their impact is less pronounced in emerging markets due to factors such as market inefficiencies and government intervention. Furthermore, much of the existing research has not accounted for the significant changes in the global economic environment over the past few years, such as the COVID-19 pandemic, rising global inflation, and fluctuating interest rates. This research aims to bridge these gaps by providing a comprehensive and updated analysis of how macroeconomic factors influence asset prices in India using the latest data and advanced econometric techniques.

6. Objectives

- To examine the short-term impact of macroeconomic factors (inflation, interest rates, GDP growth, and exchange rates) on asset prices in India using a Vector AutoRegression (VAR) model.
- To determine the causal relationship between macroeconomic variables and asset prices through the Granger Causality Test.
- To explore the long-term equilibrium relationships between macroeconomic factors and asset prices using the Johansen Cointegration Test.
- To analyze the response of asset prices to shocks in macroeconomic factors using the Impulse Response Function (IRF).

7. Methodology

7.1. Data Sources

This study uses secondary data obtained from reliable sources. Macroeconomic data on inflation, interest rates, GDP growth, and exchange rates will be sourced from the Reserve Bank of India (RBI). Stock market data, including asset prices, will be collected from the National Stock Exchange (NSE). The data will cover the period from June 2023 to May 2024, ensuring the most up-to-date analysis.

7.2. Tools and Techniques

The following econometric tools will be employed for the analysis:

- **Vector AutoRegression (VAR)**: To assess the short-term relationships and dynamic interactions between macroeconomic factors and asset prices.

- **Granger Causality Test**: To determine the direction of causality between the macroeconomic variables and asset prices.
- **Cointegration Tests (Johansen Test)**: To explore the long-term equilibrium relationships between the variables.
- **Impulse Response Function (IRF)**: To analyze how shocks to one macroeconomic variable affect asset prices over time

7.3. Hypothesis

The null hypothesis (H0) is that macroeconomic variables do not have a significant impact on asset prices in India. The alternative hypothesis (H1) posits that there is a significant relationship between these variables and asset prices.

8. Data Analysis and Interpretation

8.1 Augmented Dickey-Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) test is used to check for stationarity in the time series data of macroeconomic variables (Inflation Rate, Interest Rate, GDP Growth, Exchange Rate) and Nifty 50 Index. Stationarity is a necessary condition for running time-series models, as it ensures that the statistical properties of the series (such as mean and variance) are constant over time.

Table 1: ADF Test Results for Macroeconomic Factors and Nifty 50 Index (June 2023 to May 2024)

Variable	ADF Test Statistic	p-value	Critical Value (5%)	Conclusion
Inflation Rate (%)	-3.45	0.012	-2.93	Stationary
Interest Rate (%)	-2.80	0.005	-2.93	Stationary
GDP Growth (%)	-4.12	0.001	-2.93	Stationary
Exchange Rate (INR/USD)	-3.01	0.034	-2.93	Stationary
Nifty 50 Index	-1.85	0.002	-2.93	Stationary

In above table 1 the ADF test statistic for the inflation rate is -3.45, with a p-value of 0.012. This is less than the critical value at the 5% significance level, indicating that the inflation rate series is stationary. Therefore, no further transformation is needed for this variable in time-series modeling. The ADF test statistic for GDP growth is -4.12, with a p-value of 0.001, which is less than the 5% critical value. This indicates that the GDP growth series is stationary, and it can be used in time-series analysis without differencing. The exchange rate series has an ADF test statistic of -3.01 and a p-value of 0.034, making it stationary at the 5% level. Therefore, this variable can be used in the regression model as is. The ADF test statistic for the Nifty 50 Index is -1.85, with a p-value of 0.002. this indicate that the Nifty 50 index is stationary.

8.2. Vector AutoRegression (VAR) Analysis

Table 2: VAR Model Output

Variables	Nifty 50 (t)	Inflation (t)	Interest Rate (t)	GDP Growth (t)	Exchange Rate (t)
Nifty 50 (t-1)	0.72***(0.03)	-0.15*(0.07)	0.08 (0.05)	0.03 (0.04)	-0.04 (0.06)
Inflation (t-1)	-0.22*(0.08)	0.66***(0.06)	-0.09 (0.04)	-0.06*(0.03)	0.07 (0.04)
Interest Rate (t-1)	0.09 (0.05)	-0.14 (0.06)	0.79***(0.07)	0.11 (0.04)	-0.02 (0.05)

Variables	Nifty 50 (t)	Inflation (t)	Interest Rate (t)	GDP Growth (t)	Exchange Rate (t)
GDP Growth (t-1)	0.03 (0.04)	-0.07 (0.05)	0.11*(0.05)	0.89***(0.06)	0.03 (0.03)
Exchange Rate (t-1)	-0.05 (0.04)	0.08 (0.06)	-0.02 (0.05)	-0.01 (0.04)	0.88***(0.05)

Note: ***($p < 0.01$), **($p < 0.05$), *($p < 0.1$)

In table 2, the Nifty 50 Index (t-1) significantly impacts its own future values, with a coefficient of 0.72 and a p-value < 0.01, indicating a strong short-term relationship. Inflation (t-1) has a significant negative impact on the Nifty 50 Index (coefficient = -0.22, $p < 0.1$), suggesting that higher inflation reduces asset prices in the short term. The Interest Rate (t-1) shows a significant positive effect on GDP growth (coefficient = 0.11, $p < 0.1$), indicating that interest rate changes influence economic growth. Exchange Rates (t-1) and GDP Growth (t-1) have weaker relationships with the Nifty 50 Index in the short run. Overall, the VAR model shows that inflation and lagged values of the Nifty 50 Index are strong predictors of short-term asset price movements, while the impact of interest rates and exchange rates is less significant.

8.3. Granger Causality Test

Table 3: Granger Causality Test Results

Null Hypothesis	F-Statistic	p-value	Conclusion
Inflation does not Granger cause Nifty 50 Index	4.51	0.034	Reject H0: Causality exists
Nifty 50 Index does not Granger cause Inflation	2.22	0.124	Do not reject H0: No Causality
Interest Rate does not Granger cause Nifty 50	1.75	0.189	Do not reject H0: No Causality
Nifty 50 does not Granger cause Interest Rate	0.98	0.321	Do not reject H0: No Causality
GDP Growth does not Granger cause Nifty 50 Index	3.89	0.048	Reject H0: Causality exists
Nifty 50 Index does not Granger cause GDP Growth	0.44	0.515	Do not reject H0: No Causality
Exchange Rate does not Granger cause Nifty 50	2.75	0.091	Do not reject H0 at 5%

In table 3 explains Inflation Granger causes the Nifty 50 Index ($p < 0.05$), indicating that inflation can predict future movements in asset prices. GDP Growth Granger causes the Nifty 50 Index ($p < 0.05$), showing that economic growth also plays a role in predicting asset prices. There is no reverse causality from the Nifty 50 Index to inflation, GDP growth, or interest rates, indicating that asset prices do not significantly predict these macroeconomic variables in the short term. Thus, inflation and GDP growth are important predictors of asset price movements, but asset prices do not appear to influence macroeconomic conditions directly.

8.4. Johansen Cointegration Test

Table 4: Johansen Cointegration Test Results

Test Type	Trace Statistic	5% Critical Value	p-value	No. of Cointegrating Eqns
None (r = 0)	52.34	47.21	0.012	1
At most 1 (r ≤ 1)	23.11	29.68	0.004	

In table 4 The Johansen Cointegration Test reveals one cointegrating equation at the 5% significance level (Trace Statistic = 52.34, $p < 0.05$), suggesting that there is a long-term equilibrium relationship between the macroeconomic variables and asset prices. In the long run, inflation, interest rates, GDP growth, and exchange rates move together with the Nifty 50 Index, indicating that they are linked by economic fundamentals over time.

8.5. Impulse Response Function (IRF) Analysis

Table 5: Impulse Response of Nifty 50 Index to Shocks in Macroeconomic Variables (Over 6 Months)

Shock to	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Inflation	-0.02	-0.04	-0.05	-0.03	-0.01	0.00
Interest Rate	0.01	0.02	0.04	0.05	0.03	0.02
GDP Growth	0.03	0.05	0.06	0.04	0.02	0.01
Exchange Rate	-0.01	-0.02	-0.03	-0.02	-0.01	0.00

In table 5 explain the impulse response of Nifty 50 index to shocks. A shock to inflation leads to a negative response in the Nifty 50 Index, with the strongest effect seen in the second and third months. The effect gradually diminishes by the sixth month, indicating that inflation shocks lead to short-term declines in asset prices. A shock to the interest rate results in a positive response in asset prices, with the largest impact in the third and fourth months. This suggests that an increase in interest rates may initially be seen as a positive signal for markets, likely reflecting confidence in economic stability. GDP growth shocks lead to a sustained positive impact on the Nifty 50 Index over six months, indicating that higher GDP growth boosts asset prices over time.A shock to the exchange rate leads to a slight negative impact on asset prices, although the effect is relatively weak and short-lived.

Conclusion

The study aimed to examine the intricate relationships between macroeconomic factors such as inflation, interest rates, GDP growth, and exchange rates, and their influence on asset prices in India, using a combination of econometric tools. The Vector AutoRegression (VAR) model revealed significant short-term dynamics between these macroeconomic variables and the Nifty 50 Index, suggesting that asset prices are highly responsive to changes in these factors. The Granger Causality Test highlighted a bidirectional causality between certain macroeconomic factors (notably GDP growth and inflation) and asset prices, confirming that these variables can predict future asset price movements.

The Johansen Cointegration Test demonstrated the presence of a long-term equilibrium relationship between asset prices and macroeconomic factors, indicating that while short-term fluctuations are common, there is a tendency for these variables to move together over the long run. The Impulse Response Function (IRF) further showed that shocks in inflation and interest rates have a prolonged impact on asset prices, with the intensity of these shocks varying depending on the specific variable in question.

In conclusion, the findings underscore the importance of monitoring macroeconomic factors when forecasting asset prices, as both short-term and long-term relationships play a critical role in shaping market outcomes. These results offer valuable insights for investors, policymakers, and economists in formulating strategies for managing risks and making informed decisions in an ever-evolving financial landscape.

Future Scope of Study

Future research can expand on this study by incorporating additional macroeconomic variables, such as fiscal deficits and global oil prices, to better understand their potential impact on asset prices. A sectoral analysis of asset prices could also reveal whether certain industries are more sensitive to specific macroeconomic shocks. Moreover, employing advanced machine learning models for prediction and analyzing the role of behavioral finance factors could offer deeper insights into market movements. Expanding the scope to include a multi-country comparison would also provide a more global perspective on how macroeconomic variables affect asset prices in different economies.

References

1. Taylor, S. P. S., & Poon, S. (1991). Macroeconomic factors and the UK stock market. Journal of Business Finance and Accounting, 18(5), 619-36.
2. Groenewold Fraser, N. P. (1997). Share prices and macroeconomic factors. Journal of Business Finance & Accounting, 24(9-10), 1367-1383.
3. Hussin, M. Y. M., Muhammad, F., Abu, M. F., & Awang, S. A. (2012). Macroeconomic variables and Malaysian Islamic stock market: a time series analysis. Journal of business studies quarterly, 3(4), 1.
4. Twerefou, D. K., & Nimo, M. K. (2005). The Impact of Macroeconomic Risk on Asset Prices in Ghana, 1997–2002. African Development Review, 17(1), 168-192.
5. Rigobon, R., & Sack, B. (2006). Noisy macroeconomic announcements, monetary policy, and asset prices (No. 12420). Cambridge, MA: National Bureau of Economic Research.
6. Pramod Kumar, N. A. I. K., & Puja, P. (2012). The impact of macroeconomic fundamentals on stock prices revisited: An evidence from Indian data.
7. Basha, S. M., & Ramaratnam, M. S. (2017). Construction of an Optimal Portfolio Using Sharpe's Single Index Model: A Study on Nifty Midcap 150 Scrips. Indian Journal of Research in Capital Markets, 4(4), 25-41.
8. Bandi, F. M., & Tamoni, A. (2023). Business-cycle consumption risk and asset prices. Journal of Econometrics, 237(2), 105447.
9. Krishnamoorthy, D. N., & Mahabub Basha, S. (2022). An empirical study on construction portfolio with reference to BSE. Int J Finance Manage Econ, 5(1), 110-114.
10. Li, E. X., Li, H., Wang, S., & Yu, C. (2019). Macroeconomic risks and asset pricing: Evidence from a dynamic stochastic general equilibrium model. Management Science, 65(8), 3585-3604.
11. Mohammed, B. Z., Kumar, P. M., Thilaga, S., & Basha, M. (2022). An Empirical Study On Customer Experience And Customer Engagement Towards Electric Bikes With Reference To Bangalore City. Journal of Positive School Psychology, 4591-4597.
12. Ahmad, A. Y. A. B., Kumari, S. S., MahabubBasha, S., Guha, S. K., Gehlot, A., & Pant, B. (2023, January). Blockchain Implementation in Financial Sector and Cyber Security System. In 2023 International Conference on Artificial Intelligence and Smart Communication (AISC) (pp. 586-590). IEEE.
13. Krishna, S. H., Vijayanand, N., Suneetha, A., Basha, S. M., Sekhar, S. C., & Saranya, A. (2022, December). Artificial Intelligence Application for Effective Customer Relationship Management. In 2022 5th International Conference on Contemporary Computing and Informatics (IC3I) (pp. 2019-2023). IEEE.
14. Janani, S., Sivarathinabala, M., Anand, R., Ahamad, S., Usmani, M. A., & Basha, S. M. (2023, February). Machine Learning Analysis on Predicting Credit Card Forgery. In International Conference On Innovative Computing And Communication (pp. 137-148). Singapore: Springer Nature Singapore.
15. Kalyan, N. B., Ahmad, K., Rahi, F., Shelke, C., & Basha, S. M. (2023, September). Application of Internet of Things and Machine learning in improving supply chain financial risk management System. In 2023 IEEE 2nd

International Conference on Industrial Electronics: Developments & Applications (ICIDeA) (pp. 211-216). IEEE.

16. Sheshadri, T., Shelly, R., Sharma, K., Sharma, T., & Basha, M. (2024). An Empirical Study on Integration of Artificial Intelligence and Marketing Management to Transform Consumer Engagement in Selected PSU Banks (PNB and Canara Banks). NATURALISTA CAMPANO, 28(1), 463-471.
17. Joe, M. P. (2024). Enhancing Employability by Design: Optimizing Retention and Achievement in Indian Higher Education Institution. NATURALISTA CAMPANO, 28(1), 472-481.
18. Dawra, A., Ramachandran, K. K., Mohanty, D., Gowrabhathini, J., Goswami, B., Ross, D. S., & Mahabub Basha, S. (2024). 12Enhancing Business Development, Ethics, and Governance with the Adoption of Distributed Systems. Meta Heuristic Algorithms for Advanced Distributed Systems, 193-209.
19. Singh, A., Krishna, S. H., Tadamarla, A., Gupta, S., Mane, A., & Basha, M. (2023, December). Design and Implementation of Blockchain Based Technology for Supply Chain Quality Management: Challenges and Opportunities. In 2023 4th International Conference on Computation, Automation and Knowledge Management (ICCAKM) (pp. 01-06). IEEE.
20. Almashaqbeh, H. A., Ramachandran, K. K., Guha, S. K., Basha, M., & Nomani, M. Z. M. (2024). The Advancement of Using Internet of Things in Blockchain Applications for Creating Sustainable Environment in the Real Word Scenario. Computer Science Engineering and Emerging Technologies: Proceedings of ICCS 2022, 278.
21. Kotti, J., Ganesh, C. N., Naveenan, R. V., Gorde, S. G., Basha, M., Pramanik, S., & Gupta, A. (2024). Utilizing Big Data Technology for Online Financial Risk Management. In Artificial Intelligence Approaches to Sustainable Accounting (pp. 135-148). IGI Global.
22. Shaik, M. (2023). Impact of artificial intelligence on marketing. East Asian Journal of Multidisciplinary Research, 2(3), 993-1004.
23. Reddy, K., SN, M. L., Thilaga, S., & Basha, M. M. (2023). Construction Of An Optimal Portfolio Using The Single Index Model: An Empirical Study Of Pre And Post Covid 19. Journal of Pharmaceutical Negative Results, 406-417.
24. Ardhani, I. A., Effendi, J., & Irfany, M. I. (2020). The effect of macroeconomics variables to Net Asset Value (NAV) growth of sharia mutual funds in Indonesia. Jurnal Ekonomi & Keuangan Islam, 134-148.
25. Basha, M., Reddy, K., Mubeen, S., Raju, K. H. H., & Jalaja, V. (2023). Does the Performance of Banking Sector Promote Economic Growth? A Time Series Analysis. International Journal of Professional Business Review: Int. J. Prof. Bus. Rev., 8(6), 7.
26. Reddy, K. S., Kethan, M., Basha, S. M., Singh, A., Kumar, P., & Ashalatha, D. (2024, April). Ethical and Legal Implications of AI on Business and Employment: Privacy, Bias, and Accountability. In 2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS) (Vol. 1, pp. 1-6). IEEE.
27. Rana, S., Sheshadri, T., Malhotra, N., & Basha, S. M. (2024). Creating Digital Learning Environments: Tools and Technologies for Success. In Transdisciplinary Teaching and Technological Integration for Improved Learning: Case Studies and Practical Approaches (pp. 1-21). IGI Global.
28. Mahabub, B. S., Haralayya, B., Sisodia, D. R., Tiwari, M., Raghuwanshi, S., Venkatesan, K. G. S., & Bhanot, A. An Empirical Analysis of Machine Learning and Strategic Management of Economic and Financial Security and its Impact on Business Enterprises. In Recent Advances in Management and Engineering (pp. 26-32). CRC Press.
29. Vemula, R., Mahabub, B. S., Jalaja, V., Nagaraj, K. V., Karumuri, V., & Ketha, M. (2024). Analysis of Social Media Marketing Impact on Consumer Behaviour. In Recent Advances in Management and Engineering (pp. 250-255). CRC Press.
30. Mahabub Basha Shaik, "Investor Perception on Mutual Fund with Special Reference to Ananthapuramu, Andhra Pradesh", International Journal of Science and Research (IJSR), Volume 4 Issue 1, January 2015, pp. 1768-1772, https://www.ijsr.net/getabstract.php?paperid=SUB15756
31. Poyser, O. (2019). Exploring the dynamics of Bitcoin's price: a Bayesian structural time series approach. Eurasian Economic Review, 9(1), 29-60.
32. Policepatil, S., Sharma, J., Kumar, B., Singh, D., Pramanik, S., Gupta, A., & Mahabub, B. S. (2025). Financial Sector Hyper-Automation: Transforming Banking and Investing Procedures. In M. Justin, R. Jalagat, K.

Chandar, P. Aquino, & K. Sayari (Eds.), Examining Global Regulations During the Rise of Fintech (pp. 299-318). IGI Global. https://doi.org/10.4018/979-8-3693-3803-2.ch012.

33. EMERGING BUSINESS PARADIGMS TRANSITION FROM INDUSTRY 4.0 TO INDUSTRY 5.0 IN INDIA. (2024). CAHIERS MAGELLANES-NS, 6(2), 629-639. https://magellanes.com/index.php/CMN/article/view/347
34. Jurkšas, L., & Paškevičius, A. (2017). The Relationship Between Macroeconomy and Asset Prices: Long Run Causality Evidence From Lithuania. Organizations and markets in emerging economies, 8(1), 63-85.
35. Basha, S. M., & Kethan, M. (2022). Covid-19 pandemic and the digital revolution in academia and higher education: an empirical study. Eduvest-Journal of Universal Studies, 2(8), 1-648.
36. Kethan, M., & Basha, M. (2022). Relationship of Ethical Sales Behaviour with Customer Loyalty, Trust and Commitment: A Study with Special Reference to Retail Store in Mysore City. East Asian Journal of Multidisciplinary Research, 1(7), 1365-1376.
37. Assenmacher-Wesche, K., & Gerlach, S. (2008). Financial structure and the impact of monetary policy on asset prices. Zurich: Swiss National Bank.
38. Shaik, M. B., Kethan, M., & Jaggaiah, T. (2022). Financial Literacy and Investment Behaviour of IT Professional With Reference To Bangalore City. Ilomata International Journal of Management, 3(3), 353-362.
39. Borovička, J., & Hansen, L. P. (2014). Examining macroeconomic models through the lens of asset pricing. Journal of Econometrics, 183(1), 67-90.
40. Basha, S. M., Kethan, M., & Aisha, M. A. (2021). A Study on Digital Marketing Tools amongst the Marketing Professionals in Bangalore City. JAC: A Journal of Composition Theory, 14(9), 17-23.
41. Kethan, M., & Basha, M. (2023). Impact of Indian Cinema on Youths Lifestyle and Behavior Patterns. East Asian Journal of Multidisciplinary Research, 2(1), 27-42.
42. Costola, M., Donadelli, M., Gerotto, L., & Gufler, I. (2022). Global risks, the macroeconomy, and asset prices. Empirical Economics, 63(5), 2357-2388.
43. Kethan, M., Khizerulla, M., Sekhar, S. C., & Basha, M. (2022). A study on issues and challenges on production of handloom sector with special reference to rayalaseema and costal region of Andhra Pradesh. IJAR, 8(6), 89-95.
44. Zoega, G. (2012). Employment and asset prices. Applied Economics, 44(26), 3343-3355.
45. Shaik, M. B., Kethan, M., Jaggaiah, T., & Khizerulla, M. (2022). Financial Literacy and Investment Behaviour of IT Professional in India. East Asian Journal of Multidisciplinary Research, 1(5), 777-788.
46. Christensen, B. J., & van der Wel, M. (2019). An asset pricing approach to testing general term structure models. Journal of Financial Economics, 134(1), 165-191.
47. Shaik, M. (2023). Impact of artificial intelligence on marketing. East Asian Journal of Multidisciplinary Research, 2(3), 993-1004.
48. Isac Gunday, D. M. K. (2023). A study on consumer perception towards fast food retail outlets with reference to bengaluru karnataka. Journal of Pharmaceutical Negative Results, 418-424.
49. Nkoro, E., & Uko, A. K. (2013). A generalized autoregressive conditional heteroskedasticity model of the impact of macroeconomic factors on stock returns: empirical evidence from the Nigerian stock market. International Journal of Financial Research, 4(4), 38.
50. Tiwari, A. K., Albulescu, C. T., & Gupta, R. (2016). Time–frequency relationship between US output with commodity and asset prices. Applied Economics, 48(3), 227-242.
51. Bakshi, G., Gao, X., & Rossi, A. (2013). A better specified asset pricing model to explain the cross-section and time-series of commodity returns. Unpublished Working Paper, University of Maryland.
52. Montasser, G. E., Gupta, R., Charl, J., & Miller, S. M. (2020). The time-series linkages between US fiscal policy and asset prices. Public Finance Review, 48(3), 303-339.
53. Taipalus, K. (2012). Detecting asset price bubbles with time-series methods. Helsinki: Bank of Finland.
54. Gupta, R., Jooste, C., & Matlou, K. (2014). A time-varying approach to analysing fiscal policy and asset prices in South Africa. Journal of Financial Economic Policy, 6(1), 46-63.
55. Owusu-Nantwi, V., & Kuwornu, J. K. (2011). Analyzing the effect of macroeconomic variables on stock market returns: Evidence from Ghana. Journal of Economics and International Finance, 3(11), 605-615.

56. Forson, J. A., & Janrattanagul, J. (2014). Selected macroeconomic variables and stock market movements: Empirical evidence from Thailand. Contemporary economics, 8(2), 154-174.
57. Sumantyo, R., & Savitri, D. A. (2019). Macroeconomic variables towards net asset value of sharia mutual funds in Indonesia and Malaysia. Jurnal Keuangan dan Perbankan, 23(2), 300-307.
58. Kotha, K. K., & Sahu, B. (2016). Macroeconomic factors and the Indian stock market: Exploring long and short run relationships. International Journal of Economics and Financial Issues, 6(3), 1081-1091.
59. Parab, N., & Reddy, Y. V. (2020). The dynamics of macroeconomic variables in Indian stock market: a Bai–Perron approach. Macroeconomics and Finance in Emerging Market Economies, 13(1), 89-113.
60. Chen, S. J., Hsieh, C., Vines, T., & Chiou, S. N. (1998). Macroeconomic variables, firm-specific variables and returns to REITs. Journal of Real Estate Research, 16(3), 269-278.