IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

A macro-economic perspective to the Indian Stock Market[12]

[1]Juhi Bakshi, Lecturer at School of Business and Law, Navrachana University, Vadodara
[1] Dr. Rabichandra S. Elangbam, Assistant Professor at School of Business and Law, Navrachana University, Vadodara

Abtract: On the one hand, the stock market motivates individuals to invest in financial products and preserve money, while on the other, it makes it simple for businesses to obtain long-term funding for capital projects. However, the volatility of the stock market and its connections to economic growth have received less attention in recent economic times, which has a substantial impact on those who invest in it on a large scale. Retail investors have suffered significant wealth losses during times of acute market crashes, and this issue needs to be addressed. This study investigates whether there are long-run and short-run dynamic interactions between stock prices and GDP growth rate, which are robust to structural fractures in the cointegration vector as well as the deterministic vector, using the cointegration test and Granger causality approaches. The study also looks into the direction of causality in the event that a long/short-run correlation is found. If there is a significant correlation between stock prices and these variables and a causal linkage linking macroeconomic variables to stock prices, macroeconomic variable fluctuations can be controlled to prevent stock market crises (specifically, controlling exchange rates and interest rate movements). The government can focus on domestic economic policy to maintain the stock market throughout any financial crisis. The global bank's data for India and the Sensex were used to calculate the study's indices.

Keywords: Stock Market, GDP, Cointegration, Granger Causality, Unit Root test

Introduction

The question of whether financial development contributes to economic growth or arises because of higher economic activity is one of the most persistent ones in economics. Although there has not been much investigation into this issue, the causality paradigm has been used. The study's indexes were determined using data from the world bank for both India and Sensex.

The market where shares of publicly traded corporations are traded is known as the equity market. Similar to many other financial intermediaries, the equities market makes it easier to shift money from surplus spenders (savers) to deficit spenders (investors). As a result, the equity market distributes idle economic resources to their most advantageous uses, resulting in an efficient allocation of capital. In the past, debt was the preferred source of funding for industrial firms; but, today, equity and quasi-equity are desirable financial vehicles. The operations of financial elements must be improved by a stable and well-regulated equities market. If the equities market is effective, companies can raise money by issuing securities with ease. By enhancing financial asset liquidity, facilitating investor global risk diversification, encouraging informed investment decisions, pressuring corporate managers to work harder to increase shareholder wealth, luring foreign portfolio investment, and directing more savings to corporations in a more efficient manner, stock exchanges are predicted to hasten economic growth.

The stock market is a significant component of every nation's financial system since it is essential for transferring savings from the deficit to the surplus sectors. Policymakers, economists, and scholars have always had severe concerns

[1]Juhi Bakshi, Lecturer at School of Business and Law, Navrachana University, Vadodara

[2] Dr. Rabichandra S. Elangbam, Assistant Professor at School of Business and Law, Navrachana University, Vadodara

about these stock markets. They are frequently referred to as the "barometer of every economy" since they show how pressure on the economy is changing and moving. Stock market movement and volatility frequently reflect the state of any economy. According to the literature that is now available, scholars have been attempting to establish a relationship between changes in macroeconomic conditions and stock market returns ever since the stock market was invented. The study has discovered that asset-pricing models do not identify the basic macroeconomic elements that influence the values of securities. A specific piece of software was utilised for the empirical study, which is dependent on both the availability of data and well-established statistical standards that are frequently applied when choosing variables. Therefore, Chen et al. (1986), Mukharjee and Naka (1995), and McMillan (2001) all rely on intuitive financial theory as the foundation for their variable selection.

The long-term return on a specific asset must take into account changes in these elements, according to modern finance theory, which views macroeconomic issues as potential sources of risk. The policy makers and investors would be assisted in designing relevant investment plans by an investigation into such aspects using various approaches recommended in finance literature.

The paper proceeds as follows Section II presents the review of literature, section III discusses the data, variables and the research methodology, section IV discusses data analysis and results and section V offers conclusions.

Review of literature

Why stock market?

In low income nations that are unable to generate enough domestic savings, a more established equities market may offer liquidity that decreases the cost of the foreign capital that is necessary for development (WIDER (1990), Bencivenga et al. (1996), and Neusser and Kugler (1998)). 2) The function of equity markets in giving managers the right incentives to make investment decisions that have an impact on firm value over a longer time period than the managers' employment horizons through equity-based remuneration systems (Dow and Gorton (1997). 3) The capacity of equity markets to produce data on creative business activity (King and Levine, 1993b) or the general technological state (Greenwood and Jovanovic, 1990). 4) The ability of equity markets to diversify portfolios, allowing for the specialisation of output by particular enterprises and the ensuing efficiency benefits (Acemoglu and Zilibotti, 1997). 5) According to Perotti and van Oijen (1999), diverse stock ownership generates a constituency for political stability, which in turn fosters prosperity.

There have been relatively few empirical studies on the relationship between financial development in general and stock markets in particular and growth. According to Goldsmith (1969), there is a strong correlation between economic growth and financial development, which is calculated as financial intermediary assets divided by GDP. However, he acknowledged that there was "no means of determining with confidence the direction of the causative mechanisms" in his paradigm (p. 48). Several later studies have utilised the growth regression paradigm, in which the average growth rate in per capita production across nations is regressed on a set of variables controlling for baseline conditions and country characteristics as well as indicators of financial market development (see, for example, King and Levine (1993a), Atje and Jovanovic (1993), Levine and Zervos (1996), Harris (1997), and Levine and Zervos (1998)).

The main issue that is raised involves In this study, we examine a number of studies that investigated the relationship between the performance of the stock market and economic growth.

Numerous theoretical and empirical studies have focused on how the stock market has evolved. Levine R., Zervos S., and A. Demirguc-Kunt (1996) (1998). In recent years, the focus has increasingly centred on stock market indices and how the stock market affects economic expansion. By increasing the range of financial instruments depositors can use to diversify their portfolios and by offering a sizable supply of investment capital at a relatively low cost, the stock market helps to mobilise domestic savings. With a robust and liquid stock market that enables investors to diversify away unsystematic risk, the marginal productivity of capital will increase. Pagano, M. (1993). Risk diversification is a crucial mechanism by which the growth of the stock market may influence economic expansion. Global risk sharing via globally networked stock markets, according to Obstfeld M. (1994), improves resource allocation and speeds up the economic growth process. The development of the stock market has an impact on how financial institutions function and, consequently, on economic growth. As a result, it may be concluded that stock markets are significant and should not be ignored, particularly in many emerging markets. M. Kahn and A. Sendhji (2000). According to Levine R. and Zervos S. (1998), a well-established stock market can mobilise money, distribute risk among market players, and provide a wider range of financial services than the banking sector to support economic growth. To maximise capital allocation efficiency, if the government is able to liberalise the financial system, the stock market must develop. In terms of physical accumulation, both stock markets and banks provide sources of external financing for enterprises. They both produce information to help in resource allocation, which they both use to make decisions. Only the method

of information transmission varies between them. Equity prices on stock markets contain information, whereas loan managers gather it in banks. Therefore, stock markets can fund risky, successful, and innovative investment initiatives, but banks only finance well-established, safe borrowers.

GC (2006) used the Granger causality test to assess the existence of a causal relationship between the stock market and economic growth using time series data from 1988 to 2005. Even in Nepal's small capital market, the study discovers empirical evidence of the long-term causation and integration of macroeconomic variables and stock market indicators. Only real values have been used to observe the causation; nominal variables have not. According to econometric theory, the stock market has a big impact on economic growth and vice versa. It is interesting to note that the causation becomes clear after a 3–4 year lag. The article also emphasizes the significance of stock market growth for promoting economic growth.

Pilinkus (2010) argues that it is important to go beyond the stock markets of industrialized nations and consider the less developed economies as well. He collected samples from nations in the Baltic region and discovered that, over time, there is a considerably stronger correlation between macroeconomic indicators and stock market indexes.

Using the Ljung-Box Q test, Breusch-Godfrey LM test, Unit Root test, and Granger Causality test, Tripathy, N. (2011) evaluated the market efficiency and causal relationship between a few macroeconomic variables and the Indian stock market between January 2005 and February 2011. The study supports the existence of autocorrelation in both macroeconomic data and the Indian stock market, indicating that the market adopted the Efficient Market Hypothesis structure.

In this study we are attempting to find the causality of the fluctuations of stock market with the macroeconomic variables.

Data and Methodology

National Income - GNI less consumption of fixed capital and depletion of natural resources equals adjusted net national income.

Adjusted net national income is different from adjusted net savings in that it does not take into account investments in human capital or pollution-related damages. As a result, adjusted net national income stays within the UN System of National Accounts' framework (SNA). When non-produced natural assets (such land, mineral resources, and forests) are effectively controlled by institutional units, they are included inside the asset boundary of the SNA. Thus, the SNA boundaries are not violated in the computation of adjusted net national income, which takes into account net depletion of energy, minerals, and forests as well as consumption of fixed capital. The importance of this concept lies in the comparisons that may be made between GDP, GNI, and adjusted net national income; these comparisons highlight the effects of natural resource depletion, which are typically hidden by the widely used economic statistics.

Market capitalization of listed domestic companies (current US$)-

For domestically listed companies, market capitalization (also known as market value) is calculated by multiplying the share price by the total number of outstanding shares, including all of their different classes. Excluded are investment funds, unit trusts, and businesses whose sole purpose is to hold shares of other publicly traded firms. Data represent end-of-year values that have been translated to US dollars using appropriate year-end foreign exchange rates.

There are several ways to measure the size of the stock market, and each method may result in a different ranking of the nations. An economy's overall development and the growth of its financial markets are strongly intertwined. Good and easily accessible information is provided by efficient financial systems, which can reduce transaction costs, improve resource allocation, and spur economic growth. The main driver of poverty reduction is growth, which is boosted by both stock markets and banking systems. Commercial banks often control the financial system at low economic development levels, while domestic stock markets typically become more active and effective in comparison to domestic banks at higher levels. Financial markets are bigger in open nations that have robust legal frameworks, sound macroeconomic policies, and shareholder protection. According to recent studies on the evolution of the stock market, increased financial integration and modern communications technology have led to an increase in cross-border capital flows, a stronger global presence for financial institutions, and the relocation of stock exchange activities to international exchanges. Nowadays, a lot of businesses in emerging nations cross-list on foreign exchanges, giving them access to cheaper funding and more actively traded shares. The pressure to reconsider their business models will be increased by the possibility that exchanges in emerging markets won't have enough financial activity to support them.

Interest rate (Interest rate) indicates the real interest rate and the changes in it affects the GDP

The lending interest rate that has been adjusted for inflation using the GDP deflator is known as the real interest rate. However, the terms and circumstances that come with lending rates vary each nation, limiting their comparability.

The net foreign assets and net domestic credit of the banking system are among its assets. Liabilities to the public and private sectors in the form of deposits with the banking system are netted out. Net domestic credit includes credit extended to the private sector, general government, and the nonfinancial public sector in the form of investments in short- and long-term government securities and loans to state enterprises. Credit given to banking and nonbank financial institutions is also a part of net domestic credit. The primary mechanism for controlling variations in the money supply is domestic credit, with central bank lending to the government frequently playing the most significant role. The central bank can control lending to the private sector in a number of ways, such as by adjusting the cost of the refinancing facilities it offers to banks, by changing market interest rates through open market operations, or by limiting the amount of credit that banks can extend to the private sector and changing the reserve requirements that are imposed on banks. Different economic theories employ the real interest rate to explain events like capital flight, the business cycle, and economic bubbles. When demand for credit is high and the real rate of interest is high, money will, on average, shift from consumption to savings. On the other hand, demand will shift from savings to investment and consumption when the real rate of interest is low.

Inflation (INF) is a measure of overall price increases, and the information is derived from the WPI formula used in the Indian economic survey.Agricultural and industrial products at various stages of production and distribution are included in the wholesale price index, along with import taxes.

By gathering secondary data from sources including the World Bank, the Indian Economic Survey, and the Sensex indexes for a time span spanning from 1988 to 2020, it is possible to study the causality between stock market volatility and economic growth in India.

The question of whether the forward-looking aspect of stock prices may be fuelling the apparent causation between stock markets and growth is more challenging. The present discounted worth of future profits should be reflected in current stock market prices. Future growth rates will, therefore, be reflected in beginning pricing in an efficient equities market. Because higher prices in anticipation of faster growth would affect both the numerator and the denominator of the ratio, it is argued that turnover (sales over market capitalization) should be used as the major indicator of development. This would eliminate the erroneous causality effect.

To determine if the variables are integrated for a univariate time-series analysis with stochastic trends, Phillips-Perron (PP) unit root tests are computed for each individual series. The next step is to perform a multivariate co-integration analysis. For each independent series, augmented Dickey-Fuller unit root tests are computed to see if the variables are stationary and integrated of the same order. The estimation of one of the following equations is necessary for the Augmented Dickey-Fuller (ADF) test, according to Seddighi, Lawler, and Katos' (2000) work:

$$\Delta X_t = \beta X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t$$

$$\Delta X_t = \alpha_0 + \beta X_{t-1} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t$$

$$\Delta X_t = \alpha_0 + \alpha_1 t + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varepsilon_t$$

The maximum lag length, which starts at two lags and reduces to the right lag, is established using the AIC and SC information criterion. The variable Xt is a non-stationary series according to the null hypothesis (H0: =0), which is rejected when is significantly negative (Ha: =0) and when is 0. (Ha: 0). If the estimated ADF statistic is greater than McKinnon's crucial values and the null hypothesis (H0) is not rejected, the series is non-stationary or not integrated of order zero (0). As an alternative, stationarity is implied by rejecting the null hypothesis. Dickey D, Fuller W. Continue differencing until stationarity is attained and the null hypothesis is rejected. The difference of the series is tested if the null hypothesis is not rejected (1979). The appropriate structure of the ADF equations, including the inclusion of an intercept (0) and a trend (t), as well as the number of additional augmented lagged terms to include in the ADF equations, were determined using the minimum values of the Akaike H. (1973) and Schwarz R. (1978) criterion (SC) based on the

standard Lagrange multiplier LM(1) test. The Eviews econometric software tool, which generates simulated critical values based on response surfaces, is used to conduct the ADF, PP, and KPSS tests.

The Dickey-Fuller (DF) test is an extension of the Phillips P, Perron P (1988) test, which is more resilient in the presence of weak autocorrelation and heteroskedastic regression residuals and applies the semi-parametric correction for autocorrelation.

The Phillips-Perron test seems to be more effective than the ADF test for the aggregate data, according to Choi I (1992).

The main conclusion is qualitatively the same as that reported by the Dickey-Fuller (DF) test, despite the Phillips-Perron (PP) test providing different lag profiles for the examined variables (time-series) and occasionally at lower levels of significance.

Since a time-series contains a unit root is the null hypothesis in the Augmented Dickey-Fuller test, this hypothesis is accepted until there is compelling evidence to the contrary. This strategy might, however, perform less well against immobile near unit root processes. In a test presented in 1992 by Kwiatkowski D, Phillips P, Schmidt P, and Shin Y, the series' stationary behaviour is the null hypothesis.

In that concerns about the power of either test can be addressed by comparing the significance of statistics from both tests, the KPSS test is a useful supplement to the Augmented Dickey-Fuller test. Significant Augmented Dickey-Fuller statistics and insignificant KPSS1 statistics are seen in a stationary series. The KPSS statistic examines a parameter for relative lag-truncation. Test for Johansen co-integration: The co-integration test is carried out since it has been established that the variables under investigation are integrated of order 1. Using the Johansen maximum likelihood approach, the null of non-co-integration is being tested against the alternative, which is the existence of co-integration. Johansen S, Juselious K (1990), Johansen S, Juselious K (1992). If a data series' unit root has been identified, the next step is to determine whether any long-term equilibrium relationships between the variables exist. A collection of variables is said to be co-integrated of order (d, b) - abbreviated CI(d, b) - if Yt is integrated of order d and there is a vector,, such that ′Yt is integrated of order b, according to Engle and Granger (1987). (d-b). In this study, cointegration tests are performed with the technique created by Johansen S, Juselious K (1990), and Johansen S. (1988). Researchers can simultaneously estimate models involving two or more variables thanks to the multivariate co-integration techniques developed by Johansen S., Juselious K. (1990), Johansen S., Juselious K. (1992), Engle R., and Granger C. (1987), which avoid the issues with the conventional regression techniques used in earlier studies on this topic. The maximum likelihood process is thus used by the Johansen method to ascertain whether cointegrated vectors are present in non-stationary time-series. Following the research of Chang T, Caudill S (2005), Johansen S, Juselious K (1990), and Johansen S (1988), two test statistics—the trace (trace) and the maximal eigenvalue (max) statistics—are proposed for determining the quantity of co-integrated vectors (or the rank of). According to Johansen S. (1988), the likelihood ratio statistic (LR) for the trace test (trace) is

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1 - \bar{\lambda}_i)$$

Where λi = ˆ is the largest estimated value of ith characteristic root (eigenvalue) obtained from the estimated Π matrix, r = 0, 1, 2,…….p-1, and T is the number of usable observations.

The trace statistic compares the generic alternative to the null hypothesis that there are fewer than or equal to r distinct characteristic roots (where r is 0, 1, or 2). When the characteristic roots' values are closer to zero in this statistic, "trace" will be small (and its value will be large in relation to the values of the characteristic roots, which are further from zero). Alternatively, Johansen's suggested maximal eigenvalue (max) statistic is

$$\lambda_{max}(r, r+1) = -T \ln(1 - \bar{\lambda}_{r+1})$$

The max statistic compares the alternative of (r+1) co-integrated vectors to the null hypothesis that there are r co-integrated vectors. Thus, the alternative to the null hypothesis, r=0, is tested against the alternative, r=1, and so on. The predicted value of the characteristic root will have a modest maximum if it is close to zero. It is commonly known that the choice of lag length has a significant impact on Johansen's co-integration tests. The time-series data is first fitted using a VAR model to determine the best lag structure. The co-integration test's required number of lags is chosen using the likelihood ratio (LR) test and the Schwarz Criterion (SC). The value p=1 is the suggested specification for the order of the VAR model for Germany according to the Schwarz Criterion (SC) and the likelihood ratio (LR) test. The results of the co-integration test conducted by Johansen S., Juselious K. (1990), Johansen S., and (1988) are shown in Table 2.

Vector error correction model: The next stage is to specify and estimate a Vector Error Correction Model (VECM) including the error correction term to explore the dynamic behaviour of the model since it is discovered that the variables contained in the VAR model are co-integrated. The VEC model describes how the investigated model is adjusting in each period towards its long-run equilibrium state after the equilibrium criteria are enforced. As a result of the co-integration of the variables, short-term departures from this long-term equilibrium will feed back on changes in the dependent variables, causing those variables to move closer to the long-term equilibrium state. Because of this, each of the co-integrated vectors used to compute the error correction terms points in a different direction where a reliable long-run equilibrium state exists. In order to accommodate short-run dynamics, the VEC specification compels the endogenous variables' long-run behaviour to converge to their co-integrated relationships. While the error correction term is kept, the model's dynamic specification allows the deletion of the irrelevant variables. The magnitude of the error correction term represents the rate at which any disequilibrium is brought into a long-run equilibrium state. Granger C., Engle R. (1987). Table 3 reports the error-correction model with the calculated t-values of the regression coefficients in parentheses. Following Hendry Maddala G's approach, the Error-Correction Model (ECMultimate)'s form was chosen (1992). The following is the vector error correction model's (VECM) general form:

$$\Delta X_t = \beta_0 + \sum_i^n \beta_1 \Delta X_{t-i} + \sum_i^n \beta_2 \Delta Y_{t-i} + \sum_i^n \beta_3 \Delta Z_{t-i} + \lambda EC_{t-i} + \varepsilon_t$$

Testing for Granger causality: The long-term relationship between stock market development and economic growth is tested using Granger causality. The Granger process is chosen because it offers a more effective and straightforward method of determining if a link is causal Granger C (1986). The derived bivariate model is shown below.

$$Y_t = \alpha_{10} + \sum_{j=1}^{k} a_{1j} Y_{t-j} + \sum_{j=1}^{k} b_{1j} X_{t-j} + \mu_t$$

$$X_t = \alpha_{20} + \sum_{j=1}^{k} a_{2j} Y_{t-j} + \sum_{j=1}^{k} b_{2j} X_{t-j} + \mu_t$$

$$F = \frac{(RSS_R - RSS_U)/q}{RSS_U/(T-2q-1)}$$

where RSSU= is the sum of squared residuals from the complete (unrestricted) equation RSSR= the sum of squared residuals from the equation under the assumption that a set of variables is redundant, when the restrictions are imposed, (restricted equation) T = the sample size and q = is the lag length. The following hypothesis will be tested: H0: If Fc is less than or equal to the critical value of F, X does not cause Y, i.e., 11, 12, and 1k=0. Ha: If Fc is greater than or equal to the critical value of F, X does cause Y, i.e., 11, 12, and 1k=0 (2.6a) and Ha: Y does Granger cause X, i.e., 21, 22,.... 2k0, if Fc > critical value of F. (2.6b) [35]. Y does not Granger cause X if Fc crucial value of F. Table 4 displays the findings regarding the existence of Granger causal links between economic growth, stock market development, and bank lending.

Johanssen test

Granger introduced the idea of cointegration in 1981; it was further developed by Engle and Granger in 1987, Engle and Yoo in 1987, Stock and Watson in 1988, Phillips and Ouliaris in 1990, Park in 1990, Phillips in 1991, Boswijk in 1993, Perron and Campbell in 1993, Johansen in 1988, 1991, 1994, and Harris in 1995, among others. The fundamental tenet of cointegration is the possibility of linear combinations T zt without a unit root if all the elements of a vector time series process zt have a unit root. The long-term relationships between the elements of zt can then be deduced from these linear combinations.

Johansen and Juselius (1990) and Johansen (1988, 1991, 1994) provide an inventive and useful full maximum likelihood estimation and testing approach based on a Gaussian Error Correction Model in a recent series of notable works (ECM). The asymptotic inference used in this ECM is connected to Sims, Stock, and Watson's work, and it is based on the Engle-Granger (1987) error correction representation theorem for cointegrated systems (1990). Johansen demonstrates how the ML estimators of the cointegrating vectors can be derived from the eigenvectors of a generalised eigenvalue problem, and LR tests of the number of cointegrating vectors from the eigenvalues, by stepwise concentrating all the parameter matrices in the likelihood function out, with the exception of the matrix of cointegrating vectors. In macroeconometrics, this method has evolved into the go-to technique for examining long-term economic relationships.

Test, Results and Analysis

The unit root test

The order of integration of time series property of the study was tested using the Phillip Peron (pp) test. According to Nyong (2003), the stationary test replaces the arbitrary Augmented Dickey Fuller (ADF) unit root test's usage of delays. The Phillips-Perron test is an enhancement to the ADF test in that it addresses the serial correlation in the error terms using non-parametric statistical approaches (Gujarati and Dawn, 2009). were first changed to be stationary. Table 1 below reports the results of the unit root testing. Since the reported pp statistic for each of the variables is less negative (i.e. greater than the critical t-value) at the 5% and 10% levels of significance, the results were regarded as non-stationary at these levels. All variables in the research model that weren't stationary at levels were made stationary at their initial difference, according to the results of a subsequent test for the unit root. In other words, all variables are integrated by one (1). A prerequisite for co-integration test analysis is satisfied because all series are integrated in the same order.

Table 1: Unit Root Test

Series	Phillip-perron test		Critical values		Probability levels		Order of integration (1)
	Levels	1st Diff	5%	10%	Levels	1st Diff	
National income	-0.374	-5.449	-2.95	-2.61	0.9024	0.0001	I (1)
Interest rate	-2.726	-7.32	-2.95	-2.61	0.0804	0.000	I (1)
WPI	0.3807	-3.13	-2.96	-2.62	0.9788	0.0346	I (1)
Market value	0.1759	-10.05	-2.96	-2.61	0.9666	0.000	I (1)

Source: Author's Calculation

Cointegrating test

With the use of the Juselius Johansen cointegration approach, the cointegration test was estimated with a lag duration of 1. The maximum eigenvalue statistics and trace statistics of the unrestricted cointegration rank test with no intercept or trend in the cointegrating equation (CE) both indicated five cointegrating vectors at the 5% level of significance. The Johansen cointegration test result is displayed as follows:

Table 2: Cointegrating Test

Hypothesized no. of cointegrating equations (CEs) (i.e. Null Hypothesis)	Trace Value	5% critical value	Probability level
None	38.06	47.85613	0.2993
At most 1	18.75	29.79707	0.5104
At most 2	4.45	15.49471	0.8634
At most 3	0.008866	3.841465	0.9246
Hypothesized no. of cointegrating equations (CEs) (i.e. Null Hypothesis)	Max-Eigen value	5% critical value	Probability level
None	19.30486	27.58434	0.3913
At most 1	14.30081	21.13162	0.3408
At most 2	4.447934	14.26460	0.8093
At most 3	0.008866	3.841465	0.9246

Trace test indicates 1 cointegrating equation(s) at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level
Author's computation using Eviews 12
*denotes 5% level of significance

Cointegrating vector and error correction estimates

Table 3: Cointegrating vector and error correction estimates

	Cointegrating Equation				Error correction			
C	MKT(-1)	WPI(-1)	LNGDP*(-1)	INT(-1)	Mktα	WPIα	LNGDPα	INTα
305718.9	1	350.0192 (85.1073) [4.11268]	-21966.10 (4850.73) [-4.52841]	1456.849 (318.891) [4.56848]	-0.064348 (0.03636) [-1.76974]	-0.000609 (0.00022) [-2.73401]	-2.25E-06 (2.5E-06) [-0.90942]	0.000217 (0.00028) [0.76449]

Source: Author's calculation

*GDP signifies national income

() and [ ] represents standard error and t-statistics

The model resulted with cointegrating vector β = (1.0000; 350.0192; -21966.10, 1456.849). The speed of adjustments coefficients were αMKT = -0.064348; αWPI = -0.000609; αLNGDP= -2.25E-06; αINT = 0.000. The t-statistics for restrictions αWPI = 4.11, αLNGDP = -4.52841, αINT =4.56848. The speed of adjustment coefficients for MKT, WPI, GDP all have an empirical t-values exceeding theoretical value of 2.030 at 5%. Hence, GDP is exogenously related to WPI, GDP and INT.

Cointegrating variable estimates

Table 4: Cointegrating variable estimates

Variables	Coefficient	Standard Error	t-statistics
C	0.066783	(0.02922)	[2.28587]
MKT(-1)	-2.02E-05	(1.4E-05)	[-1.44764]
MKT(-2)	-1.49E-05	(1.5E-05)	[-1.01692]
WPI(-1)	-0.003846	(0.00282)	[-1.36431]
WPI(-2)	0.001509	(0.00273)	[0.55248]
LNGDP(-1)	0.207104	(0.26246)	[0.78910]
LNGDP(-2)	-0.156752	(0.27413)	[-0.57181]
INT(-1)	-0.001430	(0.00333)	[-0.42924]
INT(-2)	0.001169	(0.00217)	[0.53819]

Source: Author's Calculation

Table 4 below shows the dynamics of short run equilibrium behaviour among research variables. The table presents the coefficients, the standard errors and the t-values of the model variables.

Interpreting across the row, the result shows that a 1% increase in 1 year lag of market valuation of stock market (MKT) only lead to 0.00002% change increase in economic growth (GDP) in India. The change in valuation of stock market didn't affect the GDP significantly. The result further confirmed that changes in the 2 years lag of market valuation MKT affect the output expansion less significantly during the research period. Similarly change in prices of the commodities also didn't effect the GDP much in the short run.

Granger causality

We discuss causality concerns using Granger's paradigm (1969). Numerous studies of the factors that influence economic growth, such as savings (Carroll and Weil, 1994), exports (Rahman and Mustafa, 1997; Jin and Yu, 1995); government spending (Conte and Darrat, 1988); money supply (Hess and Porter, 1993); and price stability, have made extensive use of Granger causality tests (Darrat and Lopez, 1989).

Pairwise Granger Causality Tests
Date: 11/23/22 Time: 15:02
Sample: 1 34

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNGDP does not Granger Cause MKT	31	3.94238	0.0320
MKT does not Granger Cause LNGDP		2.27654	0.1227
INTEREST does not Granger Cause MKT	31	0.20783	0.8137
MKT does not Granger Cause INTEREST		1.22967	0.3088
WPI does not Granger Cause MKT	30	2.86607	0.0757
MKT does not Granger Cause WPI		3.22109	0.0569
INTEREST does not Granger Cause LNGDP	32	1.04063	0.3670
LNGDP does not Granger Cause INTEREST		1.39059	0.2662
WPI does not Granger Cause LNGDP	30	0.45915	0.6370
LNGDP does not Granger Cause WPI		3.49301	0.0459
WPI does not Granger Cause INTEREST	30	0.09072	0.9136
INTEREST does not Granger Cause WPI		1.40662	0.2637

Source: Author's Calculation

The Granger Causality test indicates that the GDP growth has a considerable impact on the market capitalization of the stocks, whilst the other factors have no significant impact. The market capitalisation of the stock market is a result of Granger's economic expansion. Granger's market capitalization is another factor that influences prices, but it is not relevant at the 5% level.

Conclusion

The study makes an effort to comprehend the relationship between the stock market and some macroeconomic factors, including GDP, inflation, and interest rates. For India, we used the years 1988 through 2020. According to the investigation, there is at least one long-term cointegrating factor that affects how market capitalisation fluctuates in relation to macroeconomic variables. However, its significance was not particularly noteworthy in the short term. Granger causality has demonstrated that GDP does have an impact on stock market market capitalization.

The purpose of the article is to examine how macroeconomic factors affect Indian capital markets. It is crucial to comprehend the underlying factors influencing markets both domestically and globally in the current era of market globalisation and integration. In order to depict the Indian stock market, BSE Sensex and S&P CNX Nifty are dependent variables, whereas macroeconomic indicators such as inflation rate, interest rate on Treasury Bills, and GDS of India have been taken as explanatory variables. This study shows that there are other macroeconomic factors affecting the Indian capital market, validating previous research by numerous studies, and that movements in stock markets are influenced by more than just a small number of selected macroeconomic variables.

References:

Demirguc-Kunt A, Levine R, 1996. Stock markets corporate finance and economic growth. World Bank Economic Review, 10(2): 223-240.

Levine R, Zervos S, 1998. Stock markets, banks and economic growth. American Economic Review, 88(3): 537-558.

Tripathy, N. (2011). Causal relationship between macro-economic indicators and stock market in India. *Asian Journal of Finance & Accounting*, *3*(1), 208-226.

Obstfeld M, 1994. Risk-Taking, Global Diversification, and Growth. American Economic Review, 84: 1310-1329.

Schwert W, 1990. Stock returns and real activity: a century of evidence. Journal of Finance, 45: 1237-1257.

Dickey D, Fuller W, 1979. Distributions of the Estimators for Autoregressive Time-series with a Unit Root. Journal of American Statistical Association, 74: 427- 431.

Phillips P, Perron P, 1988. Testing for a unit root in time-series regression. Biometrika, 75: 335-346.

Choi I, 1992. Effects of Data Aggregation on the Power of the Tests for a Unit Root. Economics Letters, 40: 397-401.

Johansen S, Juselious K, 1990. Maximum Likelihood Estimation and Inference on Co-integration with Applications to the Demand for the Money. Oxford Bulletin of Economics and Statistics, 52: 169 - 210.

Johansen S, Juselious K, 1992. Testing Structural Hypotheses in a Multivariate Co-integration Analysis at the Purchasing Power Parity and the Uncovered Interest Parity for the UK. Journal of Econometrics, 53: 211- 244.

Engle R, Granger C, 1987. Co-integration and error correction: Representation, estimation and testing. Econometrica, 55: 251-276.

Johansen S, 1988. Statistical Analysis of Co-integration Vectors. Journal of Economic Dynamics and Control, 12: 231-254.

Phillips P, 1987. Time-series Regression with Unit Roots. Econometrica, 2: 277-301.

Granger C, 1986. Developments in the study of co-integrated economic variables. Oxford Bulletin of Economics and Statistics, 48: 213-228.

Akaike H, 1973. *Information Theory and an Extension of the Maximum Likelihood Principle*, In: Petrov, B. and Csaki, F. (eds) 2nd International Symposium on Information Theory. Budapest: Akademiai Kiado.