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Research Article

The investigations of long and short-term relationships between macroeconomic variables and stock markets: Evidence from China and Pakistan

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Abstract

The motivation behind this research study is the pragmatic examination of associations existing between the stock markets of (SSE), (KSE-100) and macroeconomic variables (Balance of trade, Unemployment rate, Inflation rate, Broad supply of money, and Foreign direct investment) using the annually time series informational data set for the period cover from January 1995 to December 2019. The key objectives of this examination are to check the long and short-term association between the macroeconomic variables and both stock market returns by utilizing different methods and strategies. The results of the unit root test specified the primary series is not stationary at a level and becomes stationary in the first difference. On an annual basis through utilizing the Fisher combined Johansen co-integration test and Vector Error Correction (VCM) technique, it shows that both stock markets had a long-term equilibrium association with macro variables and short-run dis equilibrium adjusted at 6.78%. These findings are valuable for stock exchange editors, financial analysts, policymakers, shareholders, and investors as well as for the Government.

Introduction

Founding the lead-lag associations amongst the macroeconomic variables and both the stock market prices is extremely essential. The significance of time lag influences by macroeconomic variables of stock market prices indicates stock market inefficient information examined by Zaheer and Rashid [1]. It means the past exploitation of macroeconomic information is insufficient for a single investor to earn normal profits. The existence of this exploitable prospect would cause the former to seriously misrepresent the capability of the market and proficiently allocate scarce resources [2]. The stock prices' inverse influences by macroeconomic variables indicate the variations of the stock market can expect the future condition of the economy according to Barakat, et al. [3]. Consequently, they could be engaged as leading indicators in assisting the formulation existence of economically stabilized policies. While the price effect and causality between variables and stock market prices are unknown, they remain assumed to be interrelated [4]. The present experiential indication is concerning the long and short-term connection between macro variables and stock market returns are varied since the

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use of changes data set and also test the techniques according to [5] that is universally recognized that the stock return is incompletely expectable through the usage of public accessible material about the macroeconomic fundamentals. Furthermore, the expected using of macro-economic information might exist considered as proof of stock market incompetence [6]. Consequently, by examining the long and short-term associations among the macro variables and stock market returns, assumptions about the effectiveness of the stock price market can be imitative, and related policies and instructions develop the stock return market circumstances can be evaluated. According to [7] the stock market imitated earnings, interest rate, and dividends prospection as well as the future economic activities information. Additionally, the investor's wealth is affected by stock returns which in converse affect the investment and consumption levels. Bilgili [8], developed and motivated research on the co-integration technique for the short and long-term relationship amongst variables of interest. Moreover, the Error Correction Model (ECM) development has assisted in the investigation of key measures and amendment procedure to the long run equilibrium amongst the variables [9]. The purpose of this research study is to investigate the dynamic short-run and equilibrium relationship long run among the variables and stock prices for the emerging stock market (SSE) and stock market (KSE-100). Precisely, the usage of the co-integration method, Granger causality, Augmented Dickey-Fuller and Vector Error Correction Model (VECM), this research study investigates where a set of macro variables i.e., Balance of trade, Un-employment, Money supply, Inflation and Foreign Direct Investment can be used in forecasting stock return in both stock exchanges (SSE) and (KSE-100). The relationship between the macro variables and stock markets indicates the study with a challenging investigation of the connections from a multi-dimensional perception [10]. Hence, it assists in determining if the relationship among the variables changes depending on the market nature (emerging, developed) development in various countries. So the movement of the index may be varied in the stock price markets [11]. In this recollection, the emerging market stock return may respond inversely to macro variables than individuals of the developed market. Therefore, this research study is annoying to perceive if there is any change in the response of price movement of stock to the macro variables between the emerging markets. Macro variables such as the supply of money, inflation, exchange rate, etc. have been recognized as specific key elements of stock market price indication by Pradhan, et al. [12]. Therefore, it is essential to know how these macro variables transmit to the stock market and their probable influence on the formation of the stock market. Dynamic causality is similarly important between the macro variables stock market. Ullah, et al. [13], originated and characterized the emerging economy by political uncertainty, high external debt, and turbulence of currency. Additionally, the emerging market differentiates itself from the developed economy of the capital market with concern about informational proficiency and recognized Infrastructure. It is recommended that the supply of money changes affect direct stock prices by changes in portfolio and indirectly affect through their on real variables activities example by Vveinhardt, et al. [14].

Stock market and inflation

Inflation either happens when the prices increase or when it takes a lot of money to purchase a similar item. Definitely, in the statement of the liquidity prefers hypothesis, an increase in the supply of money is expected to lessen the rate of interest hence the stock will rise. Also, the causality of stock return and inflation has been a difficulty of substantial interest later [15] recommended that common stock is measured as a decent hedgerow beside inflations meanwhile they represented as a statement on the actual asset whose worth is presumed the rate of inflation to be independent. Suggests that variable and high inflations create ambiguity and hence lower the share value. Exactly, which generates demand for risk premiums through depositors for allotment of equities, therefore, the stock price will decrease [16]. Additional research also provokes the hypothesis that stock return is negatively interrelated to the inflation rate expected or unexpected. [17] investigate the negative connections between inflation and real stock and propose that around 30% of the observation of negative relation is attributed to monetary inventions. According to [18] there is a significant relationship between two variables. The inflation and stock price association is not clear, it is essential for the researcher to clear out the variables' behaviour.

Stock market and Balance of Trade (BOT)

The balance of trade or balance of goods and services, is the difference between exports minus imports. The association between the Balance of trade and stock prices has also been deliberated and several have inspected the changes in stock return sensitivity in the Balance of trade [19]. The price volume causality has an important effect on future market research because it is claimed that price changeability may touch the volume of trade in the future [20]. Several empirical studies documented has been extensively the positive relation between changes in price variation and trade volume example by [21], the Turkish emerging stock market, and proposed the changes in price and Trading volume are co-integrated. [22] Investigated six emerging markets in Latin America using monthly data to indicate the volume of trade changes the stock prices. However, the balance of trade has also influenced the stock prices, with the increase in the balance of trade being inflation and leading to a reaction from the monetary authority through a high rate of interest, which affects stock prices negatively [23]. There are two primary channels existing that affect real stock prices through the balance of trade, namely the wealth effect channel and to an extent, the exchange rate channel [24]. According to the wealth channel, the fundamental general logic is that when stock prices rise, specifically if it is considered to be perpetual, increases household income expected and hence in consumption, however, it also makes it easier for the firm to capital investment opportunities, hence with a decline in a particular country's balance of trade [25].

Stock market and supply of money (M2)

Supply of Money (M2) is a merger of M1 and less liquid in nature. And also includes saving and times deposits, deposit certificates, and market money funds. It signifies

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the broad money supply in the economy. As upraised in the supply of money causes liquidity and also increases the citizen purchasing power [26]. It means that much money will be available for investment not just for consumption. Therefore, the relationship is positively expected even though, [27] investigated the causality between the supply of money and the emerging markets stock prices of Thailand, Mexico, Korea, Malaysia, India, and Taiwan he did not consider other variables [28]. The suggestion on the stock price market of Korea is that it is effective with deference regarding incorporated information changes in monetary policy [29], realized that variations in the supply of money do not affect stock prices. The suggestion of [30] will be assumed correspondingly as they assert that the supply of money has negligible influence on the stock price. However, the influences of monetary policy on stock prices also be influenced by on environment of the economy [31] explain that increasing the stock prices is responsive to the monetary extension. Conservative tools of monetary policy are proficient in reasoning greater variation in prices paralleled to the policy tools for minor certain economies [32]. However, the excessive money supply would originate the possibility increase in inflation which is harmful for stock markets.

Stock market and unemployment

The development of the stock market has also been affected by the unemployment level through a decrease in investment and aggregate income of the nations [33], explained that the insistent increase in unemployment can decrease investors' assurance and generate fright for predictable changes in the rate of interest which traditionally, have a negative influence on the stock returns. In addition [6], indicate that the stock markets are affected by announcing the most critical declaration of unemployment news. However [33], originated the significant connection between the crash stock market and unemployment in the United States. The author attributes further that the crash market to a self-satisfying tragedy of sureness that the economy moves from a low to a high equilibrium of unemployment. Additionally [34], indicate that there is a positive connection between the unemployment rate and fluctuation in stock market. Instinctively the stock market is looking forward because the expectancy approximately the future is reflected in equity deviation and prices from such expectation outcomes to volatility of the market. Further, more studies indicated the presence of positive relationships see example [35-38].

Stock market and Foreign Direct Investment (FDI)

The inflow of FDI to the host country will bring growth in employment, high production, transfer capital, exchange of technology, developed performance, and managerial skills [39]. FDI has an enormous positive influence on the developing nation's economic growth. [40] Found a high correlation between FDI and stock market indices. [41] Inspect the long-term association between FDI and the stock market. [42] Find the positive effect of FDI on the stock market developments of India. [43] Examined the Indonesian stock market he found a negative correlation during his study. [44] discover the long-term relation and positive role between FDI and stock market development. [45] Also, find that foreign direct investment has a long-term influence on the stock market in Ghana. The FDI impact on the host country's economy, as a whole, may be negative or positive. [46] Determined that the instability in the stock market is the most significant determinant factor of portfolio and FDI transactions. The flows of FDI affect the stock market movement by producing indications that are significant for the corporate investment decision Via Tobin's Q theory. On the other side [47] examined the domestic and foreign stock markets' determined portfolio investment since "they measure the investment opportunity set and wealth effect" A recently empirical study it's determined by number of features like globalization and privatization of productions, the mark of political consistency, the government policy nature, investment and trade system, the host country openness and market size.

Literature review

The literature theories are the most significant means the explanation of the relationship between economic factors at the level of macro and stock returns. The macroeconomic variables and stock market connection is a significant research area that many researchers addressed nationally and universally. [48] Investigate the short and long-run association between the macroeconomic variables and the stock exchange of Athens (ASE). The outcomes of the calculated work indicate the existence of short and long-term connections between the macroeconomic variables and the stock market. Equally, there is no connection between the exchange rate and the stock market. [49] Considers the threshold adjustment in the association between macro variables and economic activities in the UK. The previously disclosed work un-detected abnormality in the long-term association between the economic activity and stock market by utilizing the momentum threshold autoregressive co-integration test. [50] Examined the relationships among the set of macro variables containing interest rate, exchange rate, inflation, industrial production, supply of money, and stock market of China. They found the indication of co-integration of association between macro variables and the stock market. Furthermore, macroeconomic variables' position originated to be positive and long-term influences on the performance of the stock market [51]. Inspect the association between a set of macro variables and the Japanese stock market. They originate positive relationships among the share prices and supply of money escorted by the exchange rate and industrial production [52]. Attempt to describe the presence of long-run equilibrium utilizing the co-integration exploration, which has now; come to the preferred method and association between the study of macroeconomic variables and the stock market [53]. Investigate the dynamic long-term association between the financial factors and equity prices in Pakistan employing the Granger Causality and Multivariate Co-integration technique. Their research result exposed the presence of the long-term association between financial factors and equity prices, such as the supply of money, consumer price index foreign exchange, and treasury bill rate. [54] Inspected the dynamic association between the four macro variables and stock prices for the stock market of Malaysia utilizing the vector autoregressive and co-

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integration. They suggest their results indicate the existence of a long-term linkage between the variables and stock prices with considerable short-term connections among them. [55] Inspected a time series linkage among seven macro variables and New Zealand stock indexes applied co-integration, Granger causality, and Johansen maximum likelihood tests to define whether the stock indexes redirect the variations in the analysed macro variables. The response was no. [56] Utilizing the Johansson's co integration test and found that the macro variables are co integrated with Indian stock markets. In the long-term, the stock prices behave to be positive correlated to industrial production and interest while exchange and inflation rates are negative correlated to the stock market. However the results are fail to originate the short-term association between the macro variables and Indian stock market. [57] Examine the long and short-run relations between the macroeconomic variables and the Lahore stock market of Pakistan. Utilizing monthly data for the period 2002 to 2008, they perceive a negative influence of consumer's price index on the stock return, however, exchange rate, production indexes, and supply of money have a significantly positive influence on stock return in the long term. [58] Utilizing the Vector Error Correction technique ensured that inflation positively affected the stock market in the long-term, Treasury bill and exchange rate negative effect through crude oil. However, in the short run inflation behave negatively, and variation in stock returns, and treasury bill is positive. [59] Investigate the associations between the stock prices and real output indicates there is a strong linkage between stock prices and gross national product. [60] Found long-term positive relationships between industrial production and stock prices in the US. [61] Examined the Singapore stock exchange to generate the long-run relation among numerous macroeconomic variables and stock market indices and also property indices. In this respect, they establish that stock prices and property indices generate co integration linkage amongst supply of money, industrial production interest and exchange rates. Therefore, [62] also found there is no causality between industrial productions and stock market of Greek during from the period of 1996 to 2008 utilizing multivariate VAR model. He also discussed, in the long term oil prices and stock market movements positively influence on Greek consumer prices index. [63] Investigate such associations in Singapore. They also originate the supply of money, inflation, variation in the short and long-term interest rate, and changes in the rate of exchange moulded a co-integration relationship with variation in the level of the Singapore stock market. [64] Absorbed in inspecting the influence of real interest as an important element in the presentations of the Egypt stock market, together in term of market liquidity and activity. The analysis of co-integration through error correction mechanisms (ECM) specified important short and long-term connection between the variables, suggestions that real interest has an impact on the performances of stock market.

H1 = A constant significant long-term association present between macroeconomic variables (BOT, UNEMP, M2, FDI, and INF) and stock market of SSE and KSE-100 index.

H2 = A constant significant short-term association present between macroeconomic variables (BOT, UNEMP, M2, FDI, and INF) and stock market of SSE and KSE-100 index.

Sources of data and description

This research study was established on realistic secondary data. On this topic the previous study also supports that macro variables and the stock market have an association with each other, after the studying and consulting as well as the reviewing of Pakistan and China economies it measured that five macro variables are significant to check the association with stock market prices. The annual time series data is utilized from 1995 to 2019 (25) years. The up-to-date data in this research study was collected from the Shanghai Stock Exchange (China) and Karachi Stock Exchange (Pakistan). The Key sources from which the macro variables data is collected are Investing.com, Yahoo Finance, the stock exchange official site World Development Indicator, Business Recorder, State Bank of Pakistan, and Index Mundi. The following table shows the description of the variables.

Variables Description

Variables	Description	Unit
SSE	Shanghai stock exchange	
KSE	Karachi stock exchange	
BOT	Balance of Trade	% of GDP
Unemp	Unemployment Rate	% of GDP
M2	Broad money supply	RMB/Rupees
INF	Consumer price index (CPI)	% of GDP
FDI	Foreign Direct Investment inflow	% of GDP

Methodology

To investigate as an essentiality the relationships, whichever long or short runs exist amongst the macroeconomic variables and stock markets of China (SSE) and Pakistan (KSE-100). To use the specific models of Johansen co-integration Fisher combine test, vector error Granger causality test, and Cross-Sectional Panel Data test.

Panel economical models

In order to begin with a suitable method for the unit root test, we put on the Pesaran cross-section dependence test. We used our panel model method as:

$$z_{it} = \alpha_i + \beta_{it} y_{it} + \mu_{it} \quad (1)$$

Wherever i = 1, 2..., N is the subscripts of both countries is applied herein, t = 1, 2.., T represented dimension of the study; β_{it} shows the stricture direction for the valuation of our unintentional variables; y_{it} signify every one of the unexpected variables; α_i designate the constant structures and μ_{it} indicate the error time. Here describe together the alternatives and null hypothesis:

$$H_0 : \gamma_{ij} = \gamma_{ji} = cor\left(\mu_{it}, \mu_{jt}\right) = 0 \text{ for } i \neq j \quad (2)$$

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$$H_a : \gamma_{ij} = \gamma_{ji} \neq 0 \text{ for } i \neq j \quad (3)$$

Mathematical, we formulated $\gamma_{ij} = \gamma_{ji}$ as:

$$\frac{\sum_{t=1}^{T} \mu_{it}\, \mu_{jt}}{(\sum_{t=1}^{T} \mu^2_{it})^{\frac{1}{2}} (\sum_{t=1}^{T} \mu^2_{jt})^{\frac{1}{2}}} \quad (4)$$

On behalf of our sample test, we take the General Diagnostic Test for cross-sectional dependence in panel an enhancement on the Lagrange Multiplier (LM) Test and its application toward specifications of economic Models subsequently it's our sample test.

$$\sqrt{\frac{2T}{N(1-N)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \tau_{ij} \rightarrow N(0,1) \quad (5)$$

Wherever the residual coefficient of the panel model is signified by τ_{ij}. Afterward, the Perasan cross-sectional dependence test is realized, we initially apply the Im, Pesaran, and Shin (IPS) test to develop a seasonal unit root in heterogeneous panel either consent for heterogeneous autoregressive coefficient. Mathematical formulated model as.

$$\Delta zit = \gamma izit - 1 + \delta iYit + \varepsilon it \quad (6)$$

In the above equation Yit indicates the forecaster encompassing singular interval tendency; i represents autoregressive coefficient and stationarity stochastic errors term is shown by εit. Subsequently, there might be a present indication of autocorrelation.

Im Pesaran Shin (IPS) test1997:

$$\sqrt{N} \frac{(\bar{t}_{N,T} -)}{ó} \Rightarrow N(0,1), \text{ where } \bar{t}_{N,T} = \frac{1}{N} \sum_{i=1}^{N} t_{i,T} \quad (7)$$

Basically within the model we have the linear trends for respectively of the N cross sectional Unit. Therefore as a substitute for combining the data, we use an isolate unit root test on behalf of the N cross-sectional unit. Deliberate that t-test of every single cross-sectional unit based on T observation. So $t_{i,T}$ (i = 1, 2... N) Is represents the t-statistic for the unit root testing, and e ($t_{i,T}$) = μ and V ($t_{i,T}$) = σ^2 formerly.

Augmented Dickey-Fuller

Analysis of the non-stationarity in time series data is the key improvement in econometrics. The specious problem of regression could be found in variables when the regression is run on non-stationary time series data. By the use of a unit root test, the non-stationarity of the data is eradicated and transformed into time series stationarity data. There are several unit root tests but the well-known test is the Augmented Dickey-Fuller test (ADF). The ADF test [65,66] essential is the X variables are regressive at the first difference the lagged level

$$\Delta Y_t = a + \beta_t + \rho Y_{t-i} + \sum_{i=1}^{K} Y_i \Delta Y_t + e_t \quad (8)$$

H0 = Y_t is unit root

H1 = Y_t is not a unit root

In the equation, Y_t represent variables in the equation, the sign of T indicates time tendencies, while Δ denoted change operative, et shows error terms trouble with mean 0 (zero) and variances σ^2 and k indicates the number of lags for differences in ADF equation. The ADF test is limited through a number of lags and also rejects the null of unit root since the amplified numbers of lag require the approximation of supplementary parameters and a loss of degree of independence. The number of lags' existence is defined by the lowest number of residuals that is free from autocorrelation. This is inspected for the standard approaches of Akaike's information criterion (AIC) and Schwartz Criterion (SC).

Phillips Perron (PP) Unit root test (1987, 1988)

$$\frac{1}{N} \sum_{t=1}^{N} \varepsilon_t^2 + \frac{2}{N} \sum_{t=1}^{N} \omega(s,l) \sum_{t=s+1}^{N} \varepsilon_t \varepsilon_{t-s} \quad (9)$$

The Phillip Perron test functions are comparable to the Augmented Dickey-Fuller test, either in its takings into the explanation of an involuntary adjustment to the Dickey-Fuller technique to consent for an autocorrelation residual. The Phillips-Perron test as compared to Augmented Dickey-Fuller is very problematic and requires much statistics calculation [67]. However, the Augmented Dickey-Fuller test result shows similarity to the test statistics. Through the unit root test, the stationary test of SSE and KSE-100 markets against the five variables are tested, which are Balance of trade, unemployment, money supply, inflation, and foreign direct investment. By considering the data status of stationarity, we can evaluate the long-run association among the stock markets and independent variables meanwhile the vector error correction model requires the data should be stationary at first difference.

Fisher combines the Johansen co-integration test

Generally, macroeconomic variables are stationary with time-dependent mean variants. Linear combination of variables shows a series of data stationarity. These relations are called co-integrated equations and indicate the long-run equilibrium's association with variables. After the determination of the integration order of every single variable, we implemented the Johansen co-integration test whether there are co-integration relations amongst the stock return and selected five variables in China and Pakistan. In Mathematical form, we write Johansen co-integration test are specified below.

$$z_t A_1 Z_{t-1} \ldots\ldots\ldots\ldots A_p Z_{t-p} + Bx_t + \mu_t \quad (i)$$

Where z_t, x_t and $_t$ indicate = k vector of endogenous variables, a vector of deterministic variables, and a vector of innovations.

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the model (i) is also re-write as a vector autoregression (VAR) in behind technique

$$\Delta z_t = c + \Pi z_{t-1} \sum_{i-1} \Gamma_i \, \Delta z_{t-i} + \mu_t \quad \text{(ii)}$$

$$\text{Where } \Pi = \sum_{i=1}^{p} A_i - I \text{ and } \Gamma_i = - \sum_{j=i+1}^{p} A_j \quad \text{(iii)}$$

In the beyond equation (ii) the vector Δz_t and Δz_{t-i} are I (1) variables. Consequently, the rank of Π, defines the long-run relationship amongst the z_t. If r = 0 formerly the equation (ii) decreases to a VAR model of p-th direction in this condition macro variables in at level ensure not have some co-integration vector. On the other side, if the rank 0<r<n at that point there is a probability of remaining n×r the matrices' namely α and β, and also will be written as

$\Pi = \alpha\beta$ **[68]**

The estimations of the Johansen co-integration test is the Π medium from an unrestrained VAR and test whether rejected, the limit indicated by the decreased rank of utilising whichever the suggestion statistics or the extreme Eigen valued statistics (Wickremasinghe, 2011). The traced statistics and the determined Eigenvalues statistics are determined by consuming the subsequent equation.

$$\text{Trace Test} = \lambda_{\text{trace}} - T \sum_{j=r+1}^{k} \text{In } 1 - \ln\left(1 - \hat{\lambda}_j\right) \quad \text{(iv)}$$

Maximum Eigenvalue test = λ_{max}

$$-T \ln\left(1 - \hat{\lambda}_{r+1}\right) \quad \text{(v)}$$

In the above equation T, $\hat{\lambda}_j$ and r represent observation of the number, largest to smallest characteristic root rank of estimated value, and r = 0, 1, 2, ...n-1. The co-integration test is well known as lag sensitive. This study of research monitors Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC) to choose the amount of suitable lags.

Vector error correction model (VECM)

The co-integration model which is also recognized as an error correction model and a kind of time series data model is used when the data essential variables have long-run casual trends. The VECM estimations can observe the short-term associations among the macro variables, stock return, and amendment rapidity to the long-term equilibrium level. If there is a co-integration relationship existence among the macro variables and stock return formerly there is a chance of causation amongst the variables at minimum one trend (Granger & Engle, 1987) by considering the yt (macroeconomic variables) and xt (stock market indices) as the two dissimilar time series formerly the error correction model. It shows that variables are co-integrated in VECM hence identified by Faisal, et al. (2017).

$$\Delta x_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta x_{t-1} + \sum_{i=1}^{pm} \beta_2 \Delta y_{t-1} + \beta_3 ECT_{t-1} \varepsilon_{1t} \quad \text{(vi)}$$

$$\Delta y_t = \delta_0 + \sum_{i=1}^{n} \delta_1 \Delta y_{t-1} + \sum_{i=1}^{pm} \delta_2 \Delta x_{t-1} + \delta_3 ECT_{t-1} \varepsilon_{2t} \quad \text{(vii)}$$

In these above two equations Δ is the variance operative, m and n are the variables lag of interval, ECT_{t-1} is the residual of the co-integration equation, and ε_{1t} and ε_{2t} are the error terms. From the above two equations (vi) and (vii) we can examine the statistical significance of the error correction terms by individual t-test and also combine the significance of the lags of every one descriptive variable through X^2 t-test.

Empirical conclusions

A. stationary tests: The unit root tests are implemented on the China and Pakistan time series data to define whether time series data is stationary. We applied together IPS, PP, and ADF unit root tests. The empirical finding is following Table 1.

The above Table 1 existence the outcomes of Im Pesaran Shin (IPS), the Phillips Perron (PP), and Augmented Dickey-Fuller (ADF) unit root tests. The outcome shows that all the variables are not unit root at level but applying the first difference all the variables become significant at the level of 1% and 5%. Utilizing the unit root test, the macro variables and the stock markets indicate non-stationary behalf in level and become a series of stationary on the first differences. The stock markets of SSE, KSE-100, and the macro variables show non-stationary at the level test, and taking the first difference indicates stationary in all variables which are directed towards the long-run relationships as by Zhang, et al. (2006) Table 2.

The suitable lag length will be chosen before the co-integration technique, and the lag order selection is established on informational criteria and LR test statistics. The outcome recommends altered lags similar to LR test statistics, Akaike Information Criterion (AIC), and Final Prediction Error (FPE)

Table 1: China and Pakistan Unit Root Test Result of Stock Markets.

	Unit root test at Level			unit root test at first difference		
Variables	IPS	ADF	PP	IPS	ADF	PP
SSE/KSE	-0.60017	5.3661	-1.46353	-3.20328	16.7454	-9.6511
	(0.2742)	(0.2518)	(0.0717)	(0.0007)	(0.0022)	(0)
BOT	-0.73171	5.2799	0.09783	-1.45562	8.19259	-2.56151
	(0.2322)	(0.2598)	(0.539)	(0.0427)	(0.0427)	(0.0052)
Un-emp	1.67502	0.53146	2.20866	-2.79387	14.6629	-4.02318
	(0.953)	(0.9704)	(0.9864)	(0.0026)	(0.0055)	(0)
M2	-0.99362	6.23238	0.15342	-2.6873	13.9872	-2.81889
	(0.1602)	(0.1825)	(0.561)	(0.0036)	(0.0073)	(0.0024)
Inflation	-0.58741	6.33955	-2.28355	-3.95241	20.5902	-6.74112
	(0.2785)	(0.1752)	(0.0112)	(0)	(0.0004)	(0)
FDI	-0.06034	3.16753	0.1218	-2.19162	11.8942	-3.18808
	(0.4759)	(0.5302)	(0.5485)	(0.0142)	(0.0182)	(0.0007)

Note: indicate significance at 1% and 5%.

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suggest lag 5, according to this study we select Schwarz Information Criterion (SIC) with suggested lag 1 and Hunnan Quinn (HQ) imply lag 3. The correctness of co-integration is lag 5 is shown by VAR lag order selection criteria Table 3.

The beyond table suggests the outcomes of trace and max-Eigen test values that contain a significance of 5% at a level in the individual co-integration equation. According to this co-integration test, a Fisher combination scrutinizes macro variables with SSE and KSE-100. The outcomes indicate the long-term equilibrium connection amongst both stock price markets and the five macroeconomic variables in Pakistan and China for the present study of the time.

Table 2: VAR Lags Order Selection Criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-753.555	NA	8.69e+08*	37.59785	39.08729*	38.14379*
2	-715.837	53.88263*	8.73E+08	37.51605	40.49491	38.60792
3	-677.786	43.48722	1.02E+09	37.41837*	41.88666	39.05618
4	-645.535	27.64394	2.19E+09	37.59688	43.55461	39.78062

* specifies lag order nominated by the criterion.

Table 3: Johansen multivariate co-integration Results of China and Pakistan.

Unrestricted Co-integration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-Eigen test)	Prob.**
None*	57.79*	0	23.16	0.0001
At most 1	37.83	0	19.74	0.0006
At most 2	20.87	0.0003	18.1	0.0012
At most 3	6.992	0.1363	3.938	0.4144
At most 4	6.65	0.1556	4.58	0.3332
At most 5	8.049	0.0898	8.049	0.0898

* Probabilities are calculated by consuming asymptotic Chi-square distributions. 0.05 at level trace test straight 1 co-integration equivalence, *0.05 at level indicate elimination of H0, ** *p* - values Mackinnon Haug Michelis 1999.

Vector error correction model test

[69] planned Vector Error Correction model. Use to investigate long-run co-integration relationships among the dependent and independent variables. VECM analyzed several time-series with long-run stochastic tendency, also called co-integration. In the short run relationships with macro variables and stock return as well as adjusted speed towards long-run equilibrium levels are observed by VECM estimations. The vector error correction model equations are as follows Table 4.

In the above VECM table, the value CointEq1 of the Error Coefficient term (ECT) has negative significance. That indicates the long-run relations among variables. The brackets denoted the coefficient value of variables. The error term co-efficient identifies or points out the adjustment speed of long-run equilibrium when there is an inequality. While the long-run equilibrium of stock price variant into short-run equilibrium, that shows accuracy. And the equilibrium of the long run is carried back. The rate of disequilibrium is corrected at -0.067802 indicating the round about 6.78% per annum to the level of long-term equilibrium of the short-term abnormality. In the long-term coefficient of inflation is positively significant at 10%, while the coefficient of FDI is negatively significant at 10% and the coefficient of M2 is also positively significant at the level of 10% Table 5.

The above table outcomes describe the value of unemployment as negative and insignificant it describes that there is no long-run association with the stock market but indicates a significant short-run relation in the Exogeneity Wald test at a level of 1%. Inflation shows a long-run positive significance relation with stock markets at a level of 10% however Exogeneity Walt test also shows a significant short-run relation at a level of 5%. The value of BOT is negative and insignificant means no long-run relation with the stock market and there is no short-run relation in the Exogeneity Walt test. FDI is negative and significant at the level of 10% indicating a long-run relation with stock markets but does not

Table 4: Vector Error Correction Estimates.

Error Correction:	D(SSE/KSE)	D(UN-EMP)	D(INFLATION)	D(BOT)	D(FDI)	D(M2)
CointEq1	-0.067802**	-4.83E-07	6.87E-05***	-1.30E-05	-1.12E-05***	0.000107***
	[-2.03262]	[-0.11077]	[1.65774]	[-0.58081]	[-1.75029]	[1.65142]
D(SSE/KSE (-1))		4.90E-05*	-0.000115	9.61E-05	3.54E-05	-0.00031
		[2.24205]	[-0.50413]	[0.85374]	[1.10059]	[-0.89540]
D(UN-EMP(-1))	-5964.173*		-0.479365	-0.585704	-0.087602	3.701345
	[-4.21882]		[-0.24831]	[-0.61546]	[-0.32188]	[1.26131]p
D(INF(-1))	-219.4537**	-0.024817***		-0.030796	-0.00279	0.060776
	[-2.07200]	[-1.79338]		[-0.43193]	[-0.13682]	[0.27644]
D(BOT(-1))	93.78475	-0.025338	-0.617192***		0.005753	-0.21015
	[0.38189]	[-0.78968]	[-1.84043]		[0.12169]	[-0.41226]
D(FDI(-1))	493.8	-0.066811	0.497301	-0.32195		-1.89746
	[0.59357]	[-0.61468]	[0.43775]	[-0.57490]		[-1.09879]
D(M2(-1))	15.69852	-0.015841	0.006254	0.000909	0.049862*	
	[0.16185]	[-1.25006]	[0.04722]	[0.01392]	[2.67040]	
C	1166.624	0.138871	-0.297009	-0.208536	-0.210331	1.978465
	[2.38707]	[2.17480]	[-0.44503]	[-0.63386]	[-2.23552]	[1.95022]
R-squared	0.370244	0.260277	0.346606	0.061141	0.214891	0.122448
Adj. R-squared	0.254237	0.124012	0.226244	-0.111807	0.070266	-0.03921
F-statistic	3.19155	1.910082	2.879699	0.353524	1.485847	0.757465

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show a short-run relation in the Exogeneity Walt test. The last value of M2 indicates a positive significant long-run relation at a level of 10% with stock markets while does not show a short-run relation in the Exogeneity Walt test.

Diagnostic tests of the VECM model

A. VEC Residual Serial Correlation LM Test Table 6

The result shows that p-value 0.6623(66%) which is much greater than 5% (Probe>0.05) which indicates acceptance of the H0 hypothesis for the un-existences of serial correlation.

H0 = serial correlation is existent

H1 = serial correlation is not existent.

B. VEC Residual Heteroskedasticity Test Table 7

H0 = Heteroskedasticity does not exist

H1 = Heteroskedasticity exist

The pronunciation of the Heteroskedasticity word is difficult, but it is not a difficult concept to understand. It means that heteroskedasticity denotes the condition where the variability of variables is not equivalent in the range of value to the second variable. Accept the H0.

Conclusion

This research study investigates the causal association between both stock markets and particular a set of macroeconomic variables in China and Pakistan. Here we examined the relationship of both long and short-term amongst the nominated macro variables and both stock price market determinants. Using the time series annually information set of data from 1995 to 2019. This examination consists of the chosen time period collection of informational data of China (SSE) and Pakistan (KSE) Balance of trade (BOT), Un-employment (un-emp), Broad money supply (M2), Inflation (inf) and Foreign direct investment (FDI). The ADF, IPS, and PP utilized these tests for the stationarity property of the demonstrated data information each one of them was not stationary on a level and became stationary in the first difference. For this analysis, the Johansen co-integration model was employed to inspect the long-term equilibrium causality of the macro variables with both stock exchanges. The VECM model indicates the short-run connection among variables and both the stock market and the speed of adjustment to the long-term level of equilibrium. The co-integration test exposes that the macro variables are co-integrated with stock market prices which indicates that variables have a long-term association with both stock prices. The investigated information recommended that the macro variables in specific foreign direct investment, Inflation rate, and supply of Money standard are destined in long-term equivalence association also their variability preference stock return to fluctuation. It further realized that both stock markets have a positive connection with the supply of money and inflation rate the spreading out rate by a negative association with Balance of trade, Foreign direct investment, and the unemployment rate. The VCM outcome shows expo annual 6.78% deterioration from long-term volatility in the short term. The Granger Causality Wald test revealed that using 5 lags of SSE and KSE return has a short-term influence on unemployment and inflation rates. It is determined that a long-run connection exists between the macro variables and both stock markets so on behalf of this association, prospects can be made by utilizing this research.

Based on the sources of the analysis, specific recommendations to improve the performances of the Shanghai and Karachi stock markets for both governments of China and Pakistan are; that increasing the bank interest rate is not in favour of a dynamic stock market because the fast augmentation in rate of interest are become the causes of inflation. Inflation is the cause of currency devaluation that decreases the money rate of exchange. So we can say the bank rate of interest is the major phenomenon that generates the rest of the problem components which also affect the both stock exchange as well as economies. This research study results will also be useful for foreign and domestic investors although the decision-making is to capitalize on both stock exchanges.

Table 5: VEC Granger Causality/Block Exogeneity Wald Tests.

Dependent variable: D(SSE/KSE)			
Excluded	Chi-sq	Df	Prob.
D(Un-employment)	17.79846	1	0.000*
D(INFLATION)	4.293166	1	0.0383**
D(BOT)	0.145842	1	0.7025
D(FDI)	0.352328	1	0.5528
D(M2)	0.026196	1	0.8714
All	19.34278	5	0.0017

Annotation: *, **, *** denoted 1%, 5%, and 10% at the level of significance.

Table 6: Null hypothesis: No serial correlation at lag h.

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	32.10398	36	0.6545	0.880396	(36, 121.3)	0.6623
2	31.07129	36	0.702	0.848782	(36, 121.3)	0.7091

*Edgeworth expansion corrected likelihood ratio statistic.

Table 7: VEC Residual Heteroskedasticity (Levels and Squares) Joint test.

Chi-sq	Df	Prob.
320.505	294	0.1381

Appendix

http://www.sbp.org.pk/

https://www.gdpinflation.com/search/label/Pakistan%20Economic%20Indicators

https://www.psx.com.pk/

https://data.worldbank.org/indicator

https://www.indexmundi.com/

https://www.brecorder.com/market-data/ Endnotes

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