Do Macroeconomic indicators influence stock returns?

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Abstract

The financial sector plays an imperative character in the economic growth and progress of a state, and efficient use of capital resources makes the financial market more effective and more robust. Investors prefer to invest in areas where growth has a positive relationship with increasing investment opportunities. Stock markets promote and contribute towards the economic growth. The present study selected the macro-economic variables (MEV) that include Interest Rate (IRR), Exchange Rate (ER), Inflation Rate (IR) (GDP deflator), risk premium and are subsequently associated with future investments. The present study considered the arbitrage price theory as underpinning to evaluate the association among the latent constructs. The data used in the current study is time series data for the period of 1998 to 2020. The present study used the co-integration and granger causality test to evaluate the long-term and feedback relationship among the latent constructs. The findings of the present study reveal there is long-term relationship between returns, real GDP growth, interest rate, inflation rate, and foreign direct investment. In addition to that exchange rate cause stock market returns, moreover, inflation rate granger cause stock market returns, and stock market returns granger cause to economic growth. The results outline the implication for the investors, policymakers, and regulatory authorities. Future studies can analyze the link between macroeconomic variables and SMR by using different macroeconomic variables such as the supply of money, prices of oil in the international market, and rates of gold in the international market.

Keywords: Macroeconomic, stock market returns, interest rate, inflation rate, exchange rate, gross domestic product.

INTRODUCTION

A well-Developed financial sector plays an imperative character in the economic growth and progress of a state, and efficient use of capital resources makes the financial market more effective and more robust (Khalid & Khan, 2017). Nowadays, investors prefer to invest in developing economies where growth has a positive relationship with increasing investment opportunities, growth of the industry, a sound financial system, increased employment opportunities, reduced inflation, a balanced relationship among macroeconomic relationships, a better-earning environment, and improved per capita income (Lewis, 2013). All such factors are instigated by several selected Macro-Economic Variables (MEV) that include (i) Interest Rate (IRR), (ii) Exchange Rate (ER), (iii) Inflation Rate (IR) (GDP deflator), risk premium and are subsequently associated with future investments (Khan, 2018).

Two most important factors determine economic growth: First is the consistent political and macro-economic stability throughout the country, which increases the confidence of investors and creates a channel for domestic and foreign investment, and second is the financial sector development (Rafique, Naseem, & Sultana, 2O13; Khalid & Khan, 2O17). According to recent economic evidence, Pakistan is an emerging economy in the world (Khalid & Khan, 2017). Although the economic growth and its performance have been severely affected by various factors such as battles, floods, earthquakes, and uncertainty in politics, currently, Pakistan is the 25th largest economy in the world. According to Khalid and Khan (2O17), Pakistan's economy has marvelous potential for economic development and growth.

The stock exchange of Pakistan plays an essential role in the country's economic growth and can be used as an indicator for evaluating economic growth (Khalid & Khan, 2017). The stock market plays a dynamic role in the economy because companies can quickly get money for their businesses, and investors can own shares in those companies (Joshi, 2015). In the past, Pakistan Stock Exchange has faced rise and fall in its performance due to different factors such as economic, political, and social (Khan & Ahmed, 2015). In past years, a significant fluctuation in ER has been observed due to instability in the value of the Pakistani Rupee owing to the economic position of Pakistan (Mubarik & Javid, 2018). The performance of the stock exchange market is affected by ER and IRR (Abbas, Bhowmik, Koju, & Wang, 2017). The increase in prices is offset because of excessive ER difference. Thus, investors are interested in increasing their profits, and when opting to invest in the stock market, they always try to manage the element of risk involved in the stock exchange market (Patro, Wald, & Wu, 2014). For this reason, it is crucial to see the causal relationship between the SMR of the country and the selected MEV so that the investors can take their investing decisions profitably (Pervaiz, Manish, & Jian-Zhou, 2018).

The role of the stock market is to promote growth and development in the country, and stock exchanges are considered the main element of any economy; if the stock market of any economy is strong, it is considered that the economy of such country is progressing. Furthermore, it is claimed that the stock market can improve liquidity by mobilizing investors' savings. This is possible only by reducing costs, and strong corporate governance can

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reinforce and enable international risk-sharing, promoting the economy's growth (Ho, 2017). The impact of SMR on the country's economy is a vital interest area for economists, business community experts, policymakers, and financial analysts due to its critical role in economic growth (Kirui, Wawire, & Onono, 2014). Fluctuation in the SMR is strongly correlated with selected macroeconomic variables: ER (USD/PKR) and IRR, which significantly impact the stock market volatility and stock market returns. The stock market's significant change is caused by ER and IRR (Khalid & Khan, 2017). Moreover, foreign investment also leads to volatility in the stock market (Gu, Kang, & Xu, 2018).

Research Questions

Based on the problem described above following research questions have been derived:

- Does ER (USD/PKR) impact Pakistan stock market returns?
- Does GDP (produced goods and services in a year) impact Pakistan stock market returns?
- Does the inflation rate (as a proxy of GDP deflator) impact Pakistan stock market returns?
- Does IRR (KIBOR) have an impact on Pakistan stock market returns?
- Does foreign direct investment (FDI) impact Pakistan stock market returns?

The research is vital for the business community and decision markets. The research findings enable the investors to take effective and efficient decisions and help the firms to improve their market worth by viewing the influence patterns of these macroeconomic constructs on SMR. This will help boost investors' confidence and monetary authorities and encourage the investors to make further investments in the stock market. Moreover, it will also be helpful to the concerned financial experts and government bodies in policy and decision-making. Securities and Exchange Commission of Pakistan will also get an insight into which macroeconomic variables contribute towards enhancing the stock market performance, thereby facilitating more domestic and foreign investment. This study will also help understand the participants' portfolio strategies and returns on investments of different macroeconomic variables, i.e., IRR, inflation rate, GDP, ER and FDI. On the other hand, investment practitioners should incorporate such information for making investment strategies for maximizing profits. Since the correlation between SMR and economic activity is essential for designing the economic policy and investment strategies' implications (Gupta, Rangan, & Modise, 2013; Allam, 2016), thus, the significance of this study will be its contributions to the literature on the behavior of the stock market by analyzing that which relationships exist among SMR and macro-economic constructs.

Theoretical Framework

The thesis used the Arbitrage Price Theory (APT) by Stephen Roos in 1976. The arbitrage price theory has become one of the essential forms of asset pricing theory. In Arbitrage Pricing Theory (APT), multiple risk factors are considered to explain asset returns. According to Roos (1976), the expected rate of return on assets is approximately related to macroeconomic factors. Equilibrium prices no longer offer an opportunity over the asset portfolio. According to this approach, macroeconomic variables change can be reflected in the underlying systematic risk factor that influences the future stock returns (Joshi, 2015). It provides an alternative and improved model against Capital Asset Price Model (CAPM) (Joshi, 2015). The capital asset pricing model uses the market expected return, whereas arbitrage-pricing theory incorporates the expected return of the risky asset and the risk premium of several macroeconomic variables (Joshi, 2015). Thus, arbitrage price theory needs a lesser and more realistic assumption in contrast to the weakness in the capital asset pricing model, which increases its explanatory power and makes it a better multi-variable model. It is essential to consider that APT is an approach that determines asset prices. According to this approach, it is evident that one product with the same quality does not sell in one market at two different prices. If it is not the case, then the arbitrage pricing theory exists (Talla, 2013).

The Arbitrage pricing theory is a multi-factor theory in which stock asset returns are generated through the procedure of the portfolio of multiple factor function. According to this theory, the relationship between stock asset returns and a set of indexes should be linear, as shown:

$R_j = a_i + b_{i1}l_1 + b_{i2}l_2 + \cdots + b_{ij}l_j + e_i$

a_i = the expected level of return for stock (i) if all indices have a value of zero

L_j= The value of the j^{th} index that impacts the return on stock I

b_{ij} = the sensitivity of stock I's return to the j^{th} index

e_i = a random error term with a mean equal to zero

The short-run relationship among stock market returns and selected macro-economic variables assumed to be at first level difference trend stationery when they test the validity of Arbitrage Pricing Theory supports that macro-economic variables and stock market returns are causally related is a model on which realistic work based on the APT theory (Faisal, Muhamad, & Tursoy, 2016).

Assumptions of Arbitrage Price Theory

Asset stock markets are perfectly competitive; mainly, the investors are interested in the returns generated primarily according to the "k factor model" (Gay, 2016). In the stock markets, the portfolio of the number of existing assets is much more extensive than the number of several factors. So, there is no chance of existing arbitrage pricing theory opportunities. It is not essential to deal with all the risk factors involved to test the arbitrage pricing theory because no such restrictions are imposed on short selling. Because this theory only constitutes one side of the theory, the short-selling requirements are also essential for this theory (Joshi, 2015).

Empirical Tests of the Arbitrage Pricing Theory

There are two APT tests available, Statistical APT and Macro-variable APT. Roll and Ross (1980) tested the statistical arbitrage pricing theory, which was used to identify common risk price factors. This statistical theory is also known as the factor loading model (Gay, 2016).

Number of Risk Factors in APT

Roos (1976) initially developed the arbitrage pricing theory, but then Roll and Ross (1980), who first applied the empirical test of the model, used a two-step testing procedure. The periods

considered were from 1962 to 1972 for examining the daily data of forty-two different groups of thirty securities. Firstly, the maximum likelihood factor was used to estimate the expected asset returns. Then the factor coefficient taken from time-series data was used to estimate the individual asset returns. Then both estimations were used to test a relationship of cross-sectional pricing. Later, both researchers observed that minimum three and maximum six factors were significant, which mainly explained the joint variability of this group in the returns.

The previously employed techniques were used by Roll and Ross (1980). They were re-investigated by Dhrymes, Friend and Gultekin (1984) and numerous limitations were observed. First of all, researchers pointed out that the results of both small portfolios and large portfolios were different from each other. Secondly, they argued that the methodology used by Roll and Ross (1980) was not appropriate for determining evidence of several factors. In that specific study, the researchers observed that the number of securities and the number of factors increased similarly at the level of 5% significance. According to the researchers, the number of factors determined was two from 15 groups, three from 30 securities, 4 from 45 securities, and six from 90 securities, respectively.

Following is the theoretical framework, keeping in view the literature review and underlying theory in which explanatory variables are GDP, FDI, inflation rate, IRR and ER and explained variable is stock market returns.

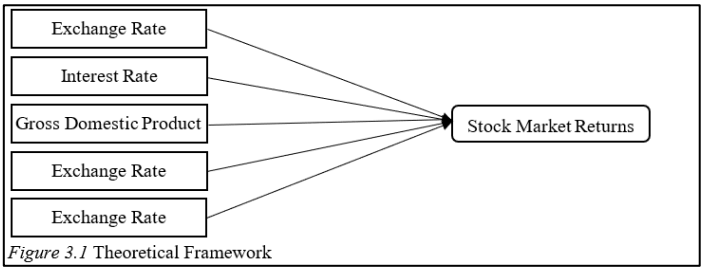

Figure 3.1 Theoretical Framework

Population of the study

To examine the impact of selected macroeconomic variables, namely GDP, FDI, inflation rate, IRR, and exchange rate on the Pakistan stock exchange, all 559 listed companies of the Pakistan stock exchange (PSX) are included in this population study.

Sample of the study

KSE100 index was selected as the sample, including 100 listed companies from different sectors.

Data Sources

In this study, secondary data has been used. Yearly data is collected from the official websites of the World Bank, and the Pakistan stock exchange has been used for 23 years, from 1998 to 2020.

Data Analysis

To utilize the long-run relationship among six variables named ER of Pakistan with US dollar, IR (GDP deflator of the economy), IRR (KIBOR), GDP (growth rate of the economy), Foreign Direct Investment (FDI) and stock exchange return of Pakistan, Granger causality test tells about the directions of variables and Johansen-Juselius Co-integration. In different studies, these two tests are also utilized to check the causal relationship among these variables (Iqbal, 2017; Singh, 2010; Vejzagic & Zarafat, 2013). One of the preliminary requirements to apply these tests is that the data should be stationary at level or first difference. However, if the data is stationary at the level, then Ordinary Least Square (OLS) regression is applied.

Stationarity

The time series properties must be examined before conducting any econometric analysis. Unit root test was used to check the stationary of the data by following Augmented-Dickey Fuller (ADF). Stationarity means that mean and variance do not vary systematically over time (Iqbal, 2017). If the data is not stationary at level, then it should be stationary at 1st difference by utilization unit root test.

Co-integration test

Co-integration test is applied to check the impact of the predicted variable on explanatory (Fadhil, Azizan, & Shaharudin, 2007; Ali, Rehman, Yilmaz, Khan, & Afzal, 2010). To conclude the nature of the long-run relationship co-integration test is applied. This test is applied to determine whether the variables move jointly (cointegrated) or not (Nasir, Hassan, Nasir, & Harun, 2013). However, one of the primary pre-requisites for the Johansen co-integration test is that all the macroeconomic variables should be integrated of the same order, i.e., all variables should be stationary at 1st difference.

Granger Causality test

In this study, the Granger causality test is applied, which was proposed by C. J. Granger. The Granger causality test is applied to see any causal relationship among the variables (Ali, Rehman, Yilmaz, khan, & Afzal, 2010). The Granger Causality test checks whether the lagged information of a variable provides some significant information to another variable (Nasir, Hassan, Nasir, & Harun, 2013). This test can check unidirectional and bi-directional causality (Granger, 1969).

Model specification

1. *Interest rate*

$$IR_t = \sum_{i=1}^{n} \alpha_i SR_{t-i} + \sum_{j=1}^{n} \beta_j IR_{t-j} + \mu_{1t}$$
$$SR_t = \sum_{i=1}^{n} \gamma_i SR_{t-i} + \sum_{j=1}^{n} \delta_j IR_{t-j} + \mu_{2t}$$

2. *Exchange rate*

$$ER_t = \sum_{i=1}^{n} \alpha_i SR_{t-i} + \sum_{j=1}^{n} \beta_j ER_{t-j} + \mu_{1t}$$
$$SR_t = \sum_{i=1}^{n} \gamma_i SR_{t-i} + \sum_{j=1}^{n} \delta_j ER_{t-j} + \mu_{2t}$$

3. *Gross Domestic Product*

$$GDP_t = \sum_{i=1}^{n} \alpha_i SR_{t-i} + \sum_{j=1}^{n} \beta_j GDP_{t-j} + \mu_{1t}$$
$$SR_t = \sum_{i=1}^{n} \gamma_i SR_{t-i} + \sum_{j=1}^{n} \delta_j GDP_{t-j} + \mu_{2t}$$

4. *Inflation rate*

$$IGDP_t = \sum_{i=1}^{n} \alpha_i SR_{t-i} + \sum_{j=1}^{n} \beta_j IGDP_{t-j} + \mu_{1t}$$
$$SR_t = \sum_{i=1}^{n} \gamma_i SR_{t-i} + \sum_{j=1}^{n} \delta_j IGDP_{t-j} + \mu_{2t}$$

5. *Foreign direct investment*

$$FDI_t = \sum_{i=1}^{n} \alpha_i SR_{t-i} + \sum_{j=1}^{n} \beta_j FDI_{t-j} + \mu_{1t}$$
$$SR_t = \sum_{i=1}^{n} \gamma_i SR_{t-i} + \sum_{j=1}^{n} \delta_j FDI_{t-j} + \mu_{2t}$$

Were,

SR = Stock market returns, IR = rate of interest, ER = Exchange Rate, GDP = Gross Domestic Product, IGDP = rate of inflation (GDP deflator), FDI = Foreign Direct Investment, μ = Disturbance term.

Diagnostic Checks

Table 4.1 shows the descriptive statistics of KSE-100 index returns and other selected macroeconomic variables of this study.

Table 4.1: *Descriptive statistics*

	RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	FDI	EXCHANGE_RATE
Mean	20.91098	4.343478	9.722609	9.796922	1.243309	72.87225
Median	19.42000	4.100000	9.890000	7.750000	0.923097	60.27000
Maximum	84.70000	9.000000	15.74000	24.89115	3.668323	124.7872
Minimum	-35.55000	0.400000	1.870000	2.463093	0.382827	34.00000
Std. Dev.	27.03645	1.876124	3.790238	5.804435	0.910627	27.79643
Skewness	0.222457	0.345251	-0.317898	1.026410	1.587252	0.619145
Kurtosis	2.967650	3.594003	2.451172	3.460770	4.409296	2.122321
Jarque-Bera	0.190704	0.795064	0.676056	4.241948	11.56094	2.207695
Probability	0.909053	0.671976	0.713175	0.119915	0.003087	0.331593
Sum	480.9526	99.90000	223.6200	225.3292	28.59611	1676.062
Sum Sq. Dev.	16081.33	77.43652	316.0498	741.2122	18.24330	16998.11
Observations	23	23	23	23	23	23

The descriptive statistics show that the mean value of the KSE-100 index is 0.136, whereas the maximum returns achieved were 84.7 and the minimum value was -35.55. The standard deviation value shows that values have a maximum deviation of 27.03645 from their mean value. The skewness and kurtosis values of KSE-100 returns are 0.222457 and 2.96765, respectively.

The descriptive statistics show that the mean value of ER is 72.87225, whereas the maximum returns achieved were 124.7872, and the minimum value was 34.0. The standard deviation value shows that values have a maximum deviation of 27.79643 from their mean value. The skewness and kurtosis values of ER are 0.619145 and 2.122321, respectively.

The descriptive statistics show that the mean value of IRR is 9.722, whereas the maximum returns achieved were 15.740 and the minimum value was 1.870. The standard deviation value shows that values have a maximum deviation of 3.790 from their mean value. The skewness and kurtosis values of IRR are -0.317 and 2.451, respectively. The descriptive statistics show that the mean value of IR is 9.696, whereas the maximum returns achieved were 24.891, and the minimum value was 2.463. The standard deviation value shows that values have a maximum deviation of 5.804435 from their mean value. The skewness and kurtosis values of IR are 1.0264 and 3.46077, respectively.

The descriptive statistics show that the mean value of the real gross domestic product growth rate is 4.343478, whereas the maximum returns achieved were 9.0 and the minimum value was 0.40. The standard deviation value shows that values have a maximum deviation of 1.876124 from their mean value. The skewness and kurtosis values of the growth development product are 0.345251 and 3.594003, respectively. The descriptive statistics show that the mean value of the foreign direct investment is 1.243, whereas the maximum returns achieved were 3.668 and the minimum value was 0.382. The standard deviation value shows that values have a maximum deviation of 0.9106 from their mean value. The skewness and kurtosis values of foreign direct investment are 1.58725 and 4.409296, respectively.

The null hypothesis of the unit root test: there is a unit root which means that the series is not stationary. SMR was not stationary at the level, but it can be seen from Table 4.3 that the p-value is less than 5%. So, on this basis, the null hypothesis is rejected, and there is no unit root at the level. The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. SMR was not stationary at the level, but it can be seen from table 4.4 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at 1st difference. The null hypothesis of the unit root test: there is a unit root which means that the series is not stationary. ER was not stationary at level, but it can be seen from Table 4.5 that the p-value is more than 5%. So, on this basis, the null hypothesis is accepted, and there is a unit root at the level. The null hypothesis of the unit root test states that there is the unit root which means that the series is not stationary. Exchange rates are not stationary at the level, but it can be seen from Table 4.6 that the p-value is less than 5%. So, on this basis, the null hypothesis is rejected, and there is no unit root at 1st difference.

The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. IRR was not stationary at the level, but it can be seen from Table 4.7 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at the level. The null hypothesis of the unit root test is that there is the unit root which means that the series is not stationary. IRRs are not stationary at level, but it can be seen from Table 4.8 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at 1st difference.

The null hypothesis of the unit root test is that there is the unit root which means that the series is not stationary. Inflation rates are not stationary at the level, but it can be seen from Table 4.9 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at the level. The null hypothesis of the unit root test: there is a unit root which means that the series is not stationary. Inflation rates are not stationary at the level, but it can be seen from Table 4.10 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at 1st difference.

The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. Gross domestic product was not stationary at the level, but it can be seen from Table 4.11 that the p-value is more than 5%. So, the null hypothesis is accepted, and there is a unit root at the level. The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. Gross domestic product was not stationary at the level, but it can be seen from Table 4.12 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at 1st difference.

The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. Foreign direct investment was not stationary at the level, but it can be seen from Table 4.13 that the p-value is more than 5%. So, the null hypothesis is accepted, and there is no unit root at the level. The null hypothesis of the unit root test is the unit root, which means that the series is not stationary. Foreign direct investment was not stationary at the level, but it can be seen from Table 4.14 that the p-value is less than 5%. So, the null hypothesis is rejected, and there is no unit root at 1st difference.

The augmented Dickey-fuller test has been applied to show that all six variables, Stock market returns, Exchange rate, IRR, Inflation rate, GDP and FDI, are integrated in the same order, meaning that all these variables are non-stationary at the level. Still, all variables become stationary when these variables are converted into the first

difference. Because Johansen co-integration test can only be applied if all variables integrated are in the same order.

Returns and Exchange rate.

In the trace statistic, the null hypothesis shows that the co-integration relationship exists because (p-value) is more than the significance value, which is 0.05. It means that the alternative hypothesis cannot be accepted. In addition, the trace statistic calculated of 14.316 is less than the 0.05 threshold value of 15.494, which confirms that the co-integration link between stock exchange return and ER can be accepted. Moreover, at most 1, the trace statistic (p-value) is (0.04346), above the significance level of 0.05. It shows that there is a co-integration link among variables, and on this basis, it concluded that the null hypothesis could be accepted. However, the trace statistic value of 0.6106, which is less than the threshold level of 0.05, is 3.8414, which shows that co-integration among constructs can be accepted.

In the next column, the Maximum Eigenvalue test indicates that both values at a level and the first difference indicate 0.6011 and 0.4346, respectively. These values are higher than the threshold value of 0.05, which shows that a co-integration link exists between SMR and ER and could not be rejected as a null hypothesis and alternative hypothesis.

Returns and IRR

In the trace calculated value, the null hypothesis shows co-integration relationship exists because the p-value is below 0.05. It means that alternative hypotheses can be accepted. In addition, the trace statistic value of 23.6757 is more than the 0.05 critical value of 15.4947, which confirms that no co-integration link between stock exchange return and IRR can be accepted. Moreover, at most 1, the trace statistic p-value is 0.0O58, below the significance level of 0.05, which shows that there is no co co-integration link among variables. It is concluded that the null hypothesis cannot be accepted. However, the trace statistic value of 7.6048, which is greater than the critical value of 0.05, which is 3.8414, which shows that no co-integration link exists among variables, cannot be accepted. In the next column, the Maximum Eigenvalue test indicates both values at a level, and the first difference indicates 0.0256 and 0.0058, respectively. These values are lesser than the significance value of 0.05, meaning that no co-integration relation exists between SMR and IRR and could be accepted as a null hypothesis and alternative hypothesis.

Returns and inflation rate.

In the trace statistic, the null hypothesis shows that no co-integration link exists because the p-value is less than 0.05, which means that the null hypothesis can be rejected. In addition, the trace statistic value of 20.4809 is greater than the 0.05 critical value of 15.494, which confirms that no co-integration link between stock exchange return and IR cannot be accepted. Moreover, at most 1, the trace statistic p-value is 0.0342, below the significance level of 0.05. It shows that there is no co-integration link among variables. It is concluded that the null hypothesis cannot be accepted. However, the trace statistic value of 4.4844, which is greater than the critical value of 0.05, which is 3.8414, which shows that no co-integration link exists among variables, can be rejected.

In the next column, the Maximum Eigenvalue test indicates that both values at a level and the first difference indicate 0.0264 and 0.0342, respectively. This value is lesser than the significance value of 0.05, meaning that no co-integration relation exists between SMR and IR and could not be accepted as a null hypothesis and alternative hypothesis.

Returns and GDP

In the trace statistic, the null hypothesis shows that no co-integration link exists because the p-value is less than 0.05, which means that the null hypothesis can be rejected. In addition, the trace statistic value of 24.1594 is more than the 0.05 critical value of 15.494, which confirms that no co-integration link between stock exchange return and gross domestic product cannot be accepted. Moreover, at most 1, the trace statistic p-value is 0.7840, above the significance level of 0.05. It shows a co-integration link among variables, and it is concluded that the null hypothesis can be accepted. However, the trace statistic value of 0.0751, less than the critical value of 0.05, is 3.8414, which shows that co-integration among variables can be accepted.

In the next column, the Maximum Eigenvalue test indicates both values at a level, and the first difference indicates 0.0011 and 0.7840, respectively. These values are more significant than the significance value of 0.05, meaning that a co-integration relation exists between SMR and gross domestic product and could not be rejected as a null hypothesis or alternative hypothesis.

Returns and FDI

In the trace statistic, the null hypothesis shows that no co-integration link exists because the p-value is less than 0.05, which means that the null hypothesis can be rejected. In addition, the trace statistic value of 27.2151 is more than the 0.05 critical value of 15.494, which confirms that no co-integration link between stock exchange return and foreign direct investment cannot be accepted. Moreover, at most 1, the trace statistic p-value is 0.0066, which is less than the significance level of 0.05. It shows that there is no co-integration link among variables, and on this basis, it is concluded that the alternative hypothesis cannot be accepted. However, the trace statistic value of 7.3734, which is greater than the critical value of 0.05, is 3.8414, which shows that no co-integration link exists among variables that cannot be accepted.

In the next column, the Maximum Eigenvalue test indicates both values at a level, and the first difference indicates 0.0059 and 0.0066, respectively. These values are more significant than the significance value of 0.05, meaning that a co-integration relation exists between SMR and foreign direct investment. It could not be accepted as a null hypothesis or alternative hypothesis.

Another method has also been applied for further authentication to ensure that the results are significant, and the findings are authentic. The results of co-integration using Engle granger have been mentioned below.

Co-integration test has an error correction system. The above Augmented Dickey-Filler and co-integration test results show that macroeconomic variables and stock exchange prices have a valid error correction system.

ANALYSIS

After applying the above tests, now Granger causality test is applied in this section to find out the result of macroeconomic variables and the SMR relationship. Granger causality is the most

suitable test to check the presence of the short-run link between two macroeconomic variables. The Granger causality test is a method used to determine the direction of macroeconomic variables, i.e., unidirectional, bidirectional and no causality.

The above results show that ER Granger causes SMR with a significant p-value O.7531, and the null hypothesis is rejected. As ER Granger causes stock market returns, H_1 is accepted. It also shows that SMR does not Granger causes to ER with an insignificant p-value of O.7645, and the null hypothesis is rejected. Therefore, in this table, ER and returns both Granger causes each other.

Table 4.18 shows that IRR does not Granger cause to return with in-significant p-value 0.2205. That is why the null hypothesis cannot be rejected. Based on the above results, it is concluded that H_4 is rejected. However, SMR does not Granger cause IRR with an insignificant p-value of 0.6152, which is lesser than the significance value at 5%, and thus, the null hypothesis is rejected.

Table 4.19 shows that IR does not Granger cause SMR because its p-value is insignificant, and the null hypothesis cannot be rejected. Based on the above results, it is observed that H_3 is rejected. Moreover, IR Granger causes SMR with an insignificant p-value of 0.7934, and the null hypothesis is rejected.

The results in table 4.20 show that gross domestic product Granger causes stock exchange return with a significant p-value of 0.0111, and the null hypothesis is rejected. Based on the above results, it is observed that H_2 is accepted. On the other side, SMR Granger causes gross domestic product with a significant p-value of 0.4591, thus rejecting the null hypothesis. Table 4.21 shows that foreign direct investment Granger does not cause returns with an insignificant value of O.315, which is greater than the significance value of 5%, which is why the null hypothesis cannot be rejected. Based on the above study, it is observed that H_5 is rejected. Likewise, SMR does not Granger cause to foreign direct investment with in-significant p-value O.1893.

Summary of Hypotheses

H_1: *ER has a significant impact on stock market returns.*

Results: H_1 is accepted, and ER significantly impacts stock market returns.

H_2: *Gross domestic product has a significant impact on stock market returns.*

Results: H_2 is accepted, and the gross domestic product significantly impacts stock market returns.

H_3: *The inflation rate has a significant impact on stock market returns.*

Results: H_3 is rejected, and the inflation rate does not significantly impact stock market returns.

H_4: *IRR has a significant impact on stock market returns.*

Results: H_4 is rejected, and IRR does not significantly impact stock market returns.

H_5: *Foreign direct investment has a significant impact on stock market returns.*

Results: H_5 is rejected, and foreign direct investment does not significantly impact stock market returns.

In this study, it is observed that there is a positive and significant link exists between ER and SMR by using co-integration and the Granger causality test. Many researchers studied ER and stock market returns and observed similar results in their studies (Allam, 2016; Mubarik & Javid, 2018). Because ER directly impacts the economy of any country, especially Pakistan, where currency depreciation is a huge problem for financial debts. The stock exchange is also affected by the increase in Dollar price or depreciation in local currency, which is the Pakistani Rupee. Based on the results, it is observed that this study has a positive and significant impact on stock market returns. So H_1 is accepted.

Interest rates and SMR have been examined by researchers many times before. According to Sensoy and Sobaci (2014), it was observed that there is a considerable relationship between SMR and IRR. A study conducted by Attari and Safdar (2013) had the same results consistent with previous studies that are a positive and in-significant link between IRR and stock market returns. In this study, it is are also observed similar results by using co-integration and Granger cause. The result shows a positive and insignificant relationship between IRR and stock market returns. If the IRR increases, people will save more and invest less because of the high IRR. Conversely, if IRR decreases, people will borrow money from the bank and start investing to take opportunities from low IRRs.

Many researchers examined the link between IR and SMR by using different techniques. Mubarik and Javid (2018) study was conducted among IR and SMR and concluded that there is an inverse and insignificant relationship. But in this study, the results are contradictory. The GDP deflator is used as a proxy of IR. Using co-integration and Granger causality, it is observed that there is an insignificant but positive link between IR and stock market returns. So, based on the current findings, the hypothesis is rejected. In case of higher inflation rates, investors tend to invest in stock exchange more to increase their earnings; thus, higher IR leads to higher stock market returns.

Gross domestic product plays a vital role in the economy of any country, and it is also one of the most critical factors in determining the condition of a country. Hsing (2014) concluded a positive link between the gross domestic product and stock exchange return. Another study investigated the relationship between gross domestic product and SMR and observed a positive and significant link (Kibria et al., 2014). Similarly, this study's results showed a significant and positive link between gross domestic product and SMR by using the co-integration and Granger causality test.

Foreign direct investment also plays a vital role in a country's economy. It makes opportunities in different business sectors. It also boosts the economy of the country. According to Boateng, Hua, Nisar and Wu (2015), it was observed that there is a positive and significant link between foreign direct investment and stock market returns. In the same study, Issahaku, Ustarz, and Domanban (2013) also observed the positive and significant link between foreign direct investment and stock market returns. This study concluded that the link between foreign direct investment, using co-integration and Granger causality and a significant negative impact has been observed.

The study findings will help enhance investors' confidence and monetary authorities and will encourage the investors to make further investments in the stock exchange market. Furthermore, it

will help government bodies while making policies and decisions. Pakistan's Securities and Exchange Commission will also be the beneficiary of encouraging investment. As the stock mark performs better, this will boost the economic growth of Pakistan. During the study period, several factors have been attributed to the sentiments of the Pakistan Stock market. Among those factors, aggressive privatization and procedures of state-owned enterprises were among the top. These alternative measures were taken along with strengthening the structure of the Security Exchange Commission of Pakistan (SECP).

This study analyzes the impact of selected macroeconomic variables on the SMR of KSE 100 index companies of Pakistan. In this study, SMR has been taken as the dependent variable, and independent variables such as Exchange rate, IRR, Inflation rate, Gross domestic product and Foreign direct investment represent macroeconomic variables. There are more than 500 listed companies on the Pakistan stock exchange, out of which 100 listed companies were chosen, commonly known as KSE 100 companies. The study period was 23 years, starting from 1995 to 2017. Arbitrage pricing theory is applied in this study because this study constructs to see the variable macroeconomic impact on stock market returns. Different tests have been applied to find the results of this study, such as Stationarity: to check whether data is standard or not, the unit root test has been applied by using the Augmented Dickey-Filler test to see the association between macroeconomic variables and stock market returns. A correlation test is also used to check whether any correlation exists between macroeconomic variables and stock market returns.

To investigate the granger, cause bidirectional, directional, no relation among macroeconomic variables and stock market returns, granger cause tests have been applied to check which macroeconomic variable causes a change in SMR and vice versa. In this study, ER and SMR were observed to have a positive and significant link using co-integration and the Granger causality test. The link between IRR, IR, and gross domestic product with SMR has also been positive and significant using co-integration and Granger causality tests. However, foreign direct investment has been observed to have a negative and insignificant link with stock market returns. In short, it can be said that only real GDP and FDI have a long-term and significant impact on stock market returns. However, in the short run, return affects GDP growth rate, FDI, and IRRs. The findings are similar and contradictory to the previous findings for specific reasons. The primary reason behind inconsistent results was the risk behavior of investors. Variations in government policies concerning fiscal and monetary are also the reason for the inconsistent results of the study.

Future Direction

Future researchers can expand this study by keeping in mind the following considerations:

Future researchers can analyze the link between macroeconomic variables and SMR by using different macroeconomic variables such as the supply of money, prices of oil in the international market, and rates of gold in the international market. Future researchers can use monthly data to test these macroeconomic variables to get more explained variation.

Limitations

Following are the limitations of this study:

First, this study has analyzed the listed companies on the KSE 100 index of the Pakistan stock exchange. Non-listed companies of Pakistan were not included. Secondly, in this study, a few macroeconomic variables are chosen. Although, some other variables can be applied to check the link between macroeconomic variables and SMR, such as the supply of money, prices of oil, and rates of gold in the market. Thirdly, the data used in this study was only yearly instead of quarterly, monthly, or daily.

Annexture

Table 4.2 *Unit root test for stock market returns*
Null Hypothesis: RETURNS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.015824	0.0489
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RETURNS)
Method: Least Squares
Date: 10/30/19 Time: 06:07
Sample (adjusted): 2 23
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RETURNS (-1)	-0.610499	0.202432	-3.015824	0.0068
C	13.69738	6.927112	1.977358	0.0619

R-squared	0.312601	Mean dependent var	0.889871
Adjusted R-squared	0.278231	SD dependent var	30.21409
SE of regression	25.66898	Akaike info criterion	9.414951
Sum squared resid	13177.93	Schwarz criterion	9.514137
Log-likelihood	-101.5645	Hannan-Quinn criter.	9.438316
F-statistic	9.095196	Durbin-Watson stat	1.972749
Prob(F-statistic)	0.006828		

Table 4. 2 *Unit root test for stock market returns*
Null Hypothesis: D(RETURNS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.695971	0.0002
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RETURNS,2)
Method: Least Squares
Date: 10/30/19 Time: 06:08
Sample (adjusted): 3 23
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RETURNS (-1))	-1.264045	0.221919	-5.695971	0.0000
C	1.039544	6.687446	0.155447	0.8781

R-squared	0.630667	Mean dependent var	0.515438
Adjusted R-squared	0.611228	SD dependent var	49.14524
SE of regression	30.64282	Akaike info criterion	9.773067
Sum squared resid	17840.67	Schwarz criterion	9.872545
Log-likelihood	-100.6172	Hannan-Quinn criter.	9.794656
F-statistic	32.44408	Durbin-Watson stat	2.156403
Prob(F-statistic)	0.000017		

Table 4. 3 *Unit root test for exchange rate*
Null Hypothesis: EXCHANGE_RATE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.002948	0.9950
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHANGE_RATE)
Method: Least Squares
Date: 10/30/19 Time: 06:13
Sample (adjusted): 2 23
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHANGE_RATE (-1)	0.032572	0.032476	1.002948	0.3279
C	1.829964	2.433889	0.751869	0.4609

R-squared	0.047887	Mean dependent var	4.126692
Adjusted R-squared	0.000281	SD dependent var	3.867861
SE of regression	3.867317	Akaike info criterion	5.629507
Sum squared resid	299.1228	Schwarz criterion	5.728693
Log-likelihood	-59.92458	Hannan-Quinn criter.	5.652872
F-statistic	1.005906	Durbin-Watson stat	1.458410
Prob(F-statistic)	0.327867		

Table 4. 4 *Unit root test for exchange rate*
Null Hypothesis: D(EXCHANGE_RATE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.111362	0.0411
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHANGE_RATE,2)
Method: Least Squares
Date: 10/30/19 Time: 06:12
Sample (adjusted): 3 23
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (EXCHANGE_RATE (-1))	-0.677027	0.217598	-3.111362	0.0057
C	2.671430	1.242732	2.149643	0.0447

R-squared	0.337531	Mean dependent var	-0.192145
Adjusted R-squared	0.302664	SD dependent var	4.582520
SE of regression	3.826709	Akaike info criterion	5.612280
Sum squared resid	278.2303	Schwarz criterion	5.711758
Log-likelihood	-56.92894	Hannan-Quinn criter.	5.633869
F-statistic	9.680576	Durbin-Watson stat	1.798190
Prob(F-statistic)	0.005748		

Table 4. 5 *Unit root test for IRR*
Null Hypothesis: INTEREST_RATE has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.555703	0.0184
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST_RATE)
Method: Least Squares
Date: 10/30/19 Time: 06:10
Sample (adjusted): 6 23
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTEREST_RATE (-1)	-0.682169	0.191852	-3.555703	0.0040
D (INTEREST_RATE (-1))	0.476585	0.198872	2.396437	0.0337
D (INTEREST_RATE (-2))	0.132962	0.234445	0.567136	0.5811
D (INTEREST_RATE (-3))	0.360415	0.203268	1.773101	0.1016
D (INTEREST_RATE (-4))	0.501808	0.229177	2.189607	0.0490
C	6.260317	1.857044	3.371120	0.0056

R-squared	0.613639	Mean dependent var	-0.263889
Adjusted R-squared	0.452655	SD dependent var	2.392270
SE of regression	1.769867	Akaike info criterion	4.240887
Sum squared resid	37.58914	Schwarz criterion	4.537678
Log-likelihood	-32.16798	Hannan-Quinn criter.	4.281810
F-statistic	3.811810	Durbin-Watson stat	2.186839
Prob(F-statistic)	0.026729		

Table 4. 6 *Unit root test for interest rate*
Null Hypothesis: D(INTEREST_RATE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.506939	0.0182
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INTEREST_RATE,2)
Method: Least Squares
Date: 10/30/19 Time: 06:10
Sample (adjusted): 3 23
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (INTEREST_RATE (-1))	-0.785761	0.224059	-3.506939	0.0024
C	-0.303354	0.527754	-0.574802	0.5722

R-squared	0.392944	Mean dependent var	0.042381
Adjusted R-squared	0.360994	SD dependent var	2.972186
SE of regression	2.375901	Akaike info criterion	4.659023
Sum squared resid	107.2532	Schwarz criterion	4.758502
Log-likelihood	-46.91975	Hannan-Quinn criter.	4.680613
F-statistic	12.29862	Durbin-Watson stat	1.823588
Prob(F-statistic)	0.002358		

Table 4. 7 *Unit root test for the inflation rate*
Null Hypothesis: INFLATION_RATE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.009809	0.0059
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION_RATE)
Method: Least Squares
Date: 10/30/19 Time: 06:11
Sample (adjusted): 2 23
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION_RATE (-1)	-0.903700	0.225372	-4.009809	0.0007
C	8.642752	2.602112	3.321437	0.0034

R-squared	0.445654	Mean dependent var	-0.448824
Adjusted R-squared	0.417937	SD dependent var	7.849545
SE of regression	5.988658	Akaike info criterion	6.504120
Sum squared resid	717.2805	Schwarz criterion	6.603305
Log-likelihood	-69.54532	Hannan-Quinn criter.	6.527485
F-statistic	16.07857	Durbin-Watson stat	1.942372
Prob(F-statistic)	0.000688		

Table 4. 8 *Unit root test for the inflation rate*
Null Hypothesis: D(INFLATION_RATE) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.787512	0.0001
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION_RATE,2)
Method: Least Squares
Date: 10/30/19 Time: 06:10
Sample (adjusted): 4 23
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (INFLATION_RATE (-1))	-2.109961	0.364571	-5.787512	0.0000
D (INFLATION_RATE (-1),2)	0.454276	0.212248	2.140302	0.0471
C	-0.871696	1.520069	-0.573458	0.5738

R-squared	0.785347	Mean dependent var	-0.193469
Adjusted R-squared	0.760093	SD dependent var	13.81915
SE of regression	6.768660	Akaike info criterion	6.799964
Sum squared resid	778.8509	Schwarz criterion	6.949324
Log-likelihood	-64.99964	Hannan-Quinn criter.	6.829121
F-statistic	31.09871	Durbin-Watson stat	1.923628
Prob(F-statistic)	0.000002		

Table 4. 9 *Unit root test for GDP*
Null Hypothesis: REAL_GDP_GROWTH has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.781397	0.0772
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REAL_GDP_GROWTH)
Method: Least Squares
Date: 10/30/19 Time: 06:09
Sample (adjusted): 2 23
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REAL_GDP_GROWTH (-1)	-0.561543	0.201892	-2.781397	0.0115
C	2.425719	0.945187	2.566390	0.0184

R-squared	0.278920	Mean dependent var	0.013636
Adjusted R-squared	0.242866	SD dependent var	2.026326
SE of regression	1.763176	Akaike info criterion	4.058618
Sum squared resid	62.17578	Schwarz criterion	4.157804
Log-likelihood	-42.64480	Hannan-Quinn criter.	4.081984
F-statistic	7.736171	Durbin-Watson stat	1.826460
Prob(F-statistic)	0.011521		

Table 4. 10 *Unit root test for GDP*
Null Hypothesis: D(REAL_GDP_GROWTH) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.256462	0.0004
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REAL_GDP_GROWTH,2)
Method: Least Squares
Date: 10/30/19 Time: 06:09
Sample (adjusted): 3 23
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (REAL_GDP_GROWTH (-1))	-1.175262	0.223584	-5.256462	0.0000
C	-0.061316	0.451381	-0.135840	0.8934

R-squared	0.592540	Mean dependent var	-0.033333
Adjusted R-squared	0.571095	SD dependent var	3.158217
SE of regression	2.068342	Akaike info criterion	4.381765
Sum squared resid	81.28275	Schwarz criterion	4.481243
Log-likelihood	-44.00853	Hannan-Quinn criter.	4.403354
F-statistic	27.63039	Durbin-Watson stat	1.619170
Prob(F-statistic)	0.000045		

Table 4. 11 *Unit root test for FDI*
Null Hypothesis: FDI has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.412026	0.1505
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI)
Method: Least Squares
Date: 10/30/19 Time: 06:11
Sample (adjusted): 3 23

Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI (-1)	-0.318183	0.131915	-2.412026	0.0268
D (FDI (-1))	0.508934	0.202499	2.513264	0.0217
C	0.383098	0.203400	1.883466	0.0759

R-squared	0.336224	Mean dependent var	-0.025379
Adjusted R-squared	0.262471	SD dependent var	0.617100
SE of regression	0.529962	Akaike info criterion	1.699541
Sum squared resid	5.055477	Schwarz criterion	1.848759
Log-likelihood	-14.84518	Hannan-Quinn criter.	1.731925
F-statistic	4.558792	Durbin-Watson stat	2.100885
Prob(F-statistic)	0.025015		

Table 4. 12 *Unit root test for FDI*
Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.052448	0.0462
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI,2)
Method: Least Squares
Date: 10/30/19 Time: 06:12
Sample (adjusted): 3 23
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (FDI (-1))	-0.652948	0.213910	-3.052448	0.0066
C	-0.020439	0.129518	-0.157812	0.8763

R-squared	0.329035	Mean dependent var	-0.011146
Adjusted R-squared	0.293721	SD dependent var	0.706043
SE of regression	0.593362	Akaike info criterion	1.884367
Sum squared resid	6.689483	Schwarz criterion	1.983846
Log-likelihood	-17.78586	Hannan-Quinn criter.	1.905957
F-statistic	9.317436	Durbin-Watson stat	1.858975
Prob(F-statistic)	0.006553		

Table 4. 13 *Co-integration Results under the Johansen Approach*
Sample (adjusted): 3 23
Included observations: 21 after adjustments
Trend assumption: Linear deterministic trend
Series: RETURNS REAL_GDP_GROWTH INTEREST_RATE INFLATION_RATE FDI EXCHANGE_RATE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE (s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.973892	171.0600	95.75366	0. 000
At most 1 *	0.896581	94.50430	69.81889	0. 000
At most 2	0.655205	46.85593	47.85613	0. 061
At most 3	0.484575	24.49503	29.79707	0.180
At most 4	0.371495	10.57700	15.49471	0.238
At most 5	0. 038495	0.824368	3.841466	0.363

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE (s)	Eigenvalue	Max-Eigen Statistic	0. 05 Critical Value	Prob.**
None *	0.973892	76.55567	40. 07757	0. 000
At most 1 *	0.896581	47.64837	33.87687	0. 000
At most 2	0.655205	22.36091	27.58434	0.202
At most 3	0.484575	13.91802	21.13162	0.371
At most 4	0.371495	9.752636	14.26460	0.228
At most 5	0.038495	0.824368	3.841466	0.363

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Cointegrating Coefficients (normalized by b'*S11*b=I):

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	FDI	EXCHANGE_RATE
-0.013493	1.397498	-0.108756	0.198128	-0.906	0.002810
0.064745	-0.026344	0.192919	-0.017413	-0.320	0.016359
0.022767	0.440903	0.189818	-0.191737	0.823	0.006754
0.032349	-0.017812	0.219109	0.235497	0.742	0.017568
0.005230	0.294173	0.382291	-0.099281	-0.581	0.002373
0.041141	-0.526894	0.052414	-0.053870	0.230	-0.050205

Unrestricted Adjustment Coefficients (alpha):

D(RETURNS)	0.101743	-6.896584	-8.139176	-8.703	1.763922
D(REAL_GDP_GROWTH)	-0.494209	0.868153	-0.412675	-0.477	-0.504490
D(INTEREST_RATE)	0.919283	-0.196023	0.577955	0.299	-0.838046
D(INFLATION_RATE)	0.191197	-1.850054	4.077316	-1.575	0.902399
D(FDI)	0.293077	0.279257	-0.205691	-0.157	-0.047576
D(EXCHANGE_RATE)	-0.382773	1.093264	1.557431	1.756	0.352101

1 Cointegrating Equation(s): Log-likelihood -264.4412

Normalized cointegrating coefficients (standard error in parentheses)

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	FDI	EXCHANGE_RATE
1.000000	-103.5684	8.059881	-14.68320	7.170	-0.208222
	(5.19749)	(1.38010)	(1.27322)	5.134)	(0.18868)

Adjustment coefficients (standard error in parentheses)

D(RETURNS)	-0.001373
	(0.08547)
D(REAL_GDP_GROWTH)	0.006669
	(0.00567)
D(INTEREST_RATE)	-0.012404
	(0.00610)
D(INFLATION_RATE)	-0.002580
	(0.02305)
D(FDI)	-0.003955
	(0.00173)
D(EXCHANGE_RATE)	0.005165
	(0.01305)

2 Cointegrating Equation(s): Log-likelihood -24O.617O

Normalized cointegrating coefficients (standard error in parentheses)

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE		EXCHANGE_RATE
1.000000	0.000000	2.959615	-0.212098	29	0.254483
		(0.58664)	(0.52742)	01)	(0.07608)
0.000000	1.000000	-0.049245	0.139725	99	0.004468
		(0.01427)	(0.01283)	48)	(0.00185)

Adjustment coefficients (standard error in parentheses)

D(RETURNS)	-0.447895	0.323866
	(0.39937)	(8.44034)
D(REAL_GDP_GROWTH)	0.062877	-0.713526
	(0.02275)	(0.48085)
D(INTEREST_RATE)	-0.025096	1.289861
	(0.02966)	(0.62681)
D(INFLATION_RATE)	-0.122362	0.315935
	(0.10775)	(2.27714)
D(FDI)	0.014126	0.402218

	(0.00673)	(0.14234)			
D(EXCHANGE_RATE)	0.075949	-0.563725			
	(0.06074)	(1.28360)			

3 Cointegrating Equation(s): Log-likelihood -229.4365

Normalized cointegrating coefficients (standard error in parentheses)

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	DI	EXCHANGE_RATE
1.000000	0.000000	0.000000	4.890302	0.90	0.275203
			(1.61313)	6.45)	(0.23666)
0.000000	1.000000	0.000000	0.054826	0.271	0.004123
			(0.02529)	0.10)	(0.00371)
0.000000	0.000000	1.000000	-1.724008	0.674	-0.007001
			(0.48689)	1.94)	(0.07143)

Adjustment coefficients (standard error in parentheses)

D(RETURNS)	-0.633199	-3.264722	-2.886507	
	(0.39174)	(8.20861)	(1.63361)	
D(REAL_GDP_GROWTH)	0.053482	-0.895476	0.142898	
	(0.02269)	(0.47548)	(0.09463)	
D(INTEREST_RATE)	-0.011938	1.544683	-0.028088	
	(0.02929)	(0.61383)	(0.12216)	
D(INFLATION_RATE)	-0.029534	2.113637	0.396243	
	(0.08203)	(1.71881)	(0.34206)	
D(FDI)	0.009443	0.311528	-0.017044	
	(0.00590)	(0.12363)	(0.02460)	
D(EXCHANGE_RATE)	0.111407	0.122951	0.548168	
	(0.05668)	(1.18776)	(0.23638)	

4 Cointegrating Equation(s): Log-likelihood -222.4775

Normalized cointegrating coefficients (standard error in parentheses)

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	DI	EXCHANGE_RATE
1.000000	0.000000	0.000000	0.000000	9.14	0.165042
				6.19)	(0.21803)
0.000000	1.000000	0.000000	0.000000	0.252	0.002888
				0.13)	(0.00477)
0.000000	0.000000	1.000000	0.000000	0.055	0.031835
				1.85)	(0.06522)
0.000000	0.000000	0.000000	1.000000	0.358	0.022527
				0.99)	(0.03520)

Adjustment coefficients (standard error in parentheses)

D(RETURNS)	-0.914747	-3.109697	-4.793523	0.348
	(0.38947)	(7.40760)	(1.84367)	1.83)
D(REAL_GDP_GROWTH)	0.038036	-0.886971	0.038278	0.146
	(0.02282)	(0.43410)	(0.10804)	0.10)
D(INTEREST_RATE)	-0.002248	1.539347	0.037546	0.145
	(0.03163)	(0.60168)	(0.14975)	0.14)
D(INFLATION_RATE)	-0.080507	2.141703	0.050988	.082
	(0.08387)	(1.59513)	(0.39701)	0.39)
D(FDI)	0.004357	0.314328	-0.051492	0.055
	(0.00556)	(0.10584)	(0.02634)	0.02)
D(EXCHANGE_RATE)	0.168234	0.091661	0.933081	0.020
	(0.04991)	(0.94919)	(0.23624)	0.23)

5 Cointegrating Equation(s): Log-likelihood -217.6O12

Normalized cointegrating coefficients (standard error in parentheses)

RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	FDI	EXCHANGE_RATE
1.000000	0.000000	0.000000	0.000000	0.00	0.242932
					(0.16285)
0.000000	1.000000	0.000000	0.000000	0.00	0.003562
					(0.00568)
0.000000	0.000000	1.000000	0.000000	0.00	0.010308
					(0.04268)
0.000000	0.000000	0.000000	1.000000	0.00	0.023486
					(0.03525)
0.000000	0.000000	0.000000	0.000000	.00	0.002672
					(0.00819)

Adjustment coefficients (standard error in parentheses)

D(RETURNS)	-0.905521	-2.590799	-4.119192	0.52	-12.06848
	(0.38853)	(7.51983)	(2.65801)	1.8)	(7.93833)
D(REAL_GDP_GROWTH)	0.035398	-1.035379	-0.154584	0.09	-0.230590
	(0.02016)	(0.39023)	(0.13793)	0.09)	(0.41194)
D(INTEREST_RATE)	-0.006631	1.292817	-0.282831	0.228	0.415060
	(0.02613)	(0.50582)	(0.17879)	0.12)	(0.53397)
D(INFLATION_RATE)	-0.075787	2.407165	0.395967	.172	2.080797
	(0.08181)	(1.58333)	(0.55965)	0.39)	(1.67144)
D(FDI)	0.004108	0.300332	-0.069680	0.060	-0.613352
	(0.00548)	(0.10613)	(0.03751)	0.02)	(0.11204)
D(EXCHANGE_RATE)	0.170076	0.195240	1.067685	0.014	2.377681
	(0.04945)	(0.95705)	(0.33829)	0.24)	(1.01031)

Series: RETURNS REAL_GDP_GROWTH INTEREST_RATE INFLATION_RATE FDI EXCHANGE_RATE
Sample (adjusted): 1 23
Included observations: 23 after adjustments
Null hypothesis: Series are not cointegratedcointegrated
CointegratingCointegrating equation deterministic: C
Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
RETURNS	-4.132996	0.310	-20.05306	0.2779
REAL_GDP_GROWTH	-5.074319	0.098	-44.84752	0.0000
INTEREST_RATE	-2.830570	0.822	-11.93225	0.8410
INFLATION_RATE	-4.730386	0.155	-49.28973	0.0000
FDI	-3.001559	0.763	-19.04536	0.3220
EXCHANGE_RATE	-0.699794	0.999	-1.528284	0.9999

*MacKinnon (1996) p-values.
Warning: p-values may not be accurate for fewer than 30 observations.
Intermediate Results:

	RETURNS	REAL_GDP_GROWTH	INTEREST_RATE	INFLATION_RATE	FDI	EXCHANGE_RATE
Rho – 1	0.911	-1.166970	-0.542375	-1.535049	0.572	-0.069467
					0.19	
Rho S.E.	0.221	0.229976	0.191613	0.324508	0	0.099268
					0.37	
Residual variance	24.69	1.304689	4.606699	24.20595	1	114.9374
					0.93	
Long-run residual variance	24.69	4.369441	4.606699	56.59157	0	114.9374

**number of stochastic trends in asymptotic distribution

Table 4. 14 *Results of pair-wise Granger Causality for exchange rate*

Null Hypothesis:
EXCHANGE_RATE does not Granger Cause RETURNS
RETURNS do not Granger Cause EXCHANGE_RATE

Table 4. 15 *Results of Pair-wise Granger Causality for interest rate.*

Null Hypothesis:
INTEREST_RATE does not Granger Cause RETURNS
RETURNS do not Granger Cause INTEREST_RATE

Table 4. 16 *Results of Pair-wise Granger Causality for the inflation rate*

Null Hypothesis:
INFLATION_RATE does not Granger Cause RETURNS
RETURNS do not Granger Cause INFLATION_RATE

Table 4. 17 *Results of Pair-wise Granger Causality for GDP*

Null Hypothesis:
REAL_GDP_GROWTH does not Granger Cause RETURNS
RETURNS do not Granger Cause REAL_GDP_GROWTH

Table 4. 18 *Results of Pair-wise Granger Causality for FDI*

Null Hypothesis:
FDI does not Granger Cause RETURNS
RETURNS do not Granger Cause FDI

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