Analysing the Impact of Sudden Capital Inflow Shocks on Kenya's Economic Growth: A Quarterly Time Series Analysis (2008 - 2022)

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ABSTRACT

Economic growth indicates the ability of a country to alleviate the poverty rate, reduce the unemployment rate, attain a surplus in balance of payments, and achieve a sustainable increase in gross domestic product (GDP). To achieve improved and continued growth of the economy in a country, there is a need to consider the stability of macroeconomic factors. Therefore, this study sought to examine the effect of capital inflow shocks on Kenya's economic growth. The study employed a correlational design using time series quarterly data for a period of fourteen years, spanning from 2008 to 2022. The unit root test realized that capital inflow shock was stationary at levels since p-value<0.05. Correlational analysis results revealed that capital inflow shock had a significant, positive impact on the growth of the economy in Kenya, with a numerical result of 0.7001 and a p-value of 0.0000. Further, the regression analysis results gave a correlational coefficient of 0.3022 and a p-value of 0.0000. Thus, the study recommends that the government reform the existing policies to favor foreign investors and to avoid depending so much on externality to reduce susceptibility to external shocks. In order for Kenya to fulfill the millennial development goals, the government must foster an atmosphere that will attract foreign investors through programs like public-private partnerships (PPP), tax regulations, and other incentives to boost capital inflows.

Keywords: Capital Inflow Shock, Economic Growth, External Shocks, Gross Domestic Product

I.INTRODUCTION

Economic growth has been fractured by different shocks, yet it has been the most studied area across the globe. Due to external trade shocks, developing countries in particular experience volatility in macroeconomic variables with effects on economic welfare, which can cause a sudden impact on macroeconomic variables. According to Aizenman et al. (2017), the general growth of GDP among countries has been revealed to be more reliant on exogenous factors such as worldwide oil and non-oil prices, external capital inflows, global financial exchange volatility, and global growth. Their study revealed that these external factors result in economic shocks, which influence growth volatility in an economy. In the period between 1950 and 2016, the proportionally increased growth of developed countries occurred not from experiencing faster growth but rather from shrinking less and less often (World Bank, 2017). Therefore, understanding trade shocks that influence macroeconomic factors and growth volatility and identifying alternatives to boost and develop the global resilience of economies becomes critical.

According to the study by Calderon et al. (2019), the sovereign European debt crisis in 2011/2012 and the oil price plunge internationally affected the current structure of capital inflows and general product prices in the global aspect, which later led to economic growth declines in the world. Emerging markets potentially benefit from capital inflows through the settlement of credit constraints, supplementing investment resources, and facilitating growth (International Monetary Fund [IMF], 2016). However, capital inflows through foreign investments across the globe require strategic policies to mitigate the negative effects on economic growth (United Nations Conference on Trade and Development [UNCTAD]/World Investment Report [WIR], 2021). This is because allowing too much dominance of external investors may raise competition, while an unfavorable environment causes a sudden decline of foreign investors, reducing incoming capital and affecting the growth of an economy.

According to Massa (2015) and Aizenman et al. (2017), the global financial crisis that occurred between 2007 and 2009 caused great volatility in economic growth, which has affected global commodity prices, capital inflows, and exchange rate stability to date. De Resende (2014) revealed that the IMF reported a financial crisis that dramatically dropped economic growth from 13.8% in 2007 to 6.1% in 2008 and 2.1% in 2009 in both developed and developing countries. Further, the international financial instability stretched to less developed countries through flows of foreign capital, remittances, commodity trading, and relief, hence causing a double-dip in prices and exchange rates, which never ends but highly affects economic growth (Massa, 2015). International integration of third-world countries through trade and capital inflows has improved growth but increased the risks and ways through which global shocks are transmitted to local economies.

Based on UNCTAD/WIR (2022), only 5% of all FDI flows come to Africa. Currently, the KNBS (2022) recorded a decline in GDP in the second quarter of 2022, 5.2% compared to 11.0% in the second quarter of 2021. The KNBS report shows that Kenya highly depends on foreign investments and savings, which expand trade links in the open market, increasing the nation's vulnerability to the impacts of external shocks. A fragile global economic environment and a double-dip recession in the local economy have affected capital inflows and overall investment levels (World Bank, 2021). Therefore, it is evident that there is an urgent need for Kenya to examine the root cause of economic volatility in foreign direct investments due to its limited ability to hedge against vulnerability to external trade shocks. The World Bank Outlook report (2022) asserted that policymakers should take the opportunity to increase economic growth at home due to the rise of the specter of stagflation.

Trade shocks are very important occurrences to take into consideration while planning for economic growth, yet existing policies have not been very effective due to the indefinite continuity of macroeconomic fluctuations, which need to be examined more critically (World Bank, 2021). Many African-developing economies face common recurring problems in relation to fluctuating and uncertain capital flows, which affect poverty alleviation policies and other economic growth projects (UNCTAD, 2021). Despite some LDCs having achieved an open economy, they still experience financial instability, a lag in economic growth, and high rates of unemployment, poverty, and market instability (World Bank, 2017). Recently, the World Bank (2022) has reported a decline in GDP growth in Kenya to 5.5% due to the ongoing drought and the Ukraine crisis, which have resulted in declining capital inflows and high dependency rates from external debts.

Further, an overview survey by UNCTAD (2022) shows that foreign capital inflows in Kenya, among other EACs, have declined from 37.52% in 2021 to 35% in 2022 due to its vulnerability to external shocks. Most related research in this aspect has been conducted in developed countries and few in developing countries, with contradicting results, yet LDCs are more vulnerable to shock effects. A study by Goel and Miyajima (2021) revealed that capital inflow shock has negatively affected the growth of the economy in South Africa, while Munene (2017) revealed a strong direct association between capital inflows and economic growth. Macroeconomic results of external trade shocks are still not well explored, despite efforts made to mitigate economic shocks in Kenya (Wambugu, 2016). Hence, there is a call for more studies to unravel the mystery behind external economic trade shocks. This study addressed these deficiencies using the 2008–2022 data set. The findings of the study therefore add more literature knowledge regarding the common external shocks, capital inflow shock, and how to modify the economy to adjust to this vulnerability level, especially in third-world nations.

II. LITERATURE REVIEW

External shocks, such as fluctuations in capital inflow or international economic crises, can significantly impact economic stability in Kenya. These shocks influence foreign direct investment (FDI) and other capital flows into Kenya, since investors are more likely to make informed decisions when they understand the effect of external factors on economic and business performance (Cheptiş, 2022). The knowledge of external shocks can encourage Kenya and other developing countries to reduce external reliance through economic diversification. Kenya has been actively seeking FDI to support economic growth and development through job opportunities and the general stimulation of economic activities. Therefore, understanding external shocks is essential for informing policy decisions, promoting sustainable growth, and effectively responding to changing economic conditions.

The World Bank (2022) reported that Kenya has been experiencing fluctuations and a low contribution of FDI inflows to GDP despite relief from the COVID-19 surge. The pandemic resulted in widespread disruptions to economic activities, travel restrictions, and uncertainty, which led to a decline in FDI flows. The review of the current economic outlook clarifies that the ongoing Russia-Ukraine war has resulted in huge economic contractions and sanctions, complicating the investment climate and financial flows among countries. UNCTAD (2022) reported that only 5% of all FDI inflows come to Africa. Therefore, developing countries with deficient capital inflows have taken heavy recourse

to foreign capital as a primary way to achieve economic growth. However, many LDCs, such as Kenya, Uganda, Ethiopia, and Tanzania, have less satisfying growth experiences and face huge recurring external shocks that pose negative impacts on capital inflows in these economies (Nyang'oro, 2017). Nyang'oro reckons that capital inflow is an icon of financing in Sub-Saharan countries that supports investments, thus supporting the growth and development of the recipient country; hence, its deep understanding becomes a necessity. The key objective of Nyang'oro's research was to test the range to which the volatility rate of capital inflow shock affects economic growth using generalized methods of the moment (GMM). The findings suggested that improving financial markets in a nation can help in attaining growth and development, while the debt market should address capital inflow issues. It recommends that an improved surge of capital inflows cannot be influenced by domestic policy reforms alone. This means that a sudden stop of capital inflow (shock) in an economy is uncertain and emerges exogenously; hence, it requires combined governmental efforts from different nations to recover.

According to Ong'ondo (2018), foreign inflows, such as debt, have resulted in a decline in economic growth due to a fall in capital inflows in Kenya. Goel and Miyajima (2021) in "Analyzing capital flow drivers using the 'at-risk' framework: South Africa's Case" reveals that the capital inflow shock has a negative and contemporaneous effect on economic growth in South Africa. Olaleye (2015) conducted a study on the impacts of capital inflow shocks on Nigeria's economic growth. The goals of this research were to assess the effects of FDI net inflow, government expenditure, trade openness, and exchange rate on economic growth in Nigeria. Olaleye used the vector auto-regressive model and revealed a unique long-term equilibrium connection between FDI net inflow and economic growth in Nigeria. Capital inflow shock effect on Kenya's economic growth was research undertaken by Waweru and Ochieng' (2017). Using an auto-regressive distributed lag model using a time series data set (1984–2014), The results of the study revealed that FDI inflows and portfolio investment flows are statistically insignificant and negatively influence economic growth.

Consequently, according to the central bank of Kenya survey, Kenya has been experiencing great fluctuations in capital inflows, and this poses a need for all interventions that will help policymakers respond appropriately to the shock.

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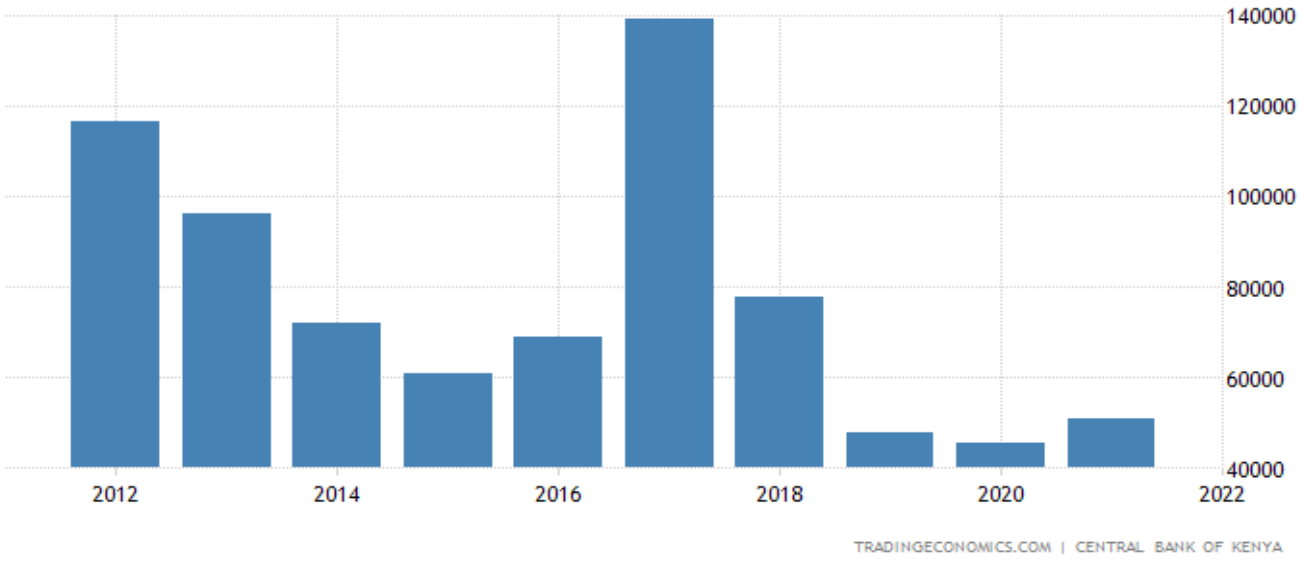

Figure 1
Current Trends of Capital Inflows in Kenya
Source; Central Bank of Kenya 2022

From the current trend shown above, it is evident that the decreasing side of capital inflows in Kenya over the years is more active than the increasing side. According to KNBS, the statistics of foreign investors have been declining even before the COVID-19 occurrence. Therefore, this study will inform policymakers on how to respond to the sudden influx of foreign capital, which requires measures to prevent overheating of the economy.

III. RESEARCH METHODOLOGY

The research employed a design known as correlational to show the direction and strength of the association between external trade shocks and economic growth in Kenya. Capital inflow shock was proxied by FDI inflows, and data was derived from the World Bank databank for a period of fourteen years (2008–2022). This study period enabled the researcher to analyze the effects of external trade shocks before and after major economic phenomena such as COVID-19 during national politics as well as the Russia-Ukraine crisis affecting macroeconomic indicators. The researcher obtained quarterly data on variables of interest.

3.1 Specification of Econometric Model

To examine the association of external trade shocks and the economic growth of Kenya, the research used a specific model that expressed economic growth as a function of capital inflow shock, commodity price shock, and interest rate shock. While the variable of focus was capital inflow shock, analysis was done using Eviews software version 10.0. The variables were transformed into natural logs (LN) to avoid problems of too large/small values.

Multivariate model was as follows;

$$LNEC_t = \beta 0 + \beta 1 LNCAPIt + \beta 2 LNCP + \beta 3 IRt + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots ii$$

Where;

$LNEC_t$- Natural log of Economic growth over time t, **LNCAPI**-natural log of capital inflow shock, **LNCP-** Natural log of Commodity price shock, **LNIR-** Natural log of Interest rate shock, **β0**-constant, **β1-3**-parameters, μ- Disturbance value, **t-** Time. The measure of goodness of fit (R^2) was used to denote the variation in economic growth over time explained by the variance in capital inflow shock, commodity price shock, and interest rate shock.

IV. RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

To establish the basic characteristics of the data set, descriptive analyses were undertaken. The application of descriptive statistics in this study also helped in identifying the outliers in the dataset and establishing the potential relationship between the variables under study. The study applied quarterly data obtained from the World Bank, Kenya National Bureau of Statistics (KNBS), and Central Bank of Kenya (CBK) websites to the variables under study. The standard deviation was used to determine how the data deviates from the mean, whereas the mean was applied to determine the relative frequency center of distribution. Table 1 below displays the descriptive characteristics of the variable under study.

Table 1

Descriptive Statistics Summary

Descriptive Analysis Summary		
Variables	**LNEC**	**LNCAPI**
Mean	0.637137	0.044433
Median	0.681241	0.222296
Maximum	1.041393	0.538636
Minimum	0.000000	-0.920618
Std. Dev.	0.202596	0.460968
Skewness	-1.261337	-0.985291
Kurtosis	4.811386	2.576325
Jarque-Bera	0.106230	6.035610
Probability	0.070163	0.106230
Sum	38.22825	2.659773
Sum Sq. Dev.	2.421660	12.53701
Observations	60	60

Where:

LNEC= Natural log of Economic growth, measured by % of GDP

LNCAPI=Natural log of Capital inflow shock, measured by FDI net inflows as % of GDP

The descriptive summary shown above consists of 60 observations of variables studied (economic growth, capital inflow shock, commodity price shock, and interest rate shock) in the form of natural logs. In the table above, the

mean shows the average distribution of the dataset per variable, while the standard deviation quantifies how much deviates from the mean. A small standard deviation suggests that data points are relatively clustered together, while a large standard deviation shows how the data points are scattered (Gujarati, 2009).

From the summary, economic growth (LNEC) has a mean of 0.637137, indicating the average economic growth rate for the period under study; a minimum of 0.0000, showing the lowest growth rate; a maximum value of 1.041393, which was the highest growth in the study period; and a standard deviation of 0.202596, showing the variation of the values from the mean. Capital inflow shock (LNCAPI) has a mean of 0.44433, a minimum of -0.920618, a maximum of 0.538636, and a deviation standard of 0.460968 indicating greater variability of the capital inflow data points (foreign direct investments) along the years' understudy.

4.2 Correlational Analysis

Correlational analysis was employed to establish the strength and direction of the relationship with the objectives under study. This analysis also measures the correlation coefficient (R) between a positive one and a negative one. It is also applied to indicate the existence of the problem of multicollinearity, which occurs when the variables studied are highly correlated. The objective of the study was to examine the extent to which the dependent variable (economic growth) correlates with the independent variable of focus (capital inflow shock). The table below shows the correlational computational results.

Table 2

Correlational Analysis Results

Correlation **t-statistic** **probability**	**LNEC**	**LNCAPI**
LNEC	1.000000	
LNCAPI	0.700051* [7.466010] (0.0000)	1.000000

*Note. Values in [ ] indicate t-statistic and parenthesis values ( ) indicate p-values while * shows significance at 0.05*

Pairwise correlation was performed before stationary tests, and the findings are displayed in Table 2. The above correlational results show the absence of high collinearity among the residuals. From the findings, capital inflow shock has a significant positive (0.700051, $p<0.05$) relationship with economic growth. This is a clear indication that when CAPI increases by one unit, the economic growth rate shoots by 0.7001 units, and vice versa.

These findings collaborate with studies on econometric analysis of external trade shocks and economic growth conducted by previous researchers. From summary table 2, we confirm that CAPI and IR have a direct and significant relationship with economic growth. This concurs with the results of Munene (2017); Wambugu (2016); Duodu and Tawiah (2020); Rehman and Ahmad (2016); and Nyang'oro (2017), who found that FDI inflow as a measure of CAPI had a positive relationship with economic growth.

4.3 Stationarity Test

Time series data is prone to unit root problems because of non-stationary behavior. This means that the variable is not integrated to order 0, so inference is not applicable, and it can also result in a spurious regression. Therefore, stationarity must be attained to allow the model to predict future occurrences. To achieve robustness in the results, this research adopted both the Augmented Dickey-Fuller Test (ADF) and the DF-GLS test to test unit root on individual variables. The tests were conducted at levels and the first difference to achieve stationarity. Table 3 below shows the unit root test summary at levels.

Table 3
Unit Root Test, Augmented Dickey-Fuller

Augmented Dickey-Fuller test statistics						
Variables At Levels	**t-statistics**	**Prob-Value**	**1% critical Value**	**5% critical Value**	**10% critical Value**	**Conclusion**
LNEC	-2.602637	0.0986	-3.555023	-2.915522	-2.595565	Unit root
LNCAPI	-3.884003	0.0373	-3.654013	-2.082402	-2.001340	Stationary

The findings of the Augmented Dicker Fuller (ADF) test are shown in Table 3 above. The alternative hypothesis here is that the data on time series has no unit root problem, while the null hypothesis for the test states that time series data has a unit root problem. All the variables, apart from LNCAPI, demonstrated unit root problems at levels of LNEC (p-value 0.0986 > 0.0500). The alternative hypothesis was only accepted under LNCAPI, which was stationary at certain levels (p-value <0.05).

Table 4
Augmented Dickey Fuller test at first difference

Augmented Dickey-Fuller test statistics						
Variables At 1st difference	**t-statistics**	**P-Value**	**1% critical Value**	**5% critical Value**	**10% critical Value**	**Conclusion**
DLNEC	-4.153648	0.0019	-3.568308	-2.921175	-2.598551	Stationary

Table 4 shows that the statistics on LNEC became stationary at first differencing, while LNCAPI was found to be stationary at levels. The P-value of LNEC in their natural logs is < 0.05 significance level and t-statistics greater than all the critical values (1% and 5%) indicating stationarity. Thus, the null hypothesis is declined after initial differencing, whereas the alternative hypothesis is adopted.

Table 5
DF-GLS Test for Unit Root

Elliot-Rothenberg-stock DF-GLS test statistics					
Variables At levels	**t-statistics**	**1% critical Value**	**5% critical value**	**10% critical Value**	**Conclusion**
LNEC	-0.627046	-2.607686	-1.946878	-1.612999	Unit root
LNCAPI	-2.676168	-2.604746	-1.946441	-1.613238	Stationary

Table 6
DF-GLS at First Difference

Statistics for Elliot-Rothenberg-stock DF-GLS test					
Variables At 1st difference	**t-statistics**	**1% critical value**	**5% critical value**	**10% critical value**	**Conclusion**
DLNEC	-4.556005	-2.605442	-1.946549	-1.613181	Stationary

4.4 Determination of Optimum Lag Length

It is very important to determine the lag length of unrestricted vector autoregressive order and order for vector error correction before estimating the VAR model and VEC model. This is because the lag length must be specified in order to examine the number of cointegration ranks or fit cointegration in the model, VECM. According to Engle & Granger (1987), there are many approaches that can be employed to choose the lags for a VAR model without unit root problems with the variables. The findings in the table below indicate that the lag length used was one lag for this multivariate model because the SIC: Schwarz information criterion used revealed that at a lag length of one, there was the optimal number of selected lag orders by the criterion, which was identified by the asterisk (*). The SIC criterion was most selected since it showed the lowest value amongst other criteria with one lag.

Table 7

Determination of Lag Length summary

Lag	LogL	LR	FPE	AIC	SC	HQ
0	98.28532	NA	3.81e-07	-3.428557	-3.282569	-3.372103
1	304.6465	375.2021	3.76e-10*	-10.35078*	-9.620842*	-10.06851*
2	314.0745	15.77057	4.83e-10	-10.11180	-8.797911	-9.232025
3	326.0632	18.31002	5.73e-10	-9.965936	-8.068094	-9.232025
4	340.1319	19.44037	6.44e-10	-9.895707	-7.413913	-8935977
5	365.3299	31.15382	4.99e-10	-10.23018	-7.164432	-9.044629

*-is the order of lag chosen by the criterion

Considering the table above (7), there are different criteria applied in the determination of lag length statistics selection (each test at a 5% level). This also reported likelihood ratio statistics for VARs of < or = order to greatest lag order. Where FPE is more appropriate when observations are below 60, the Hannan-Quin criterion is more preferred where the number of observations is higher than 120 (Liew, 2004; Lütkepohl, 2005). Lütkepohl (1993) reckons that choosing a greater order lag raises the mean square variance of errors, while a small lag order generates problems of autocorrelation (Ozcicek, 1999). Since all criteria showed one lag, the SIC criterion was adopted because it had the lowest value.

4.5 Cointegration Test- Bounds Test

A test for co-integration is wished to determine the long-run relationship of the linear collaboration of the objectives. The cointegration found between variables with regard to test results may be shown as a real long-run association and used in the model in the case of levels (Talas et al., 2013). For the variables of interest (capital inflow shock and economic growth), the ARDL bound test was applied. The bound test was preferred since the variables had mixed results on stationarity, and therefore the researcher could not apply the Johansen test. The null hypothesis rejection was based on decision criteria at 10%, 5%, 2.5%, and 1% levels, considering the lower bounds I (0) and the upper bounds I (1). According to Wolde-Rufael (2010), the HO is rejected if the critical values are less than F-statistics for the upper bounds I (1), and the presence of cointegration can be confirmed, implying that there is a long-run association. In the event that the null hypothesis is rejected, the VEC model is estimated in the long run. However, if the F-statistic calculated is lower than the critical value of the lower bound, it is concluded that there is no existence of cointegration or a long-run relationship, and the researcher may fail to reject the null hypothesis. Further, if the calculated F-statistic is in between the lower and upper bounds, then it is inclusive. The table below shows the summary output of the bounds test.

Table 8

Bound Test for Cointegration

F-Bound Test Null Hypothesis: No levels relationship

Test statistic	Value	Signif	I(0)	I(1)
		Asymptotic:n=1000		
F-statistic	18.89621	10%	3.47	4.45
K	3	5%	4.01	5.07
		2.5%	4.52	5.62
		1.%	5.17	6.36

Table 8 above shows that the calculated F-statistic (18.89621) is greater than the critical values of 5.07, 5.62, and 6.36 of upper bound I (1) at 5%, 2.5%, and 1% significance levels, respectively. Therefore, this study rejects the null hypothesis and concludes that there is cointegration and a long-run relationship between the variables understudy; hence, the acceptance of the alternative hypothesis and VECM matrix was conducted.

4.6 Vector Error Correction Matrix

The matrix was applied in this study to show the rate at which economic growth modifies regarding a change in the independent variables (CAPI, CP, and IR). According to Lutkepohl and Kratzik (2004) and Lutkepohl (2005), the variable coefficients in the VECM model indicate the short-run variation. A negative and significant sign must be affixed to cointegrating equations at a 5% level of confidence in order for them to demonstrate the long-term link between the

variables (Lütkepohl & Krätzig, 2004; Lütkepohl, 2005). Table 9 below shows the vector error correction equation and the output of the lagged values. The table below shows the estimated error correction in the VECM of the cointegrating equation as -0.1793219 to justify that (VECM) has a long-run relationship. This also showed that previous years' errors were corrected at a convergence speed of 17.932% within the current year. The independent value indicated that 17.932 percent of disequilibrium, in the long run, is modified by a lagged period of error shock. Therefore, this confirmed that the previous statistics of the variable had an effect on the current statistics in the short run (Gujarati, 2009). The cointegrating equation was revealed to be statistically significant with a t-statistic of 2.60029 (P-value<0.05), which further clarifies the long-term association between the explanatory and the explained variables studied. Part two of the VECM model shows the short-run relationship. It displays how the lagged values of capital inflow shocks, commodity price shocks, and interest rate shocks affect economic growth in Kenya. Values are lagged basically to show the effect of the past outcome on the present. The results in Table 9 below show that the coefficient of the fourth lagged difference of economic growth rates is -2.63119, which is statistically significant since the t-statistic is greater than 2. This implies that, holding other variables in the study constant, economic growth in the past fourth quarter still affects economic performance in the present by 26.31%. From the results, capital inflow shock, commodity price shock, and interest rate shock from the first to fourth lagged last quarters affect the current economic growth rate since the coefficients of the four quarters are statistically significant.

Table 9

Vector Error Correction Output

Vector Error Correction Estimates tStatistics in [ ] & Standard errors in ( )		
Cointegrating Eq:	CointEq1	
LNEC(-1)	1.000000	
LNCAPI(-1)	-0.543315	
	(1.14137)	
	[-3.84331]	
Error Correction:	D(LNEC)	D(LNCAPI)
CointEq1	-0.179322	0.438714
	(0.03213)	(0.22507)
	[-2.60029]	[1.94920]
D(LNEC(-1))	-0.240278	-0.232725
	(0.21414)	(0.38178)
	[-1.072021]	[-0.464021]
D(LNEC(-2))	-0.395022	-0.174422
	(0.22068)	(0.37590)
	[-0.88371]	[-0.46402]
D(LNEC(-3))	-0.244629	-0.041170
	(0.26213)	(0.44649)
	[0.93323]	[-0.09221]
D(LNEC(-4))	0.619427	-1.586924
	(0.30641)	(0.40099)
	[-2.63149]	[-3.95751]
D(CAPI(-1))	0.145223	0.073843
	(0.02886)	(0.17447)
	[4.41779]	[1.42324]
D(CAPI(-2))	0.053126	-0.002560
	(0.00438)	(0.17780)
	[2.50895]	[-0.01440]
D(LNCAPI(-3))	0.045363	0.157760
	(0.02886)	(0.21950)
	[3.35202]	[2.71873]
D(LNCAPI(-4))	0.018243	-0.036667
	(0.01086)	(0.18884)
	[3.16456]	[-0.19417]

C	0.152409	0.090045
	(0.04279)	(0.07288)
	[2.22490]	[1.23555]
R-squared	0.499120	0.675818
Adj. R-squared	0.391376	0.526869
Sum sq. residuals	0.810594	2.351771
S.E. equation	0.148013	0.252114
F-statistic	1.438803	9.537254

4.7 Regression Analysis

The key goal of this research was to assess the effect of external trade shocks on Kenya's economic growth. From the pre-diagnostic tests conducted, it is clear that the explanatory variables (capital inflow shock, commodity price shock, and interest rate shock) are statistically significant in revealing the growth of the economy in Kenya.

Table 10

Summary output on Multiple Regression analysis

Dependent Variable: DLNEC				
Method: Least of Squares				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
LNCAPI	0.302163	0.034237	8.825617	0.0000
DLNCP	-0.201914	0.175531	-2.150304	0.0321
DLNIR	0.665800	0.150668	4.418978	0.0000
C	0.058158	0.273123	2.129403	0.0376
R-Squared	0.661003	Mean dependent var	0.637138	
Adjusted R-Squared	0.642842	S.D dependent var	0.202596	
S.E of regression	0.121077	Akaike info criterion	-1.3204444	
Sum squared resd	0.820937	Schwarz criterion	-1.180821	
Log likelihood	43.61331	Hannan-Quinn criter.	-1.265829	
F-statistic	36.39766	Durbin-Watson Stat	1.973016	
Prob (F-statistic)	0.000000			

From Table 10 above, the regression output displays a p-value of (0.0000), which shows that the objectives in the models are jointly important in explaining the change in economic growth rate in Kenya at a 5% significance level. The output above also indicates that there is autocorrelation, as the level of Durbin-Watson (1.973016) is within the range of 1.5 to 2.5.

The following is the regression equation obtained:

$$\mathbf{DLNEC_t = 0.058158+0.302163LNCAPI_t - 0.201914DLNCP_t + 0.665800DLNIR_t}$$

Where;

DLNEC = natural log of Economic growth at the first difference; **LNCAPI** = natural log of capital inflow shock **DLNCP=** natural log of commodity price shock at First difference; **DLNIR** = natural log of interest rate shock at First difference**; t =** Time

The above regression results indicate that the model confirms that if all independent variables are held constant, the growth of the economy in Kenya will increase by 5.8158%. The results also reveal that holding other variables constant in the study, capital inflow shock will cause an increase in economic growth rate of 30.2163%, while commodity price shock will reduce economic growth levels by 20.1914 units, and interest rate will cause an increase in economic growth rate of 66.5800% holding other variables constant in the study, which is a strong positive relationship.

4.8 Discussions

The main aim of the research was to assess the effect of capital inflow shocks on the growth of the economy in Kenya. Findings from regression analysis in Table 10 show correction statistics for the capital inflow shock as

(0.302163) and a p-value of 0.0000< 0.05. Thus, the capital inflow shock has statistically significant economic growth in Kenya and exhibits a positive sign as anticipated. From the regression results, *ceteris paribus*, an increase in FDI inflows, an indicator of CAPI, by 1% will boost economic growth in Kenya by 30.2163%. This can be explained by the fact that the moderate presence of foreign investors is associated with faster economic growth. Capital inflow shock is vital to establishing economic growth, and therefore there is a need to strategically regulate foreign investors for economic effectiveness.

Given appropriate host country policies and a favorable environment, foreign direct investments will lead to employment creation, technology transfer, innovation, and improvement in human capital via the induction of employees into new business premises, trade integration, flows of ideas, and global business standards, resulting in competitiveness in a country and increased capital inflows from corporate taxes on profits and capital gains generated by these foreign direct investments. These are foregoing deals expected to enhance higher economic growth in the host country; hence, the aspects boost development in the economy.

The results of this study are consistent with those of numerous scholars who believe that the benefits of capital inflow shock (through foreign investors, which may include the acquisition of new technology, the creation of employment, the development of human capital, the contribution to the integration of international trade, the enhancement of domestic investment, and an increase in tax revenue generated from external investors) significantly enhance economic growth (Hailemariam et al., 2020). The findings are also in line with the study done by Olaleye (2015), who found a positive long-run association between economic growth and capital inflow shock. However, these findings contradict Goel and Miyajima (2021) who found that capital inflow had a significant negative effect on economic growth. Whereas Waweru and Ochieng's (2017) found that FDI inflow has a negative and insignificant influence on economic growth. These repudiations of the results may be caused by timeframe context, variability in the study area, methodological differences, or confounding variables in various studies.

4.8 Results Post-estimation diagnostic tests

4.8.1 Multicollinearity

To assess the existence of the multicollinearity problem, the variance inflation factor test was undertaken. For a variance inflation factor value higher than 10, multicollinearity is considered to exist (Laurens, 2018). The variance inflation factor is calculated below.

Table 11

Test for Multicollinearity using Variance Inflation Factor

Variance Inflation Factors			
Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNCAPI	0.001172	1.011880	1.002452

The findings above reveal that no variable was highly collinear since there is no variable with centered VIF exceeding 10.

4.8.2 Autocorrelation/Serial Correlation Test

Uyanto (2019) confirmed that the serial correlation of the noise terms breaks the assumptions of OLS that in regression analysis, error terms are uncorrelated. Autocorrelation in time series data happens when the residuals in one period cross into another period. Alternatively, it is possible that the error term of one observation will be modified by the noise term of another observation. According to Flick (2020), the successive values of the disturbance terms in linear regression are supposed to be independent subsequently. Breusch-Godfrey Serial correlation (LM) A test was used in this study to determine the existence of a serial correlation. The HO is that there is no autocorrelation, while the alternative hypothesis states that there is autocorrelation. The table below displays the summary output from the test applied.

Table 12

Breusch-Godfrey Serial Correlation LM Test

No serial correlation at up to 4 lags: Null hypothesis		
F- statistic	3.509711 prob F(4,52)	0.1362
Obs*R-squared	5.75507 prob. Chi-square(4)	0.0525

From table the above the observed R-squared displayed prob. Chi-Square value of 0.0525 which is greater than 0.0500 hence acceptance of null hypothesis that there is no serial correlation while the alternative hypothesis is rejected.

4.8.3 Normality

The residuals in an econometric study should display a normal distribution. This study used Jarque-Bera test to assess the normality in the model acquired after regression. According to study done by Okamoto et al. (2009), the null hypothesis is that there is regular distribution of residual. This implies that the p-value should be greater than 0.0500 while the alternative hypothesis has a p-value less than 0.0500. The figure below (2) displays the results for normality from Jarque-Bera test.

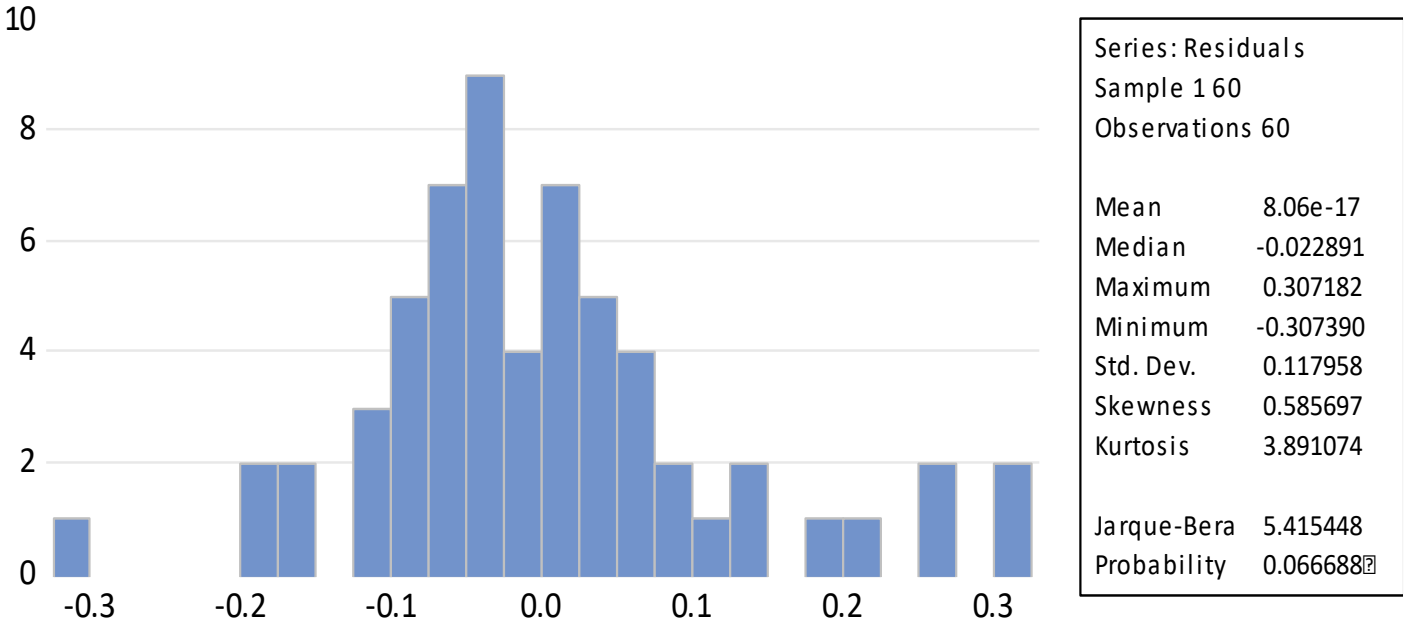

Figure 2
Normality Test

The figure above shows that the probability value from Jarque-Bera is 0.066688 which is greater than the 0.0500 significance level. Thus, rejection of the alternative hypothesis in favor of null hypothesis based on the above output.

4.8.4 Heteroskedasticity

The Breusch-Pagan test estimates if the variation of the errors in a regression model is dependent on the values of the independent variables (Uyanto, 2019). Whenever the variance of the disturbance term differs from each value of the independent variable, heteroscedasticity occurs. Rosopa et al. (2013) posit that detecting violations of the homoscedasticity assumption and mitigating its biasing effects can strengthen the validity of future inferences. The variance of the error term depends on the magnitude of the independent variables since the error term can change from one observation to the next. Even though it renders the Ordinary Least Squares estimator wasteful, the presence of heteroscedasticity has no effect on the estimator's independence. This is due to the fact that the OLS estimator will not have the smallest variance among the class of unbiased estimators for small sample sizes, and it will be asymptotically inefficient for large sample sizes. This study employed the Breusch-Pagan Godfrey test to determine the presence of heteroscedasticity. The resulting result is displayed in Table 13.

Table 13
Breusch-Pagan-Godfrey Output

Heteroskedasticity Test: Breusch-Pagan Godfrey		
F-statistic	5.367996 prob F(3,6)	0.0825
Obs*R-squared	6.400631 Prob Chi-Squared (3)	0.08384
Scaled explained SS	7.874394 Prob Chi-Squared (3)	0.1075

From the table above, it is clear that the Pv > chi-square (3) value is 0.08384 which is higher than 0.05 therefore, revealing that there was no heteroscedasticity hence, the null hypothesis is accepted.

4.8.5 Model Stability by Use of CUSUM Test

A stable model should lie within the upper and lower limits of the 0.05 level of significance. To assess the fitness of the model obtained, a cumulative sum test (CUSUM) was undertaken. The CUSUM test enables more robust estimations and provides more information about a model (Talas et al., 2013). Figure 3 below indicates that all the variables lie within the 5% significance level both at the lower and upper boundaries. This clarifies that the regression model employed for analysis was fit and stable in the study.

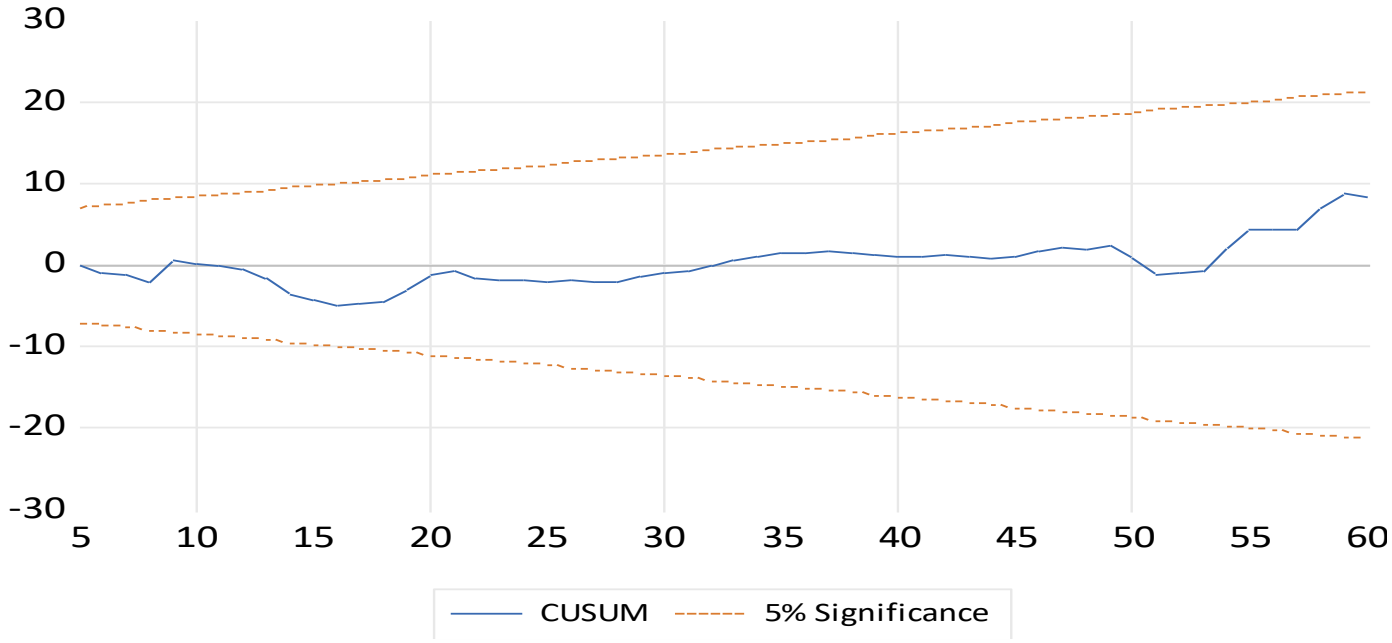

Figure 3
CUSUM Test

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusion

From the preceding discussions, the study concluded that capital inflow shock (CAPI) had a positive, direct, and statistically significant influence on economic growth in Kenya. This clarifies that when foreign direct investment inflows increase, it boosts economic growth and vice versa. The null hypothesis of this study states that the capital inflow shock has no statistically significant effect on Kenya's economic growth. Therefore, the study rejected the HO in favor of the H1.

5.2 Recommendations of the Study

The findings demonstrate that capital inflow shocks promote economic growth since they were revealed to be statistically significant. This research recommends that the Kenyan authorities adopt sound policies that will spur more capital inflow through foreign investors into the Kenyan economy, as they will provide vital resources for economic growth. In order for Kenya to fulfill the millennial development goals, the government must foster an atmosphere that will attract foreign investors through programs like public-private partnerships (PPP), tax regulations, and other incentives to boost capital inflows. The researcher also recommends that Kenya reform and retool its existing policies to favor foreign investors and to avoid depending so much on externality to reduce susceptibility to external shocks.

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