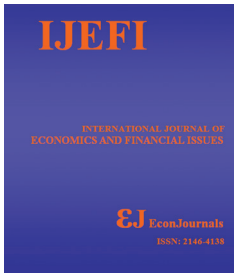

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A Comparative Analysis between Intrinsic and Extrinsic Drivers of Inflation

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ABSTRACT

In most economies, particularly in developing countries, addressing inflation remains a significant macroeconomic challenge. This study seeks to examine the factors, both internal and external, that contribute to inflationary trends in South Africa. To achieve this objective, the authors employ the Johansen cointegration test, vector error correction approach, impulse response function, and variance decomposition on quarterly time series data spanning from 1994 to 2022. The findings of the study provide compelling evidence suggesting that both internal and external factors play a statistically significant role in influencing inflation. However, external forces exert a greater impact on the inflationary pressures witnessed in South Africa when compared to internal factors. Notably, factors such as trade openness, exchange rates, and imported prices contribute significantly to the elevated inflation rate in South Africa. On the other hand, internal factors like sustainable government expenditure, interest rates, and net export prices prove effective in mitigating the inflation rate.

Keywords: Inflation, Inflation Targeting, Macroeconomics, South Africa
JEL ClassificationS: B 22, C32, E31

1. INTRODUCTION

Inflation is defined as a continuous increase in the overall price level of goods and services within a specific economy, resulting in a higher cost of living within a particular country (Friedman and Schwartz, 1963). The dynamics of inflation vary between developed and developing countries. Developing countries often experience heightened inflation dynamics, characterized by high and fluctuating inflation rates, whereas developed countries, such as those in the OECD, typically exhibit lower and less volatile inflation rates, usually in single-digit figures.

Mankiw (2012) points out that, in addition to factors related to demand and supply, there are other contributors to inflationary behavior. These include structural factors, which involve the degree of independence of monetary authorities in decision-making, and monetary factors, such as fluctuations in the money supply. The drivers of inflation can be categorized into two groups: intrinsic or internal factors and extrinsic or external factors. Internal factors are those that are, to some extent, under the control of a country's policymakers, while external drivers of inflation are beyond the control of domestic policymakers.

South Africa, a country in sub-Saharan Africa (SSA), is grappling with rising inflation similar to its peer nations (Nguyen, 2017). The inflation rate in South Africa is gauged using the Consumer Price Index (CPI), and the country has witnessed considerable volatility in this metric over several years. To address this issue, the South African Reserve Bank implemented an inflation-targeting monetary policy, aiming for the inflation rate to fluctuate between 3 and 6%. The adoption of inflation targeting in 2000 was driven by the historically high and unstable inflation experienced by the country from 1960 to 1998 (Kumo, 2015).

The primary objective of inflation targeting in South Africa was to safeguard the value of its currency, the Rand. Recognizing the

currency's crucial role in economic performance, policymakers sought not only to keep the inflation rate within the proposed bracket (3-6%) but also to curb its fluctuations, as high and volatile inflation is known to impede economic growth (Fielding, 2008). In the initial years of the inflation-targeting policy around 2000, the inflation rate was notably moderate, but this moderation came at the cost of high unemployment as a trade-off (Madito and Odhiambo, 2018).

Furthermore, in efforts to reduce the inflation rate, the South African Reserve Bank has raised interest rates. In a span of 7 months, from April 2022 to October 2023, the bank increased the repo rate (the lending rate) from 4.0 to 8.25%. This hike in interest rates led to increased borrowing costs, a reduction in total expenditure, and a slowdown in economic activities (Kozlov, 2023).

In the current economic landscape, the South African Reserve Bank finds itself in a challenging position, navigating the need to make decisions that maintain low and stable inflation while also moderating interest rates, improving exchange rates, and fostering economic growth. Given this intricate situation, it becomes imperative to examine the responsiveness of inflation to both internal and external factors contributing to inflationary pressures. This paper aims to analyze and compare the intrinsic and extrinsic factors influencing inflation in South Africa. The structure of the paper is outlined as follows: Section 2 offers a brief review of the literature on inflation, Section 3 presents and elucidates the data and research methodologies employed, Section 4 delves into the research findings and facilitates a discussion of the results, and the concluding Section provides policy recommendations based on the insights garnered from the analysis.

2. LITERATURE REVIEW

2.1. An Overview of Theoretical Literature

The Keynesian theory posits that economic growth and full employment can be achieved through the modification of the money supply and an increase in total demand via monetary policies, without necessarily leading to inflation (Keynes, 1936). However, in the early 1980s, the credibility of the Keynesian theory eroded as economists like Alton Meltzer, Karl Brunner, and Milton Friedman introduced ideas suggesting that economic stability is contingent on effective monetary regulation (Cerna, 2012).

According to Friedman and Schwartz (1963), inflation is consistently a monetary phenomenon, and various theories, particularly those rooted in the monetary and structural perspectives, explain its causes and driving factors. Monetarists assert that inflation stems from a growing aggregate demand that is incompatible with total supply. They argue that continuous and unnecessary growth in the money supply is the root cause of high demand, leading to elevated prices for consumer goods. In alignment with the monetary approach, Milton Friedman contends that inflation generally results from government deficits, triggering an increase in both direct credit distribution and the money supply. Existing literature supports Friedman's perspective, affirming that expansionary monetary policies and substantial external inflows, when implemented by a government, contribute to rising domestic prices and inflationary pressure (Alagidede et al., 2014; Khandan and Hosseini, 2016; Kundu, 2016). Moreover, in the monetarists' view, the most effective means of curbing and controlling inflation involves restricting credit and monetary growth, accompanied by fiscal cutbacks.

However, in countries with open economies, particularly those heavily reliant on imports such as many developing nations, the implementation of expansionary policies, including inflation targeting, may yield undesirable outcomes and play a counterproductive role. As a result, structuralists criticize monetarists for neglecting the supply side when addressing inflation. From the structuralist perspective, high inflation may emanate from the supply side, influenced by volatile exchange rates and a substantial dependence on imports. Consequently, when considering the supply-side or the structural view, the adoption of fiscal and monetary constraints as tools to control inflation might hinder economic growth, subsequently leading to elevated inflation (Adeleye et al., 2019).

This phenomenon is particularly prevalent in developing economies where variations in consumer goods and food prices are often linked to external factors due to weak domestic production, low levels of industrial development, and inflexibilities in the agricultural sector (Alagidede et al., 2014).

2.2. Empirical Literature

To evaluate the adverse effects of inflationary pressures and assess the validity of both monetarist and structural views on inflation, various studies have been conducted across different countries, yielding asymmetric results. The following section highlights some of these studies and their respective outcomes.

In Sri Lanka, three studies were conducted to examine the determinants of inflation. The first study by Colombage (2005) identified the supply side as the primary driver of inflation in Sri Lanka. In contrast, the second study conducted by Deyshappriya (2014) suggested that the high inflation rate observed between 1998 and 2010 was predominantly caused by the country's expansionary monetary policies. Interestingly, Deyshappriya's findings aligned with Colombage (2005), supporting the notion that inflation in Sri Lanka is influenced significantly by monetary factors. Additionally, De Alwis and Dewasiri (2022)'s findings evidenced that inflation growth results from real GDP growth.

A study conducted by Alam and Alam (2016) focused on assessing the drivers of inflationary pressures in India. The findings indicated that the main drivers of inflation in India were internal rather than external. The study further revealed that, both in the short run and long run, the inflation rate was subject to constraints in money supply and money growth. Similarly, a study by Kundu (2016) suggested that inflationary behaviors in Bangladesh were primarily driven by internal factors, including money supply and government expenditure.

Furthermore, a study conducted in Nepal by Chaudhary and Xiumin (2018) produced results consistent with monetary theory. According to their findings, the inflation rate in Nepal was determined by import prices, real GDP, and import prices. The

study highlighted that opening borders to external trade remained a central source of inflationary pressure in Nepal.

Dahiru and Sulong (2017) conducted an empirical study to explore the relationship between the inflation rate and key macroeconomic variables, including exchange rate, interest rate, GDP, financial stability, money supply, and oil price in Nigeria. Utilizing regression analysis with the autoregressive distributed lag (ARDL) technique, the study confirmed the presence of a long-run relationship between the inflation rate and the explanatory variables. However, it revealed that while exchange rate, oil price, and money supply exerted a positive impact on inflation, shocks in financial instability, interest rate, GDP, and money supply were associated with an inverse relationship with inflation.

These findings align with the results of Plessis et al. (2018), who reported that, over a 10-year period, rising inflation in South Africa was primarily influenced by domestic financial and economic conditions. The limited number of reviewed empirical studies suggests that the inflation rate is influenced by a combination of internal and external factors. As a result, the present study aims to analyze and determine the predominant drivers of inflation in South Africa, distinguishing between internal and external influences.

3. DATA AND ESTIMATION TECHNIQUES

3.1. Data Presentation

This research adopts a quantitative methodology, utilizing quarterly time series data spanning from 2002 to 2022. The details regarding the measurement of data series and their respective sources can be found in Table 1 below.

The selection of variables was based on their direct or indirect associations with inflation, and the sample period was dictated by data availability. The sampling commenced in 2002 due to the unavailability of quarterly inflation data, and all data series extend up to the second quarter of 2023.

3.2. Model Specification

To evaluate and contrast the influence of internal and external factors on inflation behavior in South Africa, the present study extends existing inflation theory by specifying the following model:

$$inf = f(int, ext, gexp, open, exp, imp, wag) \quad (1)$$

Table 1: Date series measurement and sources

Series	Measurement	Label	Source
Interest rate	Percentage	INT	SARB
Exchange rate	index	EXR	SARB
Government expenditure	R millions	GEXP	SARB
Trade openness	Degree	OPEN	SARB
Export price	R millions	EXPO	SARB
Import price	R millions	IMPO	SARB
Inflation rate	Percentage	INF	SARB
Gross domestic product	R millions	GDP	SARB
Domestic investment	R millions	INV	SARB
Real wages	R thousands	WAGE	SARB

Source: Author's computation. SARB: South African Reserve Bank

Where *inf* denotes inflation, *int* denotes interest rate, *gexp* denotes government expenditure, *open* denotes treaded openness, *exp* denotes export price, *imp* denotes import price and *wag* represents the real wages. Applying the logarithmic function on Equation (1) and considering the time effect, inflation as an implicit function of the endogenous variables is expressed as follows:

$$\begin{aligned} lninf_t &= \beta_0 + \beta_1 lninf_t + \beta_2 lnint_t + \beta_3 lexr_t + \beta_4 lgexp_t \\ &\quad + \beta_5 lopen_t + \beta_6 lexp_t + \beta_7 limp_t + \beta_8 lwag_t + e_t \end{aligned} \quad (2)$$

Where β_0 represents the intercept, β_1-β_8 presents the estimated parameters, and e_t is the model error term.

3.3. Estimation Approaches

Four approaches namely (i) the Johansen cointegration using the vector autoregressive (VAR) (ii) (2) the vector error correction model (VECM), (iii) the impulse response function (IRF) and, (iv) variance decomposition (VD) were employed to achieve the research objective. The Johansen cointegration test assists in assessing the presence or absence of cointegration or long-run relationship between series. Following Pfaff (2008) the study VAR (p) equation is expressed as follows:

$$y_t = \mu + \lambda_1 y_{t-1} + \ldots + \lambda_p y_{t-p} + u_t \quad (3)$$

Where y_t denotes the endogenous variables vector, ($lninf_t$, $lnint_t$, exr_t, $gexp_t$, $open_t$, $open_t$, exp_t, imp_t stationary at the first difference I(1), and u_t denotes the vector of the model changes or shocks. Consequently, in line with the literature, the VAR model can be re-rewritten as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} G_i \Delta y_{t-i} + u_t \quad (4)$$

Where

$$\Pi = \sum_{i=1}^{p} \lambda_i - \mathrm{I} \; and \; G_i = -\sum_{j=i+1}^{p} \lambda_j \quad (5)$$

In case the coefficient of the matrix has the reduced rank G<n, there are matrices α and β with n G, where n is a positive figure, and both α and β have a rank of G in such way:

$$\Pi = \alpha.\beta \quad (6)$$

Johansen (1988) introduced a cointegration test to ascertain the number of cointegration vectors in a given equation, utilizing two statistical tests, namely the Maximum Eigenvalue and Trace tests. These two tests have also been applied in this study to ascertain the presence of cointegration within the specified model. Following the identification of cointegration or a long-run relationship among the study variables, the Vector Error Correction Model (VECM) was subsequently employed to assess the cointegrated series. The ensuing Equation 7 was formulated for the multivariate VECM:

$$\Delta y_t = \sigma + \sum_{i=1}^{k-1} \gamma_i \Delta y_{t-i} + \sum_{j=1}^{k-1} \eta_j X'_{t-j} + \lambda ECT_{t-1} + u_t \quad (7)$$

Where y_t denotes the response variable, X' denote the vector of endogenous explanatory variables and the *ECT* denotes the error correction term. The latter is the lagged residuals derived from a cointegrating equation. Therefore, $ECT_{t-1} = y_{t-1} - \eta_j X'_{t-1}$. Additionally, λ represents the coefficient of the *ECT* which is crucial in determining the model speed of adjustment from shocks in X'. While k and u_t represent the optimum lag length and white-noise error respectively, γ and η are the estimated parameters.

The Impulse Response Function (IRF) is another approach used to determine the simulation effect of one variable's shocks towards changes within another variable within the model (system). Lin (2006), argues the IRF remains useful when assessing the influence of a policy alteration on the target series. The comprehensive IRF of y_t at horizon h is expressed as follows:

$$IRF(h, \delta, I_{t-1}) = E\left[y_{t+h} | e_t = \delta, I_{t-1}\right] - E\left[y_{t+h} | I_{t-1}\right] \quad (8)$$

In Equation 8, δ represents a one-time exogenous change. The same equation elucidates that, based on changes and past information minus the expected value of the endogenous series, the IRF equals the anticipated value of both the present and future values of the endogenous series or variable. This implies that the IRF explains the impact of changes on both current and future values of endogenous series.

4. ANALYSIS AND RESULTS DISCUSSION

4.1. Preliminary Analysis

Descriptive statistics offer a valuable approach for quickly and succinctly understanding dataset features, encompassing central tendency, distribution, and variability. Table 2 presents the summary statistics of the dataset utilized in this study. The results in the table indicate that the average inflation over the analyzed period was approximately 1.8% quarterly. The averages for export, exchange rate, and gross domestic product were 6.047350, 2.050856, and 6.604797%, respectively, while the averages for government expenditure, import, and interest rate were 5.882153, 6.028013, and 2.011335%, respectively. Additionally, the percentage averages of investment, trade openness, and wage were 5.822145, 0.544069, and 1.888000, respectively.

Table 2: Descriptive

Variable	Mean	SD	Skewness	Kurtosis	J_B
LINF	1.806842	0.141237	−0.007704	1.681063	6.306894
LEXP	6.047350	0.049446	−0.750380	2.505749	9.050040
LEXR	2.050856	0.071866	2.630486	18.87055	1013.377
LGDP	6.604797	0.057681	−0.880802	2.570360	11.91843
LGOV	5.882153	0.068557	−0.734973	2.209469	10.09809
LIMP	6.028013	0.099300	−1.162617	3.400847	20.18181
LINT	2.011335	0.072129	2.882610	17.52816	885.6066
LINV	5.822145	0.088064	−1.368091	3.843916	29.72097
LOPN	0.544069	0.031104	−0.185120	2.517526	1.340737
LWAG	1.888000	0.216021	0.087434	3.015962	0.111772

SD: Standard deviation

The standard deviation results reveal that over the analyzed period, South African wages and the inflation rate were more volatile compared to other variables. The data also indicates that the inflation rate, exports, GDP, government expenditure, employment, investment, and trade openness exhibited left-skewed distributions, while the exchange rate and interest rate showed right-skewed distributions. LINF, LEXP, LGDP, LGOV, LIMP, and LOPN have a platykurtic distribution, suggested by their kurtosis of <3, while LEXR and LINT have a leptokurtic distribution, with kurtosis greater than 3. Wages data is the only variable with a kurtosis close to 3, and together with trade openness, are the only variables exhibiting normally distributed data, as indicated by the Jarque-Bera statistics.

In conjunction with the summary statistics, Table 3 presents the pairwise correlation matrix. The results reveal significant correlations between the response and explanatory variables, with probability values below a 5% significance level. Notably, a high correlation is observed among export prices, gross domestic product, real wages, and inflation. Additionally, a moderate correlation exists between government expenditure, import prices, and the inflation rate. Lastly, there is a low or weak correlation observed between the exchange rate, interest rate, trade openness, and the inflation rate.

4.2. Results of Unit Root Assessment

To ensure a robust outcome, the examination of series properties and the determination of stationary status must precede the regression analysis. In this study, the Augmented Dickey-Fuller (ADF) test was utilized to assess whether the study series contains a unit root and to establish the integration order relevant to model selection. The results presented in Table 4 indicate that none of the study variables is stationary in its level form. Given that the variables are not integrated of order zero (I(0)), adopting ordinary least squares as a cointegration approach could lead to spurious findings. To address this, a differencing approach was applied to the series, and they became stationary after the first difference. Consequently, the integration order for the study series is determined to be I(1). It is also noteworthy that the Schwarz information criteria (SIC) were employed to determine the optimal lags.

4.3. Cointegration Results

Now that all variables are integrated after the first difference (I(1)), the subsequent step involves testing the cointegration of variables using the Johansen test for cointegration. The results of the cointegration test in Table 5 indicate that the study variables indeed cointegrate. The Maximum-Eigenvalue test suggests the existence of 5 cointegrating equations, while the Trace test indicates the presence of 7 cointegrating equations at a 0.05 significance level. This implies that both tests confirm the existence of a long-run relationship between inflation, interest rate, exchange rate, government expenditure, trade openness, export price, import price, gross domestic product, domestic investment, and real wage.

4.4. Lon-run Relationship and Normalised Cointegrating Coefficients

Table 6 presents normalized cointegration or long-run coefficients. These results indicate that all eight explanatory variables, except

Table 3: Correlation

???	LINF	LEXP	LEXR	LGDP	LGOV	LIMP	LINT	LINV	LOPN	LWAG
LINF	1									
P	-									
LEXP	0.732	1.								
P	0.000	-								
LEXR	−0.108	−0.034	1.							
P	0.018	0.757	-							
LGDP	0.711	0.881	−0.072	1						
P	0.000	0.000	0.509	-						
LGOV	0.650	0.7896	−0.102	0.978	1					
P	0.000	0.0000	0.348	0.000	-					
LIMP	0.504	0.922	−0.011	0.953	0.906	1				
P	0.000	0.000	0.9230	0.000	0.000	-				
LINT	−0.349	−0.281	0.661	−0.425	−0.425	−0.368	1			
P	0.000	0.008	0.0000	0.000	0.000	0.000	-			
LINV	0.581	0.793	−0.031	0.850	0.787	0.893	−0.399	1		
P	0.000	0.000	0.774	0.000	0.000	0.000	0.000	-		
LOPN	0.165	0.719	0.091	0.386	0.256	0.613	−0.006	0.513	1	
P	0.025	0.000	0.404	0.000	0.016	0.000	0.952	0.000	-	
LWAG	0.769	0.758	0.066	0.924	0.952	0.836	−0.212	0.646	0.2178	1
P	0.000	0.000	0.539	0.000	0.000	0.000	0.048	0.000	0.043	-

Table 4: Unit root test results

Variable	Level		First difference		Decision
	Intercept	Intercept and trend	Intercept	Intercept and trend	
LINF	0.9890	1.0000	0.000**	…….	I (1)
LEXP	0.3321	0.7248	0.000**	…….	I (1)
LEXR	0.2127	0.5998	0.0004**	…….	I (1)
LGDP	0.1466	0.6344	0.0001**	…….	I (1)
LGOV	0.3178	0.8048	0.0000**	…….	I (1)
LIMP	0.1161	0.3176	0.0000**	…….	I (1)
LINV	0.0976	0.7405	0.000**	…….	I (0)
LOPN	0.9632	0.4227	0.000**	…….	I (1)
WAGE	0.9919	0.1461	0.000**	…….	I (1)

Table 5: cointegration results

Cointegration rank	Maximum eigenvalue test			Trace test		
	Statistic	Critical value	P	Statistic	Critical value	P
None	94.37841	58.43354	0.0000	350.5178	197.3709	0.0000
At most 1	68.02967	52.36261	0.0006	256.1394	159.5297	0.0000
At most 2	51.84090	46.23142	0.0114	188.1097	125.6154	0.0000
At most 3	46.46628	40.07757	0.0084	136.2688	95.75366	0.0000
At most 4	35.34477	33.87687	0.0332	89.80253	69.81889	0.0006
At most 5	23.26290	27.58434	0.1626	54.45776	47.85613	0.0106
At most 6	19.30888	21.13162	0.0882	31.19487	29.79707	0.0343
At most 7	11.80668	14.26460	0.1181	11.88598	15.49471	0.1625
At most 8	0.079307	3.841465	0.7782	0.079307	3.841465	0.7782

Table 6: Long-run coefficients

Variables	LEXP	LGDP	LGOV	LIMP	LINT	LINV	LREER	LWAG	OPEN
Coefficient	−0.456	−0.924	0.157	1.563	−0.027	0.048	0.5520	−0.300	0.680
T-statistic	3.828	7.177	−6.116	−4.651	−4.729	−1.875	5.4300	−0.664	−2.036

Table 7 : Error correction coefficients

ECM	D (LCPI)	D (LEXP)	D (LGDP)	D (LGOV)	D (LIMP)	D (LINT)	D (LINV)	D (LREER)	D (LWAG)	D (OPEN)
ECM	0.124	0.0715	−0.0097	−0.0263	0.0797	−0.0025	0.0473	−0.1260	0.0854	−0.0249
T-statistic	1.9863	1.3535	−0.5801	−3.009	3.0912	−0.2496	2.3193	−3.1231	2.2621	−0.5202

real wages and domestic investment, are statistically significant in influencing the long-term behavior of inflation in South Africa. Real wages and domestic investment are not statistically significant in impacting long-term inflation. Additionally, the results in Table 6

reveal that external factors play a dominant role in driving the inflation rate in South Africa. This is elucidated by the fact that a 1% change in import price, exchange rate, and trade openness causes the South African inflation rate to increase by 1.563%, 0.5520%, and 0.680%, respectively. A similar pattern is observed with domestic investment and government expenditure, as the inflation rate increases by 0.048% and 0.157% in response to a 1% increase in domestic investment and government expenditure, respectively.

Import price and exchange rate emerge as significant external factors contributing to inflationary pressure in South Africa. The heightened volatility of the domestic currency within an open economy leads to its depreciation against major trading partners, thereby increasing the prices of imported goods and services. Since the South African agriculture sector may not be sufficient to meet the demand for essential food items, the high demand for foreign goods negatively impacts the national currency, leading to a rising inflation rate.

Conversely, the inverse relationship between inflation and government expenditure suggests that an increase in government spending, particularly on social securities or grants, prompts a surge in consumer demand for food, subsequently driving up food prices. Additionally, the level of domestic investment is influenced by the anticipation of future capital value. The creation or expectation of future value tends to increase the cost of investment, resulting in an inverse relationship between domestic investments and the inflation rate.

Contrary to expectations, the results indicate that high government expenditure is associated with high inflation. The positive relationship between government expenditure and the inflation rate suggests that, rather than being utilized for production growth, government spending is directed towards consumption growth. Furthermore, the funds received from the government are often spent on imported products, leading to heightened import demand and external inflationary pressure. To enhance the effectiveness of government expenditure in reducing domestic inflationary pressure, a significant portion of government spending should be allocated to promoting production growth.

Nevertheless, despite the factors mentioned above, export price, gross domestic product (GDP), and interest rate demonstrate an inverse association with long-run changes in inflation. While currency depreciation may reduce aggregate exports, increased exports play a crucial role in mitigating the inflation rate in South Africa. Higher export levels imply greater competitiveness for domestic products, resulting in fewer inflationary imports. Moreover, export growth and GDP contribute to reducing inflation in South Africa. The inverse relationship between inflation and GDP contradicts the general theory that associates GDP growth with increased demand and inflation. In the South African context, slow economic growth may prevent reaching the threshold that triggers a rise in demand, thus affecting the observed relationship.

Another variable inversely linked to the inflation rate is the interest rate, a core policy implemented by the South African Reserve Bank to control inflation fluctuations. The results in Table 6 indicate that a 1% increase in export price, GDP, and interest rate leads to a decline in the inflation rate by 0.456%, 0.924%, and 0.027%, respectively.

4.5. Short-run Dynamics and Error Correction Coefficients

The study utilized the Vector Error Correction Model (VECM) to assess the long-run stability among variables. Furthermore, the VECM was estimated to uncover the short-run dynamics indicating the model's adjustment towards long-run equilibrium. Theoretically, the validity of the Error Correction Model (ECM) demands the error correction term (ECT) to be negative and statistically significant. As displayed in Table 7, the coefficients of D(LGOV) and D(LREER) are both negative and statistically significant, suggesting that the model's short-run changes tend to revert to long-run equilibrium.

4.6. Impulse Response Function (IRF)

The study utilized Impulse Response Function (IRF) estimation to gauge the responsiveness of inflationary pressure to changes in

Table 8: Response of LCPI to Cholesky deviation innovations

Periods	LCPI	LEXP	LGDP	LGOV	LIMP	LINT	LINV	LREER	LWAGE
1	0.02979	0.00000	0.000000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.02627	0.00753	−0.000996	0.00159	−0.01522	0.00383	−0.00234	0.00339	−0.00131
3	0.02111	0.00418	−0.000833	−0.00232	−0.01155	0.00219	−0.00617	0.00122	−0.00037
4	0.02029	0.00664	0.002351	−0.00174	−0.00796	−0.00968	0.00073	0.00088	−3.8E−06
5	0.02132	0.00937	0.004884	3.05E−05	−0.00873	−0.01797	−0.00170	0.00202	−0.00172
6	0.01847	0.01078	0.005173	−0.00321	−0.00974	−0.01774	−0.00363	0.00517	−0.00210
7	0.01510	0.01011	0.007036	−0.00660	−0.00794	−0.02512	−0.00358	0.00695	−0.00165
8	0.01335	0.01126	0.008302	−0.00685	−0.00631	−0.03553	−0.00041	0.00698	−0.00142
9	0.01211	0.01322	0.010910	−0.00918	−0.00495	−0.04258	−0.00139	0.00810	−0.00232
10	0.00939	0.01294	0.013016	−0.01257	−0.00437	−0.04562	−0.00215	0.00979	−0.00273
11	0.00693	0.01132	0.014836	−0.01581	−0.00274	−0.04994	−0.00204	0.01100	−0.00301
12	0.00554	0.01075	0.016038	−0.01731	−0.00135	−0.05516	−0.00049	0.01145	−0.00354
13	0.00472	0.01090	0.017295	−0.01884	−0.00039	−0.05882	−0.00081	0.01208	−0.00430
14	0.00331	0.01045	0.018268	−0.02066	6.80E−05	−0.06044	−0.00116	0.01292	−0.00475
15	0.00204	0.00951	0.019104	−0.02228	0.00087	−0.06251	−0.00116	0.01346	−0.00505
16	0.00131	0.00905	0.019666	−0.02307	0.00160	−0.06490	−0.00051	0.01363	−0.00540
17	0.00088	0.00898	0.020254	−0.023815	0.00208	−0.06655	−0.00064	0.01388	−0.00583
18	0.00025	0.00868	0.020681	−0.02464	0.00231	−0.06722	−0.00083	0.01423	−0.00610
19	−0.00032	0.00818	0.021031	−0.02538	0.00268	−0.06804	−0.00084	0.01445	−0.00628
20	−0.00064	0.00792	0.021254	−0.02571	0.00301	−0.069027	−0.00056	0.01451	−0.00646

external factors. The results presented in Table 8 suggest that, over the analyzed period, the impact of external factors on inflationary pressure in South Africa increases with an extended time frame, albeit at a moderate rate. Among the variables examined, the exchange rate and GDP exhibit a significant impact on inflationary pressure compared to other explanatory variables. After twenty quarters (5 years), GDP contributes to around a 2% deviation in inflation, while the exchange rate contributes approximately 1.2% to inflationary pressure.

Conversely, the contributions of domestic investment, import price, and real wages to inflationary pressure remain modest, with these variables contributing 0.69027% for investment, 0.0301% for import price, and 0.0646% for real wages over 5 years. The Impulse Response Function (IRF) aligns with expectations, showing that an increase in the standard deviation for the interest rate leads to a decline in inflationary pressure. Figure 1 below illustrates the responses of inflation (LCPI) towards Cholesky Deviation Innovations with explanatory variables.

4.7. Variance Decomposition

The results from the variance decomposition analysis for 5 years, spanning twenty quarters or periods, are presented in Table 9. In the initial ten periods, more than 50% of changes in the inflation rate originate from its own shocks, with external factors explaining less than half of the changes. Import prices emerge as the most

Figure 1: Impulse responses

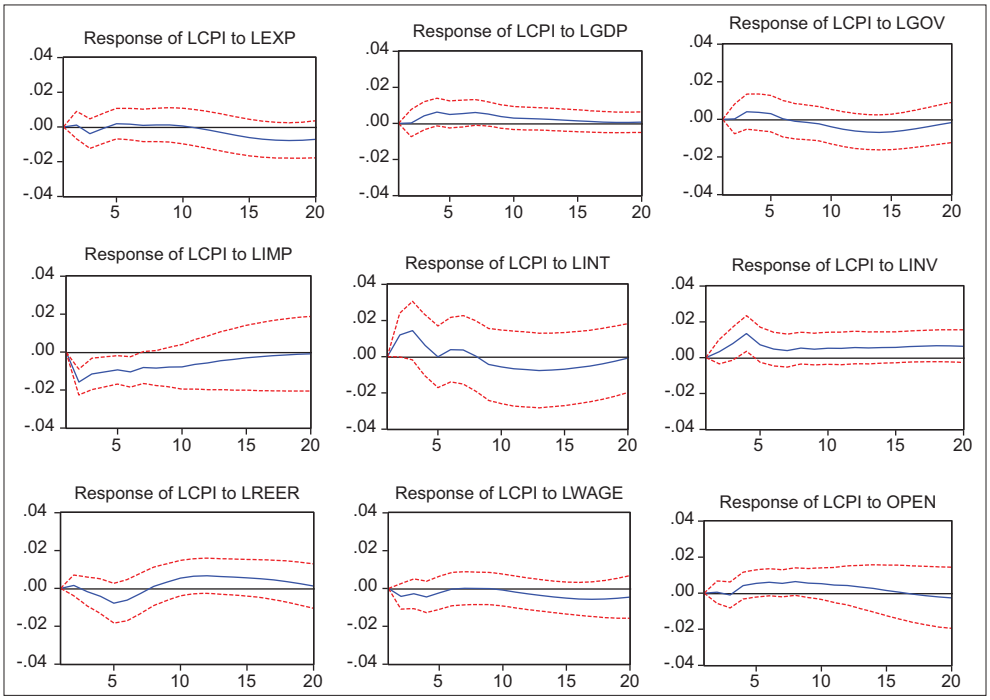

Table 9: Variance decomposition of inflation (consumer price index)

Period	SE	LCPI	LEXP	LGDP	LGOV	LIMP	LINT	LINK	LREER	LWAG	OPEN
1	0.0289	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.0417	75.55955	0.063144	0.002205	0.002869	14.35078	8.228001	0.626243	0.139651	1.012107	0.015452
3	0.0493	63.45477	0.669583	0.732875	0.674336	15.74771	14.40920	2.991060	0.218479	1.050282	0.051706
4	0.0552	56.55496	0.557887	1.872320	0.992463	16.10107	12.72310	8.356372	0.737584	1.486193	0.618040
5	0.0595	54.90455	0.581355	2.303166	1.109963	16.34227	10.94677	8.665200	2.366509	1.431114	1.349095
6	0.0630	53.24318	0.586238	2.804064	0.995434	17.37801	10.16836	8.322158	3.089609	1.282645	2.130303
7	0.0653	52.48783	0.564998	3.463060	0.950216	17.73381	9.787467	8.108507	3.043137	1.193778	2.667198
8	0.0675	51.74300	0.558021	3.839240	0.946679	18.16096	9.161433	8.209023	2.872931	1.117226	3.391483
9	0.0696	51.26126	0.552254	3.895705	1.003601	18.33787	8.978697	8.170528	2.925004	1.048882	3.826201
10	0.0719	50.37853	0.523191	3.820903	1.240292	18.38320	9.033078	8.191820	3.309868	0.998293	4.120827
11	0.0740	49.30888	0.499606	3.735541	1.671134	18.10748	9.324097	8.218247	3.868358	1.008074	4.258585
12	0.0761	47.94853	0.535025	3.644733	2.248054	17.71355	9.699412	8.330754	4.432265	1.098502	4.349178
13	0.0779	46.54989	0.694838	3.548762	2.888110	17.21701	10.20577	8.421619	4.868483	1.270894	4.334623
14	0.0797	45.13477	1.030200	3.445451	3.526168	16.70306	10.60648	8.556884	5.214037	1.529560	4.253397
15	0.0813	43.79942	1.551959	3.339748	4.060489	16.17721	10.89735	8.718953	5.474082	1.862154	4.118633
16	0.0829	42.55711	2.220268	3.234763	4.436969	15.68092	11.03427	8.960588	5.660897	2.240945	3.973264
17	0.0842	41.46798	2.967019	3.138273	4.649247	15.22909	11.05998	9.253763	5.759181	2.625928	3.849532
18	0.0854	40.55050	3.718686	3.055864	4.734169	14.84266	10.96857	9.603001	5.776263	2.980711	3.769587
19	0.0864	39.82134	4.413941	2.990683	4.733487	14.52579	10.80504	9.964215	5.726507	3.273642	3.745347
20	0.0872	39.25733	5.006050	2.942386	4.686427	14.27453	10.61823	10.31908	5.642508	3.485808	3.767643

Table 10: Residual diagnostic results

Test	Null hypothesis	P	Decision
Jarque-Bera	Normal distribution	0.5225	Failure to reject the null hypothesis
LM test	No serial correlation	0.2255	Failure to reject the null hypothesis
White (CT)	No heteroscedasticity	0.3362	Failure to reject the null hypothesis

significant explanatory variable causing changes in inflation, accounting for approximately 18.161 changes in the inflation rate from the eightieth quarter or period onward. In contrast, the domestic gross product (GDP) has the smallest impact on explaining changes in inflation, with its highest explanatory capacity ranging between 3.055864 in period 18 and 3.895705 in period 9. In summary, two explanatory variables, namely import prices and interest rates, dominate in explaining changes in the inflation rate in South Africa.

4.8. Residuals Diagnostic

Heteroscedasticity, normality, and serial correlation tests were conducted on residuals to assess the validity and reliability of the study. The results from these tests are presented in Table 10. The probability values for each test are greater than the 0.05 critical value. This suggests a failure to reject the null hypothesis, leading to the conclusion that, from an econometric perspective, the obtained results are robust. The established model is deemed free of serial correlation and heteroscedasticity.

5. CONCLUSION

The study delves into the multifaceted nature of inflationary pressure, examining both internal and external factors influencing inflationary changes in South Africa. Preceding the empirical analysis, various inflation theories were explored, with a focus on both monetarist and structural perspectives. While the monetarist approach attributes inflation pressure to government deficits, the structural approach identifies inflation as a supply-side phenomenon. The review of existing empirical literature presented divergent views, with some suggesting that inflationary pressure is strongly tied to internal factors, such as domestic reserve or national bank policies, and others asserting that external factors predominantly determine inflation pressure. However, the study's results indicate that, in South Africa, both internal and external factors significantly contribute to determining inflation pressure, supporting the validity of both the monetary and structural views. Nevertheless, external factors exert a more dominant influence.

The study's findings reveal that trade openness, exchange rates, and import prices exert a positive influence on inflation pressure in South Africa. Recent devaluation of the South African currency (rand) led to increased import prices, contributing to inflation pressure. In response to the rising inflation, the South African Reserve Bank raised interest rates, subsequently becoming a bottleneck for domestic investment. Consequently, the study suggests that domestic investment does not have a significant effect on inflationary pressure in South Africa. The impulse response analysis underscores the role of inflationary shocks. Additionally, the variance decomposition analysis indicates that import prices and interest rates remain major contributors to inflationary changes in South Africa.

Based on these findings, it can be concluded that relying solely on monetary and fiscal policies is insufficient to maintain a low and stable inflation rate in South Africa. Structural changes are deemed necessary to stimulate production, domestic investment, and the export growth of consumer goods and food.

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