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Exchange Rate Volatility, Inflation and Economic Growth in Developing Countries: Panel Data Approach for SADC

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Abstract: In the Southern African Development Community, the relationships between exchange rate instability, inflation and economic growth remain at the forefront of economic debate because of the historical antecedent and economic clustering of member countries. Nonetheless, much is not known regarding the complexity, complementarity or substitutability of exchange rate instability and inflation on economic growth for SADC countries. This article examined the influence of exchange rate instability on the inflation–growth nexus of the region for the period of 2000 to 2018. Three major techniques of analyses, Pooled Mean Group (PMG), Generalised Moments (GM) and Dynamic Fixed Effect (DFE), were employed in achieving the goal of the study, but the Pooled Mean Group estimator of the Panel Autoregressive Distributed Lag was favoured by the Hausman test as the main instrument. The GARCH (1, 1) was also employed to generate exchange rate instability. The findings of the study showed that exchange rate instability and inflation have a negative relationship with economic growth of the region. Results further show evidence that economic growth of the region is adversely influenced by the consequential effect of exchange rate instability on inflation: the higher the level of instability in exchange rate, the worse the inflationary-growth relationship of the region. This confirms the menu cost theory of price setting: the higher the rate of inflation, the quicker the exchange rate pass-through effect. It is therefore recommended that policies to ensure appreciation of local currencies should be the priority of member nations.

Keywords: panel data; economic growth; transitional economies; inflation

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1. Introduction

Mixed reactions have trailed the implications of inflation and instability of the exchange rate for GDP in economic literature. This is because the association between instability of the exchange rate and GDP constitutes a major issue for developing and emerging economies. Furthermore, there has been no consensus about findings on the nexus between volatility in the exchange rate and inflation-GDP. Most important is the tripartite relationship between volatility in the exchange rate, inflation and GDP from a regional perspective. The recent past has witnessed an increasing degree of inter-dependence among member countries of the SADC (Ogujiuba 2021), and as rightly observed by Mahawiya et al. (2020), one major strength of the African economic community is the issue of regional integration. While this type of strength can be beneficial to countries in terms of trade, economic stability, infrastructural development and overall improvement in the standard of living, it can also come with some costs. Notable among these costs are the contagion and spill-over implications of volatility of the exchange rate on GDP through inflation (UN-WESP 2020). Economists over time have therefore attempted to examine the individual effects of these costs on the economic performance of countries without much reference to the regional consequences of volatility in the exchange rate *cum* inflation pass-through (See Ogujiuba and Abraham 2013; Barguellil et al. 2018; Ehikioya 2019; Lean and Ehigiamusoe 2019).

SADC countries exhibit diverse levels of development in terms of inflation, per-capital income, economic growth and exchange rate, with South Africa dominating its economic activities at 68% of the total regional Gross Domestic Product (GDP) at the end of 2018 (Ncube et al. 2017; Southern Africa Development Community Outlook 2018; Southern Africa Development Community Outlook 2019). However, prior to 2019, South African economic agents have sometimes managed to keep the inflation rate below 6.0 percent but failed in 2007 to 2009 when the CPI was 7.1 percent (Ogujiuba and Themba 2020). Nonetheless, as contained in the Integrated Paper on Recent Economic Development in Southern Africa Development Community Outlook (2014), the average inflationary rate for the region reduced from 8.0% in 2012 to 6.6% in 2013. Malawi was the worst hit during this period, as it recorded a double-digit inflation rate of 22.9% in 2012 and 28.6% in 2013 because of an uncontrollable rise in food prices. Furthermore, the SADC Outlook report of 2019 further showed an average inflationary rate of 9.3% in 2017 and a projected rate of 10.6% in 2018 for the region. In terms of growth, the 2019 edition of the SADC Outlook reported that the region experienced sluggish GDP growth of 4% in 2010 to 1.2% in 2018, while 2.2% and 2.8% were projected for 2019 and 2020, respectively. In 2018, South Africa, which contributed 68% to the total GDP of the region, had a less than 1% GDP growth rate. Between 2011 and 2013, the GDP of the region improved to 3.9% after the financial crisis of the previous years but went down again to 1.7% in 2017 because of the 2014–2016 reduction in prices of oil and commodity outputs. Resulting from the volatility of oil and commodity prices, coupled with the uncertainty in the emerging market of South Africa, most of the countries' national currencies lost ground in 2018 and were projected to experience more in 2019 (Southern Africa Development Community Outlook 2019). With the current Covid-19 pandemic that has ravaged the global economy, the story is expected to be appalling at the end of the day.

Further, most of the countries within the region also experienced a varying degree of exchange rate instability, as revealed in Table 1. For example, Angola, which is a major net oil income earner, experienced currency depreciation throughout the period between 2008 and 2018, while Eswatini and Lesotho experienced appreciation during the years of 2010, 2011, 2017 and 2018 in currencies, because of the influence of the South African Rand. Botswana also experienced a similar trend in Pula and against the USD during the above period of assessment. At the beginning of the period, the South African Rand was exchanged for R8.19 to one US$ but appreciated to R7.18 in 2011 before an alarming deprecation to R14.80 in 2016. The Seychelles' Rupee appreciated by 12.4% between 2012 and 2013 and went down to 13.46 in 2016, 15.93 in 2017 and 12.89 in 2018.

Table 1. Exchange Rate in National Currency per 1US$.

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Angola	75.03	79.29	91.91	93.81	95.40	96.51	98.33	120.09	163.66	165.92	178.42
Botswana	6.83	7.16	6.79	6.80	7.62	8.40	8.98	10.13	10.89	10.30	10.21
Comoros	335.00	354.00	370.00	354.00	384.00	370.00	370.00	443.00	443.00	435.00	417.00
DRC	572.21	811.32	899.61	882.22	897.63	898.33	902.11	902.54	998.26	1372.85	1543.48
Eswatini	8.30	8.40	7.29	7.19	8.20	9.60	10.70	12.75	14.72	12.99	14.20
Lesotho	8.30	8.40	7.26	7.23	8.20	9.65	10.89	12.75	14.71	12.98	13.25
Madagascar	1645.28	1834.81	1903.36	1986.23	2002.34	2114.24	2309.76	2991.52	2999.02	3004.32	3223.64
Malawi	151.46	152.06	160.01	180.62	253.07	373.23	465.08	502.34	684.63	690.31	695.84
Mauritius	26.88	30.43	30.66	27.99	29.66	29.38	29.84	34.67	34.97	33.62	33.97
Mozambique	23.82	25.39	31.73	28.77	27.46	28.83	29.91	37.99	62.76	62.96	60.19
Namibia	8.38	8.38	7.49	6.93	8.16	8.99	9.96	11.97	14.63	13.26	13.18
Seychelles	9.52	13.58	12.07	12.67	13.91	11.83	12.34	13.04	13.46	15.93	12.89
South Africa	8.25	8.44	7.32	7.25	8.20	9.65	10.84	12.75	14.71	13.13	13.23
Tanzania	1201.24	1296.27	1389.29	1472.63	1483.11	1489.21	1562.09	1876.41	2066.60	2117.52	2189.79
Zambia	3.63	4.10	3.97	4.86	4.97	5.08	5.98	7.87	9.94	9.56	10.06
Zimbabwe	——	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.50

Source: Adapted from SADC Economic Outlook 2018 and 2019.

As observed, Malawi was the worst hit, with an over 600% depreciation in its currency between 2008 and 2018. The summary of the above table is that the countries within the SADC experienced a varying degree of challenges in terms of exchange rate instability, inflation and unstable economic performance. These issues are connected, and as rightly opined by Taderera et al. (2021), inflation is the channel through which the effect of volatility in the exchange rate is passed onto GDP. The need to study the role of instability of the exchange rate inflation-GDP nexus from a regional perspective was anchored on four issues: (i) the study of instability of the exchange rate in the inflation-GDP nexus will aid in achieving the goal of regional macroeconomic stability (Osabuohien et al. 2018; Mahonye and Zengeni 2019); (ii) instability of the exchange rate that leads to currency depreciation may aggravate inflation, such that export may be less competitive in eliminating possible deficits in the balance of payments and debt-relieving challenges, and as such, the expected benefits from depreciation may be an elusive thing (Chipili et al. 2017; Revelli 2020); (iii) most of the countries within the SADC are external-sector-driven, and the need to make it competitive in developing economies has long been emphasized in economic literature (Leichter et al. 2010, Ucube et al. 2017; OECD 2020), and finally, (iv) like many African countries, inflation and exchange rate instability are issues to contend with in the SADC region, and therefore, the need to examine their effects on economic growth has become a continuous academic exercise; (Vilakazi 2018).

This article, which is a deviation from previous studies, investigates the complementary consequences of exchange rate instability and the rate of inflation on the GDP of 13 SADC countries. spanning from 2000 through to 2018. The choice of this region was informed by its uniqueness in terms of economic integration and historical antecedents. This region was affected (just as other regions) by previous economic crises such as the global financial and commodity crises of 2007–2009 and 2014–2016. These crises led to fluctuations in some key macroeconomic indices, including inflation and exchange rate. For instance, and on a country-by-country analysis, the South African Rand was exchanged for R8.25 to 1US$ but appreciated to R7.25 in 2011; then, it depreciated to R14.71 in 2016. The Seychelles' Rupee appreciated by 12.4% between 2012 and 2013 and went down to 13.32 in 2016, 16.65 in 2017 and 13.92 in 2018. Further, virtually all the countries in this region experienced volatility in their exchange rate during the period under consideration. This study shows the extent to which the combined effects of exchange rate volatility and inflation affect the economic growth in the SADC. Undoubtedly, much has not been said in this extant economic literature. Closer to this study is the works of Mahonye and Zengeni (2019) and Taderera et al. (2021), which assessed the transmission effect of exchange rate volatility on inflation and its contractionary impact on economic growth for Zimbabwe. Unfortunately, the studies were time-series-based and did not examine the potential consequences of inflation and volatility in the exchange rate on the GDP of the country, especially the cross-border effects of these relationships. Consequently, this study comes with an innovation in its examination of the mixed implications of inflation and volatility in the exchange rate on the GDP growth rate in the SADC region. Authors such as Caselli and Roitman (2016) and Nshia et al. (2019) posit that one similarity of countries within the same economic integration is proximity, and the need to understand the policy implication of exchange rate variation on inflation by policy makers was emphasized. This may be true of the SADC with its geographical proximity and macroeconomic policies alignments. Nonetheless, the Southern African Developing Community (SADC), as an economic bloc, is not an exception in the inflation passthrough and exchange rate variation hypothesis. Using 13 selected countries within the SADC for data spanning from 2000 to 2018, this study had two major objectives to accomplish: firstly, we examined the combined consequences of inflation and exchange rate volatility on the GDP and, secondly, showed the extent to which exchange rate volatility influences the inflation-GDP nexus. This is unique because of the historical background and economic antecedents of member countries of this region.

Studies have employed the Portfolio Balance Model, Interest Rate Parity Theory, Traditional Flow Theory, Purchasing Power Parity, etc. to explain the exchange rate volatility-

growth hypothesis. With the nature of exchange rate practices within the SADC countries, which are a mixture of pegged and flexible ones, this study relied solely on the Purchasing Price Parity, which acknowledges the way volatility in the exchange rate influences the GDP of a nation through inflation. For instance, some countries in the SADC practice a flexible exchange rate, while others operate a pegged system. Therefore, we prefixed on the purchasing power parity (PPP) that addresses the effect of volatility in the exchange rate on economic growth through factors of economic growth itself, such as inflation. In theory, up and down movements in the exchange rate are a result of the dynamic nature of the business environment and changes in other macroeconomic indices, such as the level of inflation. The exchange rate, in its commonest sense, is the rate at which a local currency is exchanged with foreign currency. A rise in the movement of a currency relative to foreign currency represents an appreciation, while a downward movement is depreciation.

2. Review of Related Literature

In economic literature, exchange rate has been shown as an important component in determining both short- and long-run macroeconomic objectives of growth and development (Ehikioya 2019; Alagidede and Ibrahim 2017; Iyke and Odhiambo 2014). As noted by Alagidede and Ibrahim (2017), exchange rate volatility, which is a persistent fluctuation in the exchange rate, is one of the topical issues in recent times because of the effects on economic activities. Furthermore, inflation, which is another economic challenge confronting many of the SADC countries, has been argued as either having a positive or negative relationship with economic growth (Baharumshah et al. 2016). This is indicative of the fact that the combined effects of these challenges could be deleterious to an economy and snowballed into cross-border effects. Opinions vary about the association between exchange rate volatility and its effect on macroeconomic performance. While some have argued that exchange rate instability drives economic growth in an economy (Ozcelebi 2018), others have argued that it hampers the growth process (Barguellil et al. 2018). Possible reason for the differences in the findings of researchers may have emanated from data usage, methodology, the period of study and country-specific features (Phiri 2018). In separate studies, Chamunorwa and Choga (2015) and Ngondo and Khobai (2018) employed different methodologies (while the former employed GARCH, the later adopted ARDL) in assessing the relationship between exchange rate and export output for South Africa and concluded that instability in the exchange rate affects output negatively. On the other hand, Katusiime et al. (2016) employed the ARDL model for Uganda and submitted that shocks in the exchange rate influenced GDP positively.

Nigeria and South Africa were the focus of Balcilar et al. (2019), where stickier prices were recorded for South Africa than Nigeria in the study that examined the influence of exchange rate variation on inflation in both countries. Munthali et al. (2010) embraced how real effective exchange rate shocks contribute to the GDP of Malawi and found a negative and statistically significant correlation between these variables. Mahonye and Zengeni (2019) suggested, in a study on the influence of variations in the exchange rate on inflation and its attendant implications on economic growth for Zimbabwe, that real exchange rate devaluation for the country could be inflationary and that the move has the tendency of encouraging exports and, consequently, boosting economic performance in the country. This is an argument that is neither here nor there about the relationship between the country's exchange rate devaluation and GDP. Roger et al. (2019) investigated the link between GDP, exchange rate pass-through and the copper price for Zambia and concluded that a decline in inflation was a good determinant of exchange rate volatility.

Serenis and Tsounis (2014) examined the exchange rate on export for three African countries, namely Malawi, Morocco and South Africa, and reported a reduction in the overall trade because of exchange rate volatility. Although the multivariate cointegration ECM with two different measurements of volatility was introduced in the study, this led to different policy recommendations for the countries under investigation. This is an indication that the reason for the differences in recommendation was the sensitivity of the study

in terms of volatility measurement. Furthermore, Iyke and Odhiambo (2014) examined the performance of exchange rate regimes in three SADC countries, namely the Democratic Republic of Congo (DRC), Malawi and Mozambique, and the effect of these regimes on economic growth. Using data with trend, detailed graphical and growth rate analyses, the study found out that exchange rate volatility depressed economic growth between 1960 and 1990, when a fixed exchange regime was practiced, and caused a moderate-to-rapid growth for 1990 and 2010, when a managed-floating exchange rate was introduced. This is a pointer to the fact that the effects of exchange rate volatility depend on the type of exchange rate under practice.

Considerable studies have examined the link between exchange rate and economic growth in recent times (Morina et al. 2020; Ioan et al. 2020). The effect of real exchange rate instability was investigated by Morina et al. (2020), with an observation that low level of exchange rate volatility is required for growth. The study, which employed the fixed effect model of analysis, further supported trade openness and fixed capital formation as other variables that enhances steady economic growth within the Central and Eastern European Countries.

Other studies further argued that exchange rate policy differs in its effects on economic growth of countries because the exchange rate is more volatile under a flexible exchange rate regime than a fixed exchange rate system (Janus and Riera-Crichton 2015; Alper 2017; Barguellil et al. 2018; Assoumou-Ella 2018). For instance, in the case of the flexible exchange rate regime, Barguellil et al. (2018) found in their study that exchange rate volatility affected economic growth negatively in 45 developing and emerging countries under review. Further, few studies conducted on the Organisation for Economic Cooperation and Development (OECD) countries have produced mixed results between exchange rate variation and macroeconomic performance. The result by Janus and Riera-Crichton (2015) on some OECD countries revealed an inverse correlation between exchange rate changes and the GDP. In another study, a positive association was shown in the results of the Panel Vector Autoregression models on the interplay of exchange rate volatility, inflation rate and returns on stocks for 10 OECD countries by Ozcelebi (2018). The Impulse Response outcome of the VAR of the study further revealed that volatility of the exchange rate could impact positively on economic activities via a fall in interest rate. However, a high influence of exchange rate on the inflation trend was discovered with an insignificant statistical level of measurement.

Barguellil et al. (2018) used the system GMM estimators on a sample of 45 developing and emerging countries between 1985 and 2015 and found an inverse association between exchange rate movement and GDP in the case study. A similar study by Lean and Ehigiamusoe (2019) on volatility in the exchange rate and the finance-growth nexus in the West African region showed that financial deepening exhibits long-term positive effects on the GDP within the region, even though this effect is weakened by exchange rate variation. The implication of this is that the desired benefit of financial development on the GDP may not be realized unless there is a reduced and stabilized real exchange rate. Furthermore, the time-series data approach to the link between exchange rate, inflation and GDP by Hoanga et al. (2020) observed that a rising exchange rate affected economic growth in Vietnam through inflation and suggested macroeconomic policies that will moderate the effect of exchange rate variation on inflation and economic growth to achieve the desired macroeconomic stability for the country. The years of 1980 to 2011 were the target of Janus and Riera-Crichton (2015), where a negative association was confirmed between real effective exchange rate changes and GDP for a panel of OECD countries. This was also embraced for Turkey by Alper (2017), in that exchange rate instability reduces the outflow of export components of the GDP in the short run but was positive and negative in the long run for import inflows. In sum, exchange rate variation and the GDP relationship, as shown from above findings, support the conventional theory of growth that says volatility in the exchange rate depresses economic growth through low investment and international trade reduction while adding up to the challenges of human capital insurance.

With respect to the inflation–growth nexus, different arguments have permeated the empirical literature, in that the effect of inflation on economic growth could either be positive or negative, depending on the methodology, data and country-specific features (Baharumshah et al. 2016; Akinsola and Odhiambo 2017; Anidiobu et al. 2018; Phiri et al. 2018). Earlier empirical studies, such as Fischer (1993), Bruno and Easterly (1995) and Huybens and Smith (1999), established that inflation affects economic growth positively, with a caveat that only high inflation reduces productivity and economic activities in an economy. Without much contradiction, Ha et al. (2019) acknowledged the regional consequences of exchange rate instability on inflation and GDP in their investigations. While a positive influence of inflation on GDP had been well researched, the adverse consequences of not keeping it at bay, especially in developing countries, such as in the SADC community, had equally been acknowledged (Baharumshah et al. 2016). From a theoretical standpoint, the Mundell–Tobin theory posits that some level of inflation is good for an economy because, during inflation, people move away from money holdings towards investment (financial assets). This is because the interest rate is driven down, and an increase in economic activity is achieved through improved accumulation of capital in the economy. Thanh (2015) and Mahawiya et al. (2020) employed a panel smooth transition regression model and obtained different results on the inflation threshold needed for economic growth in their separate studies. While Thanh (2015) suggested a threshold of 7.8% in a study on five ASEAN countries, Mahawiya et al. (2020) indicated 17.9% and 14.5% threshold levels of inflation for the ECOWAS and SADC, respectively. Any inflationary level beyond these could be detrimental to the regional financial and economic growth. This clearly shows that the inflation–growth hypothesis remains a topical issue for developing countries, especially in Africa.

Bittencourt et al. (2015) employed panel time series data to examine the nexus between inflation and economic growth in 15 SADC countries and remarked that inflation was detrimental to the growth of the region. The study also observed that inflation offset the prospective Mundell–Fleming effect and significantly reduced economic activity in the region. Similarly, Moyo and Roux (2019) confirmed a negative relationship between inflation and economic growth in their study on interest rate reforms, inflation and investment channels to economic activities within the SADC regional bloc. On the contrary, Phiri et al. (2018) adopted a quantile regression method to investigate the nexus between inflation and the GDP growth rate in Ghana and South Africa and submitted that inflation impacts positively on the GDP growth rate for both countries but at different levels of inflationary thresholds. This was slightly supported in a study by Anidiobu et al. (2018). where inflation was shown as having a positive but insignificant effect on economic growth in Nigeria.

Taderera et al. (2021) extended the frontier of knowledge on the inflation–growth debate by incorporating interest rate in their study on the interplay of inflation, rate of interest and the GDP within the Southern African Custom Union (SACU). In a study that employed the PMG technique, it was observed that inflation affects economic growth positively, and therefore, it was suggested that a sustainable inflation rate that guarantees the desired economic growth for member countries should be complimented with a moderate interest rate. With little deviation, Vermeulen (2015) introduced employment into the inflation–growth analysis for South Africa and submitted that anything that adversely affects productivity, such as inflation, will also affect employment generation. Looking at it from another perspective, Moyo and Tursoy (2020) researched the complementary effects of inflation and exchange rate volatility using commercial banks as an endogenous variable. This was not elaborate enough, as financial institutions, which commercial banks represent, are a sub-sector of economic activities of an economy. Similarly, Jasova et al. (2016) studied exchange rate volatility pass-through inflation in 33 emerging and advanced economies without incorporating economic growth and concluded that a decrease in the exchange rate pass-through in emerging economies is a function of reduced inflation. Corroborating this submission was the study by Ha et al. (2019) on the degree of co-movement

between exchange rate instability and inflation for 55 emerging markets and developing economies where exchange rate variations were seen as having a negative effect on inflation in emerging economies. The caveat here was that this depended on the inflation threshold of the individual member country and period of investigation. In summary, these studies concluded that exchange rate volatility pass-through was low and stable for advanced economies but higher and deleterious in emerging economies.

Other studies with positive or non-linear relationships were Ndoricimpa (2017) and Odhiambo and Iyke (2017). The study by Monfare and Akin (2017) showed a negative and significant effect of inflation on economic growth. In Ndoricimpa (2017), a dynamic panel threshold regression approach was applied to examine the inflation–growth relationship, and it reported a nonlinearity nexus, in that the effects of inflation on economic growth differed between the low-income and middle-income countries of Africa. This was confirmed in the study of five Turkish Republics of Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan and Turkmenistan, where a nonlinear relationship was noticed between inflation and economic growth (Aydin et al. 2016). To achieve and maintain consistent economic growth, there is the need to balance the contributions of exchange rate volatility and rising inflation on economic activities between evolving economies. Basnet and Upadhyaya (2015) reversed this relationship to the impact of shocks in the oil price on economic growth, inflation and exchange rate volatility for selected ASEAN countries, with an outcome that the effect of oil price instability did not affect economic activities in the long run (Gbalayini, 2011; Muhammad and Ghulam 2017; Yakubu and Akanegbu 2019).

The summary from the above review is that opinions differ on how exchange rate imbalances, inflation and economic growth interact. However, a higher percentage of the reviews supported a negative association either between exchange rate instability and economic growth or inflation and GDP. It is therefore obvious that mixed and inconclusive results permeate opinions about the influence of exchange rate instability and inflation on economic growth. Aside from this, the lacuna is also obvious about the complementary contributions of exchange rate instability and inflation on economic growth from a regional perspective. This type of relationship has been adjudged as having cross-over effects on regional economic activities (Ha et al. 2019). Therefore, in this research work, we try not only to support or debunk the correlation between exchange rate instability and GDP, on one hand, and inflation and GDP growth rate, on the other hand, but to further show the complementarity or substitutability of exchange rate imbalances and inflation on the economic growth rate of the SADC.

3. Data and Methodology

3.1. Description of Data

This is a panel data study that covered the period of the years 2000 to 2018 for 13 selected SADC countries. Andre (2017) argued that panel data accounts for sample selection biasedness, owing to omitted variables. The summary of the information about the variables are contained in Appendix A. Economic growth was proxied by GDP and measured as per capita in constant 2010 US$; the measurement of exchange was the official exchange rate in the local currency unit per US$ and inflation rate proxied by the annual consumer price index. The data for economic growth, exchange rate and inflation were all sourced from the World Development Indicator (2018 edition). Oil price was measured by US closing price of the West Texas Intermediate (WTI), sourced from the Energy Information Administration (EIA-2018). The selected 13 countries were based on data availability. The list of these countries and how the variables of interest were defined and measured are as contained in Tables A1 and A2 in Appendix A, respectively. All the variables and measurements were in line with extant literatures (see Bahmani-Oskooee and Aftab 2017; Habib et al. 2017; Rodriguez 2017; Law et al. 2018; Barguellil et al. 2018; Chiweza and Aye 2018; Wesseh and Lin 2018; Lean and Ehigiamusoe 2019; Hassan and Meyer 2020; Olamide and Maredza 2021).

3.2. Model Specification

The data for this study were analysed using the Stata 13 econometric package. Following Barguellil et al. (2018) and Wesseh and Lin (2018), we specified our model as:

$$InECO_{it} = \eta_i + \lambda EXVOL_{it} + \phi INF_{it} + \delta OILP_{it} + \mu_{it} \quad (1)$$

where *ECO* represents economic growth, η represents the country-specific intercept, $EXVOL$ is the nominal exchange rate instability and *INF* denote inflation rate. The control variable for this study was solely oil price, which has been argued as having an overriding influence on economic activities of a country or region (Osigwe 2015; Chiweza and Aye 2018; Hassan and Meyer 2020). T is the time, i denotes country and μ_{it} is a time varying error term. In line with economic theory and the reviewed literature, the *a priori* results of our variables were to exhibit negative effects on the regressand. To examine the interactive effect of inflation and the instability in exchange rate on economic growth in our case study, the Autoregressive Distributed Lag Model (ARDL), as developed by Pesaran et al. (2001), was employed. The justification for the choice of this method was that where there is the problem of unit root, as argued by Alimi and Olaniran (2019), the Fixed Effect, Random Effect, Pooled Ordinary Least Square and the Generalised Moment Movement (GMM) factions of the static panel model are not ideal. Consequently, the dynamic panel approach of the form ARDL (p, q) has some overriding advantages: (i) it does not only take into account the heterogenous nature of the dynamic panel arrangement, but also the short run dynamic and long run equilibrium of the model (Rafindadi et al. 2018; Alimi and Olaniran 2019); (ii) the method is applicable to the situation of variables with I(0), I(1) or a mixture of both (Rafindadi et al. 2018). In addition, the approach produces consistent estimates in the face of endogeneity (Pesaran and Smith 1995; Alimi and Olaniran 2019); (iii) as in time series ARDL, both the short run and the long run influences can be simultaneously ascertained through this method (Pesaran et al. 1999). Therefore, this model is expressed as:

$$InEco_{i,t} = \eta_i + \sum_{j=i}^{p} \beta_{ij} \Delta \ln eco_{i,t-j} + \sum_{j=0}^{q} \psi_{i,j} \Delta X_{i,t-j} + \mu_{i,t} \quad (2)$$

where $X_{i,t} = (EXVOL_{i,t}, INF_{i,t}, INTER_{it}, OILP_{i,t},)$, and $INTER_{it} = (EXVOL_{it} * INF_{it})$.

Here, $i = 1, 2, 3 \ldots . N$ represents the number of countries under consideration, and $t = 1, 2, 3 \ldots t$ connotes the time dimension expressed in years, while j stands for the lag numbers. From our Equation (2) above, $ECO_{i,t}$, which is proxied by GDP per capita, is the economic growth of i countries at t period, which is the dependent variable; vector $X_{i,t}$ incorporates the independent variables of exchange rate instability, inflation rate, the interaction of inflation, exchange rate instability and oil price; η_i are the country-fixed effects. We can further re-write Equation (2) in re-parameterized form as follows:

$$\Delta \ln eco_{i,t} = \eta_i + \theta_i \ln eco_{i,t-j} + \varphi_i' X_{i,t} + \sum_{j=1}^{p} \beta_{ij} \Delta \ln eco_{i,t-j} + \sum_{j=0}^{q} \psi_{ij}' \Delta X_{i,t-j} + \mu_{i,t} \quad (3)$$

here,

$$\theta_i = -1\left(1 - \sum_{j=1}^{p} \beta_{ij}\right); \varphi_i = \frac{\sum_{j=0}^{q} \psi_{ij}}{\left(1 - \sum_{j=1}^{p} \beta_{ij}\right)}; \beta_{ij}^{*} = -\sum_{m=j+1}^{p} \beta_{ij} \; and \; \psi_{ij}^{*} = -\sum_{m=j+1}^{q} \psi_{ij} \quad (4)$$

Expressing Equation (5) as error correction model in a level form translates it into:

$$\Delta \ln ECO_{i,t} = \eta_i + \theta_i(\ln ECO_{i,t-j} - \varphi_i' X_{i,t}) + \sum_{j=1}^{p} \beta_{ij} \ln ECO_{i,t-j} + \sum_{j=0}^{q} \psi_{ij} X_{i,t-1} + \mu_{it} \quad (5)$$
$$\theta < 0$$

where $\theta_i(InECO_{i,t-j} - \varphi_i' X_{i,t})$ explains how economic growth adjusts to instability from its long run association with the regressors. Furthermore, the β_{ij}^* and ψ_{ij}^* stand for the short run coefficients that connect with both the lag values and the determinant's X_{it} vectors, while θ_i (the error correction coefficient) shows the adjustment speed in $lnECO_{it}$ in the long run direction of the long run equilibrium after changes in X_{it}. The existing long run association is given by $\theta_i < 0$ in the equation. It therefore follows that if the value of θ_i is significant and negative, there is evidence that both $lnECO_{it}$ and X_{it} are cointegrated.

Three different methods can be used to estimate Equation (6) above. These are the Mean Group (MG), Pooled Mean Group (PMG) and the Dynamic Fixed Effect (DFE). The MG technique of the ARDL, as explained by Pesaran and Smith (1995), estimates the long run value as the average of the long run coefficients of each cross-section. The method assumes that all coefficients are heterogenous across units, not only in the short run, but also in the long run, including the intercepts. The PMG as an estimator stands in-between the MG and the DFE estimators and only allows the long run slope of the coefficients to be homogenous. The last estimator, which is the DFE, takes its root from the fixed effect estimator and takes the lagged value of the dependent variable as part of the explanatory variables. Apart from the intercept, the approach assumes that coefficients are homogenous across units in both the short run and the long run periods. To determine the most suitable approach to be employed, the Hausman statistical test is usually the guiding approach.

3.3. Exchange Rate Volatility

Since Bollerslev (1986) hypothesized the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) into the ARCH family as an approach to determine exchange rate volatility, it has been embraced by different researchers (see Janus and Riera-Crichton 2015; Barguellil et al. 2018; Lean and Ehigiamusoe 2019). By allowing changes over time because of errors of the past, this method conditions variance, and the ability to capture clustering volatility and unconditionals return a distribution with heavy tails (Lean and Ehigiamusoe 2019). Unlike the orthodox time series and econometric models that operate with the assumption of constant variance, GARCH as a model is useful in the modelling of inflation and variability in the exchange rate (Hill et al. 2008; Alagidede and Ibrahim 2017). In addition, the Autoregressive Conditional Heteroskedasticity (ARCH) has the challenge of negative variance parameter estimates in empirical applications, which called for the ARCH model extension with a more flexible lag structure (Bollerslev 1986, Katusiime et al. 2016).

The GARCH (1, 1) of the conditional variance of exchange rate is specified as follows:

$$EX_t = \beta_o + \sum_{i=1}^{p} \beta_i EX_{t-1} + \varepsilon_t \quad (6)$$

$$\sigma_t{}^2 = \delta_0 + \sum_{i=1}^{p} \vartheta_i \varepsilon_{t-1}^2 + \sum_{j=1}^{q} \psi_j \sigma_{t-1}^2 \quad (7)$$

From the above mean Equation (7), EX_t represents exchange rate, and EX_{t-1} is the previous exchange rate, while ε_t stands for the error term. Similarly, from Equation (8), σ_t^2 represents the one period ahead forecast for exchange rate variance as a result of past information (volatility), the GARCH term (previous volatility) is σ_{t-1}^2 and ε_{t-1}^2 remains the previous information concerning the (ARCH term) volatility, and hence, the eq. is referred to as a conditional variance equation. This GARCH (1, 1) eq. above is employed in generating the quarterly data set exchange rate volatility and is included in the model of the time series data as ε_{t-1}^2.

4. Data and Preliminary Results

In Table 2 are the outcomes of the descriptive statistics and correlation matrixes for the SADC during the period under investigation. On the averages from descriptive statistics results, economic growth (ECO) and exchange rate (EXCH) recorded the highest values of 3540.308 and 184.607, respectively. Next were oil price (OILP) and inflation rate (INF) with 61.890 and 14.419, in that order, while exchange rate volatility had the lowest value of 0.3670. A wide variation was observed among the variables, as revealed by the result of the standard deviation. Economic growth had the highest SD value of 3444.411, with exchange rate volatility having the lowest value of 0.066. Accounting for this lowest value, this was because it was already in its volatility form compared with other variables.

Table 2. Descriptive statistics.

Statistics	**ECO**	**EXCH**	**EXVOL**	**INF**	**OILP**
Mean	3540.308	184.607	0.3670	14.419	61.890
Maximum	14,142.81	2206.914	0.401	513.906	109.45
Minimum	276.254			−2.409	23.12
Std. Dev.	3444.411	453.676	0.066	47.369	29.407
	ECO	**EXVOL**	**EXVOL ∗ INF**	**INF**	**OILP**
EXVOL	−0.132	1			
EXVOL ∗ INF	−0.155	−0.104	1		
INF	−0.321	−0.066	−0.282	1	
OILP	0.122	0.430	0.274	0.322	1

Note: ECO, EXCH, EXVOL, INF and OILP represent economic growth (proxy by GDP per capita), nominal exchange rate, exchange rate volatility, inflation rate and oil price, respectively.

From the lower part of the table are the results of the correlation matrix. Expectedly, exchange rate instability exhibited a negative correlation with economic growth, and it was statistically significant at 5%. Furthermore, the interaction of exchange rate instability and inflation affected economic growth positively but not statistically significantly. This is an unexpected association. In summary, this preliminary data assessment revealed that negative relationships exist between exchange rate instability, inflation and economic growth within the SADC region.

4.1. Panel Unit Root Tests

Three forms of panel unit root tests were performed in this study to establish the features of the data, allowing reasonable decision on the stationarity of the panel series and the order of the series' integration levels. These were the Breitung, Im Pesaran and Shin and the Hadri panel unit root tests. According to the results of the panel unit root tests presented in Table 3, exchange rate volatility (EXVOL) and inflation rate (INF) were made stationary at level I(0), while economic growth (ECO), as represented by GDP per capita and oil price, were stationary at their first difference, I(1). Consequently, the choice of the Auto Distributive Lag (ARDL) technique for the study was justified based on the outcomes below.

Table 3. Stationarity tests.

	IPS Test		Breitung Test		Hadri Test	
Variables	**Level**	**First Diff**	**Level**	**First Diff**	**Level**	**First Diff**
LECO	−1.0567	−3.1982 ***	5.1761	−3.8347 ***	31.1987 ***	5.0887
EXVOL	−2.7127 **	−5.0148 ***	−2.5488 **	−4.1994 ***	3.5607 ***	−1.7632
INF	−2.5561 **	−4.4447 ***	−1.7679 **	−7.1798 ***	13.1363 ***	−2.1648
OILP	−1.4834	−3.1308 ***	−1.5559	−6.5875 **	18.3692 ***	1.8428

Note: ECO, EXVOL, INF and OILP represent economic growth (proxy by GDP per capita), exchange rate volatility, inflation rate and oil price, respectively. *** and ** are, respectively, the statistical significance at 1%, 5% and 10%. The null hypotheses of Im Pesaran and Shin (IPS) and Breitung tests were that the underlying series were non-stationary, while the Hadri null hypothesis was that the series was stationary.

4.2. Discussion of Estimated Panel Results

The reports of the mean group, dynamic fixed effects and the pooled mean group estimates on the correlation between exchange rate instability, inflation and economic growth in the SADC are contained in Table 4. To determine the efficient model out of the three estimation techniques (pooled mean group, mean group and dynamic fixed effect), the use of the Hausman test became sacrosanct as a rule of the thumb. The rule is that if the *p*-value of the Hausman test is insignificant at the 5% level, then the PMG is efficient, but if the *p*-value is significant, then the use of a MG estimator is appropriate. Since the *p*-value of the test between PMG and MG was insignificant in our report, this suggests that the PMG estimate was efficient. Applying the same rule in decision making between PMG and DFE at the 5% level of significance, the PMG estimate was efficient. Based on this, our interpretation of the influence of exchange rate instability on the inflation–growth association in the SADC region was based on the PMG estimate. The reports of MG and DFE are presented for the sake of making comparison. For the three models, the coefficients of ECT were negative and statistically significant, as expected. It means the convergent values were negative and statistically significant, which suggests the presence of cointegration between economic growth and the explanatory variables. It further showed the speed with which any disequilibrium in the short term is adjusted to restore equilibrium in the long run. With a value of −0.124, it indicated that disequilibrium in the short run is adjusted for in the long run at a speed of 12.4%. The Hausman homogeneity tests revealed that the PMG model was the preferred model. The lag orders for the model were the unrestricted model of the Schwarz Information Criteria (SIC), with a lag of 2.

Starting with the impact of exchange rate instability on economic growth, the result showed that exchange rate instability can explain changes in economic growth of the region. In other words, exchange rate instability retards economic growth of the SADC as a region. One possible reason for this, as pointed out by Revelli (2020), could be the integrated economic environment in which countries within the region operate, such that any instability in the exchange rate is capable of exacerbating inflation and therefore weakening economic activities of the region. Extant literatures in support of this association include Kacperczyk and Schnabl (2010) and Kabundi and Mlachila (2018), where it was affirmed that exchange rate instability can undermine the growth aspiration of developing countries and, hence, the need to improve on monetary policy credibility that will reduce the adverse effect of exchange rate instability at regional levels. Just like other regional economic integrations within sub-Saharan Africa, the SADC has been involved in massive importation of semi-finished goods as inputs and in paying heavily for human capital without corresponding exports that could ameliorate the adverse implications of exchange rate instability. This has resulted in a regional balance of payment deficits and foreign exchange instability.

Table 4. PARDL results for the SADC on the influence of exchange rate volatility on the inflation–economic nexus (South Africa Exclusive).

Variables	PMG	MG	DFE
Long run Estimate			
Exvol	−0.566 ***	–17.81	0.0625
	(0.191)	(12.16)	(0.738)
Linf	−0.168 ***	–2.497	–0.0122
	(0.0414)	(2.624)	(0.103)
linf ∗ Exvol	−0.656 ***	6.238	–0.156
	(0.120)	(6.601)	(0.305)
Loilp	0.289 ***	0.228 ***	0.295 ***
	(0.0220)	(0.0713)	(0.0569)
Constant	0.900 ***	2.686 ***	0.884 ***
	(0.243)	(0.420)	(0.167)
Short run Estimate			
ECT	−0.129 ***	−0.281 ***	−0.136 ***
	(0.0336)	(0.0484)	(0.0232)
ΔExvol	0.792 *	1.356	0.0570
	(0.466)	(0.976)	(0.0765)
ΔLinf	0.0844	−0.0207	0.00637
	(0.0811)	(0.232)	(0.0104)
Δlinf ∗ Exvol	−0.186	0.0317	−0.0139
	(0.226)	(0.597)	(0.0278)
Δloilp	0.00591	−0.0260 *	−0.00430
	(0.0122)	(0.0145)	(0.0122)
No of Countries	12	12	12
Observations	204	204	204
Hausman Test	MG vs. PMG		PMG vs. DFE
$Chi^2(4)$	1.69		93.98
Prob.	0.7927		0.0000

Source: Author's own computation using data from WDI & EIA. The *** and * show the rejection of the null hypotheses of the unit root at 1%, 5% and 10% significance level, respectively.

From the results of the correlation between inflation and economic growth, a negative association was recorded, suggesting that the inflationary consequences on the economic growth of the region were adverse. Accounting for this could be the overriding influence of South Africa in terms of economic activities of the region. Studies such as Chipili et al. (2017) have established that inflation, which is one major challenge confronting South Africa, has permeated through other countries of the region, especially the so-called SACU and CMA countries. In addition, Bittencourt et al. (2015), Moyo and Roux (2019) and Baharumshah et al. (2016), in their various findings, identified inflation as one major challenge to contend with in the SADC region. They further argued that an increasing and consistent inflation rate could cause imported inflation at regional levels and erode the purchasing power of the citizenry. This agreed with Fatai and Akinbobola (2015) where it was asserted that one major characteristic of many of the sub-Saharan African countries is the issue of imported inflation. While few of the countries within the region may have enjoyed relative inflationary stability, the fact that they are operating in an integrated economic environment will make it easier and quicker to transmit shocks across borders (Revelli 2020). For instance, countries such as Lesotho, Swaziland, Mauritius and few other countries that have strong economic ties with South Africa may be affected by any adverse inflationary consequences that may arise from importation from South Africa (Chipili et al. 2017).

Regarding the contribution of exchange rate instability to the inflation-economic growth association, the result revealed that economic growth was adversely influenced by the consequential effect of exchange rate instability on inflation. This is an indication that volatility in the exchange rate affects economic growth negatively through inflation rate:

the higher the level of volatility in the exchange rate, the worse the inflationary-growth relationship of the region. This confirms the menu cost theory of price setting: the higher the rate of inflation, the quicker the exchange rate pass-through effect. Recent studies by Lean and Ehigiamusoe (2019) and Revelli (2020) have confirmed this association, where the need for regional price stability and encouragement of local production of goods were suggested. In addition, Mihaljek and Klau (2001) and Chipili et al. (2017) opined that the adverse consequences of exchange rate instability on inflation and economic growth can result in negative openness-inflation or imported inflation.

For the control variable of oil price, a negative and significant relationship with economic growth was observed for the SADC. Existing findings, such as in Balcilar et al. (2019), Nasir et al. (2018) and Yildirim and Arifli (2021), have supported this relationship, where exchange rate imbalances were linked with the inflation–growth nexus that resulted in cost-push inflation. They further affirmed that shocks from oil price affected economic activities severely during the period of slow growth, as has been experienced by many of the countries under investigation. Even if the shock to the oil price is in the form of a price reduction, there is evidence to show that this may not boost economic activities (van Eyden et al. 2017). Therefore, as an oil-importing region, increasing oil price shocks may result in higher input costs (Osabohien et al. 2019). Not only that, but fiscal policy might also have its own share on the effects, as social benefit claims, debt and debt servicing will all increase because of dwindling regional revenues. The better option would therefore be to place intensity more on investment in infrastructural facilities that will aid the production of goods and services and other available mitigating options.

This study has been able to establish that (i) exchange rate volatility affects the economic growth of the SADC negatively; (ii) the inflationary effect on economic growth of the SADC as a region was negative and (iii) the interaction of exchange rate instability with inflation influenced economic growth of the SADC as a region adversely. Furthermore, there was evidence of cost-push inflation resulting from the adverse influence of exchange rate imbalances on inflation and economic growth of this economic region. This evidence clearly shows that volatility in the exchange rate and inflation remain two major challenges facing the SADC. This was in line with studies by Chipili et al. (2017) and Hassan and Meyer (2020), where it was argued that inflation and exchange rate imbalances are the twin economic challenges facing the region, and to ameliorate the effects, cost of production, such as energy prices and semi-finished inputs of manufacturing goods, need to be addressed.

Table 5 below shows results of the influence of exchange rate instability.

Table 5. PARDL outputs on the influence of exchange rate instability on the inflation–economic nexus.

	Dependent Variable: LECO		
VARIABLES	**PMG**	**MG**	**DFE**
Long run Estimate			
Exvol	−0.503 **	−16.14	0.129
	(0.199)	(11.31)	(0.702)
Lninf	−0.160 ***	−2.161	−0.0133
	(0.0420)	(2.436)	(0.0986)
ln(Exvol ∗ Inf)	−0.644 ***	5.377	−0.164
	(0.122)	(6.133)	(0.289)
Lnoilp	−0.278 ***	−0.225 ***	−0.278 ***
	(0.0220)	(0.0656)	(0.0509)
Constant	0.869 ***	2.561 ***	0.911 ***
	(0.231)	(0.406)	(0.162)

Table 5. *Cont.*

Dependent Variable: LECO			
VARIABLES	**PMG**	**MG**	**DFE**
Short run estimate			
$ECT(-1)$	−0.124 ***	−0.271 ***	−0.137 ***
	(0.0318)	(0.0456)	(0.0221)
ΔExvol	−0.727	1.106	0.0503
	(0.442)	(0.931)	(0.0736)
Δlninf	−0.0903	−0.0564	0.00668
	(0.0767)	(0.217)	(0.0100)
Δln(Exvol ∗ Inf)	−0.201	0.126	−0.0131
	(0.213)	(0.557)	(0.0267)
Δlnoilp	0.00963	−0.0227 *	−0.00257
	(0.0115)	(0.0137)	(0.0113)
No of Countries	13	13	13
Observations	221	221	221
Hausman Test	MG vs. PMG		PMG vs. GFE
$Chi^2(4)$	9.17		84.73
Prob.	0.0570		0.0000

Note: ECO, EXVOL, INF and OILP represents economic growth (proxy by GDP per capita), exchange rate volatility, inflation rate and oil price, in that order, while the number in parentheses are the probability values. The ***, ** and * show the rejection of the null hypotheses of the unit root at 1%, 5% and 10% significance level, respectively.

Robustness Check for the Regression Outcomes

As a check, South Africa was excluded from the analysis, and the outcome of the remaining 12 countries is presented in table (V). Excluding South Africa was considered important because of the likely overriding impact on our analysis, with it being the largest economy that accounts for over 30% of economic activities of the region. However, the same results were observed, as all the coefficients exhibited the same signs and significance as earlier discussed, but with varying magnitude, thereby suggesting that the overbearing influence of South Africa within the region still subsists. This was in tandem with the study by Chipili et al. (2017), where the impact of inflationary shocks from South Africa was shown to have permeated through other SADC countries, and therefore, the need for monetary policy reappraisal and economic diversification by member countries was advocated for. By and large, in forecasting inflation for the region, other countries must take into consideration the implication of South Africa's inflation and therefore incorporate the same as a better guide in their economic and monetary policy formulation.

5. Concluding Remarks

This manuscript is a step further in the examination of the influence of exchange rate instability on the inflation–growth nexus at a regional level, using the SADC as case study. We examined the influence of exchange rate instability on the inflation–growth association in the Southern African Development Community for time series data spanning from 2000 to 2018. Specifically, the study hypothesized the relationships between exchange rate instability, inflation and economic growth on one hand and the interactive influence of exchange rate instability and inflation on economic growth on the other hand. Three different techniques of econometrics, namely the PMG, MG and DFG, were employed for the aggregated panel data, with a Hausman test suggesting the PMG as the best technique of analysis. We can therefore conclude that (i) exchange rate instability affects economic growth of the SADC negatively and, therefore, results in cost-push inflation, and (ii) inflation affected the economic fortune of the region negatively. There was also considerable evidence of imported inflation for the region; (iii) oil price's influence on economic growth of the region was also shown to be negative, and (iv) the influence of exchange rate instability on the inflation–growth nexus was negative. This suggests that the negative effect of inflation on economic growth brought about by exchange rate

imbalances could weaken economic growth of the region. These outcomes were all in line with extant literature, where it was established that what could guarantee regional economic advancement of developing countries is a stable exchange rate coupled with a moderate inflationary level (Caselli and Roitman 2016) and (Ogujiuba and Cornelissen 2020). It was established that exchange rate instability and inflation negatively eroded the economic growth of the region. Furthermore, exchange rate instability was shown as affecting economic growth adversely through inflation.

Several policy implications could be inferred from the findings of this study. Firstly, the adverse influence of exchange rate instability on economic growth of the region is an indication that monetary and fiscal policies employed to strengthen local currencies and discourage importation of certain goods and services have not yielded the desired results for the region. Second, apart from Botswana, Swaziland and a few other smaller countries, exchange rate instability and inflation have been a recurring decimal within the region. Monetary authorities of member countries should live up to their monetary policy responsibilities by ensuring that the adverse implications of exchange rate imbalances on economic growth are vigorously addressed through policy implementation and with necessary political will than ever before. Further, member countries should target a single digit inflation rate. Finally, the negative effect of the complimentary influence of exchange rate instability and inflation on economic growth suggests that existing policies in this direction have not been potent enough, and as such, a regional review of economic policies that will strengthen local currencies and encourage local production of semi-finished goods should be intensified.

In summary, macroeconomic policies that will further enhance local production of exports and ensure exchange rate stability with reduced inflationary pressures should be formulated and implemented. This should be complimented with fiscal measures against indiscipline in public spending on frivolities such as military budgeting since the region is not in war period. Raw materials for production and manufacturing of goods and services should be locally sourced to ameliorate the pressure from exchange rate volatility on local currencies. Our research equally established that the inflation–growth pass-through for the region was brought about by the adverse effect of exchange rate volatility on inflation. Above all, the diversification of domestic economies should be more prioritized. Nonetheless, this study was limited by the availability of data, and as such, all the countries within the SADC could not be captured. As a caveat, the outcomes of this study did not represent each individual country's situation, as they only applied to the group of countries within the SADC sub-Saharan economic region. Furthermore, our econometric setting was limited to some macroeconomic variables considered relevant for the study. By extension, therefore, we suggest that the framework of this study be extended to other regional blocs in sub-Saharan Africa where the influence of exchange rate instability on the inflation–growth nexus has not been fully exploited. In addition, there should be a revisit of the ideal inflationary threshold for the SADC to make it more growth-driven and give room for future-looking policy formulation. Finally, linking the manufacturing sector of the region in a study like this will make an interesting study area. It is therefore hoped that the outcome of this study will assist the SADC and other regional blocs in formulating and implementing exchange rate policies that will not only strengthen the economic fortune of their regions, but also ensure exchange rate stability. Therefore, this study adds to existing knowledge and provides a framework for policy formulation by affirming that exchange rate instability and inflation separately affect the economic growth of the SADC negatively.

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Appendix A

Table A1. List of sample countries (13).

Angola	Mauritius
Botswana	Namibia
Comoros	Seychelles
DR Congo	South Africa
Lesotho	Zambia
Madagascar	Zimbabwe
Malawi	

Table A2. Variable Measurement and Sources.

Variables	Measurement	Source
Economic Growth (ECO)	GDP Per Capita (constant 2010 US $)	WDI, 2018
Exchange rate (EXCH)	Official exchange rate (LCU, per US $)	WDI, 2018
Oil Price (OILP)	Annual oil price	EIA, 2019
Inflation (INF)	Inflation, consumer prices (annual %)	WDI, 2018

References

Akinsola, Foluso A., and Nicholas M. Odhiambo. 2017. Inflation and economic growth: A review of the international literature. *Comparative Economic Research* 20: 41–55. [CrossRef]

Alagidede, Paul, and Muazu Ibrahim. 2017. *On the Causes and Effects of Exchange Rate Volatility on Economic Growth: Evidence from Ghana*. International Growth Center Working Paper. London: London School of Economic and Political Science.

Alimi, Ahmed S., and Oladotun D. Olaniran. 2019. Monetary policy and the stock price-exchange rate nexus: New insights from influential African economics. *Asian Development Policy Review* 7: 66–79. [CrossRef]

Alper, Ali Eren. 2017. Exchange Rate Volatility and Trade Flows. *Fiscaoeconomia* 1: 1–26.

Andre, Hans Jürgen. 2017. The Need for and Use of Panel Data. Available online: https://wol.iza.org/articles/the-need-for-and-use-of-panel-data (accessed on 5 March 2021).

Anidiobu, Gabriel, Paschal I. P. Okolie, and Oleka. 2018. Analysis of inflation and its effect on economic growth in Nigeria. *Journal of Economics and Finance* 9: 28–36. [CrossRef]

Assoumou-Ella, Giscard. 2018. Forecasting CEMAC's foreign exchange reserves in presence of unanticipated changes in oil prices: An interrupted time series modelling. *Journal of Central Banking Theory and Practice* 2: 65–83. [CrossRef]

Aydin, Celil, Ömer Esen, and Metin Bayrak. 2016. Inflation and economic growth: A dynamic panel threshold analysis for Turkish Republics in transition process. *Social and Behavioral Sciences* 229: 196–205. [CrossRef]

Baharumshah, Ahmad Zubaidi, Ly Slesman, and Mark E. Wohar. 2016. Inflation, inflation uncertainty, and economic growth in emerging and developing countries: Panel data evidence. *Economic Systems* 40: 638–57. [CrossRef]

Balcilar, Mehmet, Ojonugwa Usman, and Esther Abdul Agbede. 2019. Revisiting the Exchange Rate Pass-Through to Inflation in Africa's Two Largest Economies: Nigeria and South Africa. *African Development Review* 31: 245–57. [CrossRef]

Barguellil, Achouak, Ousama Ben-Salha, and Mourad Zmami. 2018. Exchange rate volatility and economic growth. *Journal of Economic Integration* 33: 1302–36. [CrossRef]

Basnet, Hem C., and Kamal P. Upadhyaya. 2015. Impact of oil price shocks on output, inflation and the real exchange rate: Evidence from selected ASEAN countries. *Applied Economics* 47: 3078–91. [CrossRef]

Bittencourt, Manoel, Reneé Van Eyden, and Monaheng Seleteng. 2015. Inflation and economic growth: Evidence from the Southern African development community. *South African Journal of Economics* 83: 411–24. [CrossRef]

Bollerslev, Tim. 1986. Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics* 31: 307–27. [CrossRef]

Bruno, Michael, and William Easterly. 1995. *Inflation Crises and Long-Run Growth*. World Bank Policy Research Working Paper No. 1517. Washington, DC: World Bank.

Bahmani-Oskooee, Mohsen, and Muhammad Aftab. 2017. On the asymmetric effects of exchange rate volatility on trade flows: New evidence from US-Malaysia trade at the industry level. *Economic Modelling* 63: 86–103. [CrossRef]

Caselli, Francesca G., and Agustin Roitman. 2016. *Non-Linear Exchange Rate Pass-Through in Emerging Markets*. IMF Working Paper, 16(1). Washington, DC: International Monetary Fund.

Chamunorwa, Wilson, and Ireen Choga. 2015. Exchange rate volatility and export performance in South Africa. *Handbook on Economics, Finance and Management Outlooks* 5: 1174–86. Available online: http://pakinsight.com/?ic=book_detail&id=11 (accessed on 8 December 2021).
Chipili, Jonathan M., Keegan Chisha, and Kafula Longa. 2017. *Effect of South African Inflation on Other SADC Countries' Inflation*. Lusaka: Bank of Zambia.
Chiweza, Junior T., and Goodness C. Aye. 2018. The effects of oil price uncertainty on economic activities in South Africa. *Cogent Economics & Finance* 6: 1518117. [CrossRef]
Ehikioya, Benjamin Ighodalo. 2019. The impact of exchange rate volatility on the Nigerian economic growth: An empirical investigation. *Journal of Economics & Management* 37: 45–68. [CrossRef]
Morina, Fatbardha, Eglantina Hysa, Uğur Ergün, Mirela Panait, and Marian Catalin Voica. 2020. The Effect of Exchange Rate Volatility on Economic Growth: Case of the CEE Countries. *Journal of Risk and Financial Management* 14: 1344. [CrossRef]
Fatai, M. O., and T. O. Akinbobola. 2015. Exchange rate pass-through to import prices, inflation and monetary policy in Nigeria. *International Finance and Banking* 2: 60–78. [CrossRef]
Fischer, Stanley. 1993. The Role of Macroeconomic Factors in Growth. *Journal of Monetary Economics* 32: 485–512. [CrossRef]
Gbalayini, Latife. 2011. The interaction between oil price and economic growth. *Middle Eastern Finance and Economics* 13: 127–41. Available online: http://www.eurojournals.com/MEFE.htm (accessed on 5 March 2016).
Ha, M. Jongrim, Marc Stocker, and Hakan Yilmazkuday. 2019. *Inflation and Exchange Rate Pass-Through*. Policy World Bank Group Research Working Paper No. 8780. Washington, DC: World Bank.
Habib, Maurizio, Elitza Mileva, and Livio Stracca. 2017. The real exchange rate and economic growth: Revisiting the case using external instruments. *Journal of International Money and Finance* 73: 386–98. [CrossRef]
Hassan, Asmadi, and Daniel Meyer. 2020. Financial Development–Income Inequality Nexus in South Africa: A Nonlinear Analysis. *International Journal of Economics and Finance Studies* 12: 335–351.
Hill, R. Carter, William E. Griffiths, and Guay C. Lim. 2008. *Principles of Econometrics*, 3rd ed. Hoboken: John Wiley and Sons, Inc., pp. 382–406.
Hoanga, Thanh Tung, Van Anh Nguyen Thi, and Hoang Dinh Minh. 2020. The impact of exchange rate on inflation and economic growth in Vietnam. *Management Science Letters* 10: 1051–60. [CrossRef]
Huybens, Elisabeth, and Bruce D. Smith. 1999. Inflation, financial markets and long-run real activity. *Journal of Monetary Economics* 2: 283–315. [CrossRef]
Ioan, Batrancea, Rathnaswamy Malar Mozi, Gaban Lucian, Fatacean Gheorghe, Tulai Horia, Bircea Ioan, and Rus Mircea-Iosif. 2020. An Empirical Investigation on Determinants of Sustainable Economic Growth. Lessons from Central and Eastern European Countries. *Journal of Risk and Financial Management* 13: 146. [CrossRef]
Iyke, Bernard N., and Nicholas M. Odhiambo. 2014. The Dynamic causal relationship between electricity consumption and economic growth in Ghana: A trivariate causality model. *Managing Global Transitions: International Research Journal* 12: 141–60.
Janus, Thorsten, and Daniel Riera-Crichton. 2015. Real exchange fate volatility, economic growth and the Europe. *Journal of Economic Integration* 30: 148–71. [CrossRef]
Jasova, Martina, Richhild Moessner, and Előd Takáts. 2016. *Exchange Rate Passthrough: What Has Changed since the Crisis?* BIS Working Papers No 583. Basel: BIS.
Kabundi, Alain, and Montfort Mlachila. 2018. The role of monetary policy credibility in explaining the decline in exchange rate pass-through in South Africa. *Economic Modelling* 79: 173–85. [CrossRef]
Kacperczyk, Marcin, and Philipp Schnabl. 2010. When safe proved risky: Commercial paper during the financial crisis of 2007–2009. *Journal of Economic Perspectives* 24: 29–50. [CrossRef]
Katusiime, Lorna, Frank W. Agbola, and Abul Shamsuddin. 2016. Exchange rate volatility–economic growth nexus in Uganda. *Applied Economics* 48: 2428–42. [CrossRef]
Law, Siong Hook, Ali M. Kutan, and N.A.M. Naseem. 2018. The role of institutions in finance curse: Evidence from international data. *Journal of Comparative Economics* 46: 174–91. [CrossRef]
Lean, Hooi Hooi, and Kizito Uyi Ehigiamusoe. 2019. Influence of real exchange rate on the finance-growth nexus in the West African region. *Economies* 7: 23. [CrossRef]
Leichter, Jules Leichter, Cristina Mocci, and Stefania Pozzuoli. 2010. Measuring External Competitiveness: An Overview. *International Political Economy: Trade Policy eJournal*. [CrossRef]
Mahawiya, Sulemana, Abraham Haim, and Oteng-Abayie Eric Fosu. 2020. In search of inflation limits for financial sector development in ECOWAS and SADC regions: A panel smooth transition analysis. *Cogent Economics & Finance* 8: 1722306. [CrossRef]
Mahonye, Nyasha, and Tatenda Zengeni. 2019. Exchange rate impact on output and inflation: A historical perspective from Zimbabwe. *African Journal of Science, Technology, Innovation and Development* 11: 347–58. [CrossRef]
Mihaljek, Dubravko, and Marc Klau. 2001. A note on the pass-through from exchange rate and foreign price changes to inflation in selected emerging market economies. *BIS Papers* 8: 69–81.
Monfare, Sanam Shojaeipour, and Fetullah Akin. 2017. The Relationship between exchange rates and inflation: The case of Iran. *European Journal of Sustainable Development* 6: 329–40. [CrossRef]
Moyo, Clement Zibusiso, and Pierre Le Roux. 2019. Interest Rate Reforms and Economic Growth in SADC Countries: The Savings and Investment Channel. *Scientific Annals of Economics and Business* 66: 507–23. [CrossRef]

Moyo, Delani, and Turgut Tursoy. 2020. Impact of Inflation and Exchange Rate on the Financial Performance of Commercial Banks in South Africa. MPRA Paper No. 101383. Available online: https://mpra.ub.uni-muenchen.de/101383/ (accessed on 5 March 2021).

Muhammad, Jawad, and Shabbir Khan Niazi Ghulam. 2017. Impact of oil price volatility and macroeconomic variables on economic growth of Pakistan. *Review of Innovation and Competitiveness* 3: 49–74.

Munthali, Thomas, Kisu Simwaka, and Macdonald Mwale. 2010. The real exchange rate and growth in Malawi: Exploring the transmission route. *Journal of Development and Agricultural Economics* 2: 303–15.

Nasir, Muhammad Ali, Lutchmee Naidoo, Muhammad Shahbaz, and Nii Amoo. 2018. Implications of oil prices shocks for the major emerging economies: A comparative analysis of BRICS. *Energy Economics* 76: 76–88. [CrossRef]

Ncube, Phumzile, Simon Roberts, Tatenda Zengeni, and Paul C. Samboko. 2017. *Identifying Growth Opportunities in the Southern African Development Community through Regional Value Chains: The Case of the Animal Feed to Poultry Value Chain*. WIDER Working Paper 2017/4. Helsinki: UNU-WIDER.

Ndoricimpa, Arcade. 2017. *Threshold Effects of Inflation on Economic Growth in Africa: Evidence from a Dynamic Panel Threshold Regression Approach*. Working Paper Series No. 249; Abidjan: African Development Bank, Available online: http:/www.afdb.org/ (accessed on 10 November 2019).

Ngondo, Mashilana, and Hlalefang Khobai. 2018. *The Impact of Exchange Rate on Exports in South Africa*. The ARDL Bounds Test Approach. MPRA Paper No. 85079. Available online: https://mpra.ub.uni-muenchen.de/85079/ (accessed on 5 March 2020).

Nshia, Christian, Bichaka Fayissa, and Chen Wu. 2019. The Long-Run Impact of Financial Development on Remittances: Evidence from Developing Countries. *Review of Economics & Finance* 16: 31–46.

Odhiambo, Nicholas M., and Bernard Njindan Iyke. 2017. Inflationary thresholds, financial development and economic growth: New evidence from two West African countries. *Global Economy Journal* 17: 1–11. [CrossRef]

OECD. 2020. *COVID-19 in Africa: Regional Socio-Economic Implications and Policy Priorities*. Paris: OECD.

Ogujiuba, Kanayo, and Terfa Abraham. 2013. Testing the Philips Curve Hypothesis for Nigeria: Are there likely Implication for Economic Growth. *Economics, Management and Financial Markets* 8: 59–68.

Ogujiuba, Kanayo, and Megan Cornelissen. 2020. Macroeconomic Theory and Unemployment: A Comparison between the Keynesian and New Classical Model. *OEconomica Acta Universitatis Danubius* 16: 2.

Ogujiuba, Kanayo, and Mbangata Themba. 2020. A Comparative Analysis of Macroeconomic Outcomes amongst the BRICS Countries (2000–2015). *Journal of International Economics* 11: 49–63.

Ogujiuba, Kanayo. 2021. Trade Liberalization and Free Markets in Western and Southern Africa: How Sustainable is AfCFTA. *African Insight* 50: 144–63.

Olamide, Ebenezer G., and Andrew Maredza. 2021. The Short and Long run Dynamics of Monetary Policy, Oil Price Volatility and Economic Growth in the CEMAC Region. *Asian Economic and Financial Review* 11: 78–89. [CrossRef]

Osabohien, Obindah, Nnaemeka Emmanuel Ezenwa, and Romanus Osabohien. 2019. Implications of oil price shocks on net oil-importing African countries. *Heliyon* 5: e02208. [CrossRef]

Osabuohien, Evans, Ekene Obiekwe, Ese Urhie, and Romanus Osabohien. 2018. Inflation rate, exchange rate volatility and exchange rate pass-through interactions: The Nigerian experience. *Journal of Applied Economic Sciences* 2: 574–85.

Osigwe, Augustine. 2015. Exchange Rate Fluctuations, Oil Prices and Economic Performance: Empirical Evidence from Nigeria. *International Journal of Energy Economics and Policy* 5: 502–6.

Ozcelebi, Oguzhan. 2018. Impacts of exchange rate volatility on macroeconomic and financial variables: Empirical evidence from PVAR modeling. *Trade and Global Market*, 101–16. [CrossRef]

Pesaran, M. Hashem, Yongcheol Shin, and Richard J. Smith. 2001. Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics* 16: 289–326. [CrossRef]

Pesaran, M.Hashem, and Ron Smith. 1995. Estimating long-run relationships from dynamic heterogeneous panels. *Journal of Econometrics* 68: 79–113. [CrossRef]

Pesaran, M. Hashem, Yongcheol Shin, and Ron P. Smith. 1999. Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association* 94: 621–34. [CrossRef]

Phiri, Andrew. 2018. *Nonlinear Relationship between Exchange Rate Volatility and Economic Growth*. EERI Research Paper Series, No. 08/2018; Brussels: Economics and Econometrics Research Institute (EERI).

Phiri, Andrew, Nomahlubi Mavikela, and Simba Mhaka. 2018. The Inflation-Growth Relationship in SSA Inflation Targeting Countries. Munich Personal RePEc Archive, MPRA Paper No. 82141. Available online: https://mpra.ub.uni-muenchen.de/82141/ (accessed on 8 December 2021).

Rafindadi, Abdulkadir Abdulrashid, Ibrahim Muhammad Muye, and Rayyanu Kaita Abdulkarim. 2018. The effects of FDI and energy consumption on environmental pollution in predominantly resource-based economies of the GCC. *Sustainable Energy Technologies and Assessments* 25: 126–37. [CrossRef]

Revelli, Dongue Ndongo Patrick. 2020. *The Exchange Rate Pass-Through to Inflation and its Implications for Monetary Policy in Cameroon and Kenya*. Nairobi: African Economic Research Consortium.

Rodriguez, Cesar M. 2017. The growth effects of financial openness and exchange rates. *International Review of Economics and Finance* 48: 492–512. [CrossRef]

Roger, Lionel, Gregory Smith, and Oliver Morrissey. 2019. Exchange Rate and Inflation Dynamics in a Resource Rich Setting: The Case of Zambia. *South African Journal of Economics* 87: 490–514. [CrossRef]

Serenis, Dimitrios, and Nicholas Tsounis. 2014. Does exchange rate variation effect African trade flows? *Procedia Economics and Finance* 14: 565–74. [CrossRef]

Southern Africa Development Community Outlook. 2014. Available online: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/AEO2014_EN.pdf (accessed on 10 September 2021).

Southern Africa Development Community Outlook. 2018. Available online: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2018AEO/African_Economic_Outlook_2018_Southern-Africa.pdf (accessed on 10 September 2021).

Southern Africa Development Community Outlook. 2019. Available online: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2019AEO/REO_2019_-_Southern_africa.pdf (accessed on 10 September 2021).

Taderera, Christie, Raynold Runganga, Simbarashe Mhaka, and Syden Mishi. 2021. Inflation, Interest Rate and Economic Growth Nexuses in SACU Countries. *Academy of Accounting and Financial Studies Journal* 25: 1–14.

Thanh, Su Dinh. 2015. Threshold effects of inflation on growth in the ASEAN-5 countries: A panel smooth transition regression approach. *Journal of Economics, Finance and Administrative Science* 20: 41–48. [CrossRef]

van Eyden, Reneé, Mehmet Balcilar, Josine Uwilingiye, and Rangan Gupta. 2017. The Impact of Oil Price on South African GDP Growth: A Bayesian Markov Switching-VAR Analysis. *African Development Review* 29: 319–36.

Vermeulen, C. 2015. *Inflation, Growth and Employment in South Africa: Trends and Trade Offs*. Economic Research Southern Africa (ERSA) Working Paper, 547. Cape Town: ERSA.

Vilakazi, Thando. 2018. The causes of high intra-regional road freight rates for food and commodities in Southern Africa. *Development Southern Africa* 35: 388–403. [CrossRef]

Wesseh, Presley K., and Boqiang Lin. 2018. Energy consumption, fuel substitution, technical change, and economic growth: Implications for CO_2 mitigation in Egypt. *Energy Policy* 117: 340–47. [CrossRef]

Yakubu, Muhammad M., and Benedict Akanegbu. 2019. Oil price volatility and economic growth in Nigeria. *Advances in Management & Applied Economics* 9: 110.

Yildirim, Zekeriya, and Arif Arifli. 2021. Oil price shocks, exchange rate and macroeconomic fluctuations in a small oil-exporting economy: Evidence from Azerbaijan. *Energy* 219: 119527. [CrossRef]