

## IMPACT OF MACROECONOMIC VARIABLES ON EXCHANGE RATE UNCERTAIN

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### Abstract

Macroeconomic convergence is critical for member states to achieve the level of harmonization required for establishing a stable and resilient monetary union. The East African Community (EAC) member states, therefore, established set targets for macroeconomic convergence, intending to eliminate exchange rate uncertainty within the bloc and reduce the costs of the monetary union. However, recent empirical studies indicate that the rate of convergence of the member states to the set macroeconomic targets has been very slow, resulting in high exchange rate uncertainty within the region. It is against this backdrop that this research was conceptualized to examine the influence of convergence in macroeconomic variables on the exchange rate uncertainty of EAC states using secondary panel data. The study made use of standard deviation and the Levin Lin Chu (LLC) test to determine convergence and unit root respectively. The panel ordinary least squares (OLS) regression findings showed that all the explanatory variables had a negatively significant effect on exchange rate uncertainty. This implies that convergence in macroeconomic variables among the member countries slows exchange rate uncertainty. Thus, policy should be made towards controlling this negative effect resulting from macroeconomic variables as East Africa bids for monetary union.

**JEL classification:** E44, F15, F31, F45

**Keywords:** macroeconomic, exchange rate, regional integration, monetary union

Received: 10.07.2021

Accepted: 12.09.2021

### Cite this:

Kaboro J., Mose N. (2021) Impact of macroeconomic variables on exchange rate uncertain. Financial Internet Quarterly 17 (3), pp. 47-55.

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## INTRODUCTION

Many developing economies have experienced high exchange rate instability. This translates into a high degree of uncertainty for the two main monetary policy objectives that states and policymakers often seek to accomplish: price stability (low inflation) and economic growth (high output). Exchange rates uncertainties are associated with unpredictable movements in the relative prices in the general economy. Therefore, exchange rate stability is one of the main factors that stimulate high investment, control inflation and stabilize economic growth (AL Samara, 2009). Foreign exchange rate uncertainty can reverse both domestic and foreign investment decisions. It causes reallocation of resources among the sectors and countries, between exports and imports, and creates an uncertain environment for future investment.

Monetary integration is a key factor in economic growth of the integrating economies. Although it brings with it loss of sovereignty in the use of monetary policies, it leads to increase in trade and investments, output, financial deepening, and reduces intra-regional trade transactional costs (Mongeli, 2008). According to Collier (2000), there are two main justifications as to why macroeconomic convergence is needed for any successful monetary union of the blocs. First, domestic fiscal policies can cause negative spillover effects on other members of the union. Second, a moral hazard arises in a monetary union as countries become able to borrow unsustainably with the hope that other members of the union would bail them out in case of a debt crisis (Collier, 2000; Yilmazkuday, 2009).

The treaty to revive the East African Community (EAC) came into force on July 2000 with the objective

of fostering a closer cooperation in political, economic, social, and cultural fields. In November 2013, the five EAC members, Burundi, Kenya, Rwanda, Tanzania, and Uganda, signed a protocol outlining their plans for launching a monetary union in 2024. To reap the maximum benefits and minimize costs of a monetary union, member countries need to achieve a sufficient degree of macro-economic convergence, and financial integration among them ahead of the monetary union. Like other regional economic communities elsewhere, EAC countries have put in place macro convergence criteria to be met by each country prior to entry into the monetary union (EAC, 2005). The critical areas of harmonization include monetary and exchange rate policy, statistic, fiscal policy coordination, financial market coordination, banking supervision and financial stability, harmonization of payments and settlement systems, and cohesive accounting and financial standards. Successful implementation of the proposed monetary union would help promote trade through the enhancement of the payment system for goods and services between the states, create a larger regional market and broaden business and trade-related income earning opportunities for the sub-region, support labor mobility, strengthen cooperation, and promote competitiveness and efficiency in production (Kibua, 2007).

The East African Community members have set benchmark criteria: sustainable economic growth, low inflation, manageable external debts, fiscal and current account deficits control (EAC, 2005; Opolot & Luvanda, 2009). They are set for three different stages with targets and divided into primary and secondary criteria in the first two stages, followed by introduction of a single currency at the last stage as shown in Table 1.

**Table 1: EAC Macroeconomic Convergence Targets**

		Stage 1	Stage 2	Stage 3
	Indicator	2007-2010	2011-2014	2015 onwards
Primary criteria	Budget deficit to GDP ratio	<6%	≤5%	monetary union
	Excluding grants	<3%	≤2%	
	Including grants	≤5%	≤5%	
	Inflation	≥4 months import cover	≥6 months imports cover	
	External reserves			

<b>Secondary criteria</b>	Real exchange rates Interest rates Real GDP growth Public debt Savings to GDP ratio Current account (excluding grants)	Stable Market based ≥7% Reduced to sustainable levels ≥20% Consistent with debt sustainability.	Stable Market based ≥7% Reduced to Sustainable levels ≥20% Consistent with debt sustainability	monetary union
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Source: Opolot and Luvanda (2009).

Meeting the above macroeconomic convergence criteria has so far been problematic for EAC states. On average, these fundamentals must move together in member countries of a monetary union if they are to reap maximum benefits from the union (Opolot & Luvanda, 2009; Zuzana & Ncube, 2012). Therefore, the situation above may pose a big challenge to the proposed monetary union for the region in terms of its cost, sustainability and stability (Zuzana & Ncube, 2012).

### STATEMENT OF THE PROBLEM

The exchange rate within the EAC region has been highly uncertain, a situation that can make the monetary union costly, unstable and unsustainable. It was against this background that the study sought to determine the impact of convergence in key macroeconomic variables on exchange rate uncertainty within the EAC region, as the region moves into a monetary union.

### OBJECTIVES OF THE STUDY

The objective of this research is to establish the impact of macroeconomic variables on exchange rate uncertainty.

### THEORETICAL LITERATURE REVIEW

Keynesian theory was developed by John Maynard Keynes during the 1930s in an attempt to understand the Great Depression that was ravaging the globe. Keynesian macroeconomic premise focused on the effectiveness of stabilization policies (fiscal, monetary and exchange rate policies) in an open economy (Keynes, 1930). The theory focused on the effects of these policies on the key macro-aggregate variables (GDP, inflation, unemployment, balance of payments,

exchange rates and interest rates). With regard to the role of exchange rate policy as an instrument for correcting current account imbalances, the debate was focused on strength and weakness of fixed and flexible exchange rate regimes (Corsetti, 2009). The international monetary system was based on fixed exchange rates, which worked well until the 1970s, when the system came under attack. According to the Keynesian observation, the globe is full of rigidities (wages and prices are rigid, labor is immobile), so that exchange rate is a powerful instrument in eliminating disequilibria. For nations that are part of a monetary union, exchange rates do not adopt to the situation of an individual economy but rather to that of the union as a whole (Gramlich, 1971).

### EMPIRICAL LITERATURE REVIEW

From the recent empirical studies, it is clear that the benefits of monetary integration are colossal, and the EAC is moving towards establishing a monetary union within the member states. It has also been established that macroeconomic convergence, to make the exchange rate less ambiguous, is a key precondition for a monetary union (Zuzana & Ncube, 2012). The progress in macroeconomic convergence towards the set criteria needs to be assessed over time as the economies move towards the establishment of a monetary union to ensure its stability once it is established. However, from the empirical studies, there is none that has been done recently to show the progress being made in convergence in East African economies and to assess stability in exchange rates within the EAC region. It is on these arguments that this research seeks to assess the progress being made by EAC states on convergence of macroeconomic variables and its impact on exchange rate uncertainty as the regional bloc moves towards establishing a monetary union.

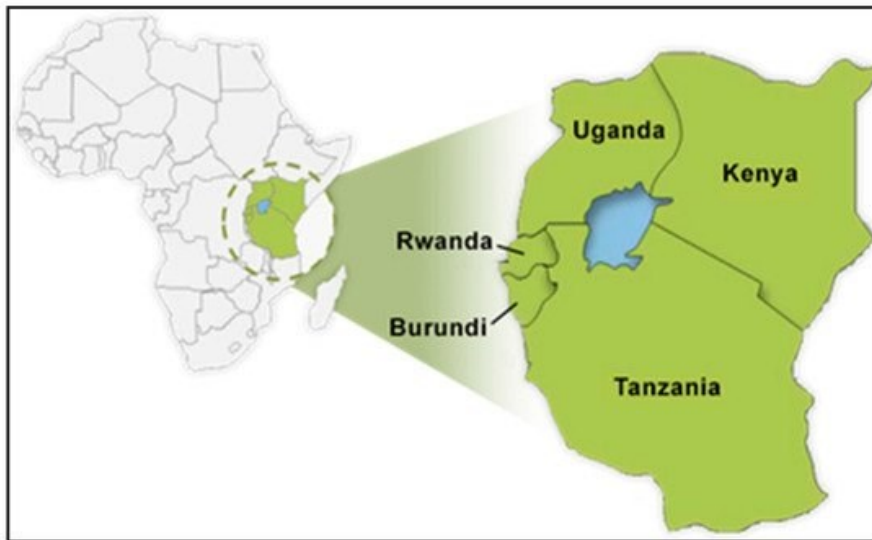
## RESEARCH METHODOLOGY

### RESEARCH DESIGN

The study used quantitative research design as it seeks to determine the impact of macroeconomic variables to the set targets on exchange rate uncertainty in the EAC region over the period 2000-2016. The re-

search design is well suited to capture trend and impact. The study covered the East African Community (EAC) region comprising of five member states: Kenya, Uganda, Tanzania, Burundi and Rwanda, which have declared interest in joining the East African Monetary Union (Opolot & Luvanda, 2009). The map of the study areas is shown in Figure 1.

**Figure 1: Map of the East African Community Member States**



Source: EAC (2005).

### PANEL ECONOMETRIC ANALYSIS

This study used descriptive analysis to show the trend and relationship of study variables. Panel Ordinary Least Squares (OLS) estimation approach was adopted to model the study relationship. Hausman approach was applied to ascertain whether to employ fixed effect or random effect during analysis. This study also employed the Levin-Lin-Chu test for unit root test in order to eliminate misleading findings (Mose, 2020; Nyoni et al., 2021). The Engle-Granger approach was used to investigate whether cointegration relations exist between these variables. Standard deviation and the OLS model were used to measure convergence of macroeconomic variables and also the uncertainty of exchange rate within the region. The expectation here is that the estimation of exchange rate uncertainty should be negative.

### MODEL SPECIFICATION AND SOURCE OF DATA

This study adopted the Optimum currency area theory (OCA) index, as used by Bayoumi and Eichengreen (1998), as a framework of analysis of the impact of macroeconomic variables on exchange rate uncertainty to determine the realization of a successful monetary union in the EAC:

$$SDr_{i,t} = \beta_0 + \beta_1SDy_{i,t} + \beta_2SDi_{i,t} + \beta_3SDs_{i,t} + \beta_4SDb_{i,t} + \epsilon_{i,t}$$

where,

SD (r) – represents standard deviation of real exchange rate volatility in the EAC (Kenyan shilling was used to standardize the other currencies since it is the largest

economy in the EAC (Mackinnon, 2004). Then the US dollar, which has been stable over time, was used as a base to calculate uncertainty, and then an average was obtained). Data for this variable was obtained from the World Development Indicator report.

SD (y) – represents standard deviation of real GDP growth rate. Countries with similar real GDP growth rates will have similar demand conditions and are less likely to face different shocks, hence this reduces the significance of exchange rate policy autonomy for making necessary adjustments, and thus these states would find it easier to share a common currency. Data was obtained from Statistical abstracts and Economic surveys.

SD (i) – represents standard deviation of inflation rate. Convergence in inflation rates will change the purchasing power of currencies of potential members. Similarity in inflation rates between nations imply that they are similar in the way they conduct their economic policies, hence they are likely to face similar shocks, eliminating use of exchange adjustment as a policy tool. Data for this variable was obtained from World Economic Outlook reports.

SD (b) – represents standard deviation of the budget deficit. A convergence in the balance of budget deficit

to GDP ratio is expected to reduce the exchange rate volatility in the region. The intuition behind this is because the variable attempts to capture the effect of government responsibility. Data was obtained from World Bank reports.

SD (s) – represents standard deviation of savings. Similarity in national savings to GDP ratio will make the countries face economic shocks in the same way, thus eliminating the use of exchange rate adjustment to smooth out the effect of those shocks and reducing volatility. Data was from Economic survey reports.

$\epsilon_{it}$  – is a stochastic disturbance term which is normally distributed.

In order to provide intuitive interpretation of the results obtained from this study, a number of post estimation diagnostic tests were conducted: Autocorrelation, Reset test, Heteroscedasticity and Cross-sectional dependence test.

## RESULT AND DISCUSSION

### DESCRIPTIVE STATISTICS RESULTS

Table 2 presents the descriptive results for the study's macroeconomic variables.

**Table 2: Descriptive Results**

Average	Real GDP Growth Rate (%)	Budget Deficit/GDP (%)	National Savings/GDP (%)	Inflation Rate (%)	Exchange Rate
N	85.00	85.00	85.00	85.00	85.00
Mean	5.57	5.73	15.53	8.21	66.61
Std. Dev	1.27	0.75	2.84	3.80	8.29
Variance	1.60	0.57	8.06	14.42	68.70
Skewness	-0.42	-0.46	-0.15	0.72	0.39
Kurtosis	-0.51	-0.52	-1.11	1.22	0.23
Minimum	3.20	4.18	10.38	1.52	51.31
Maximum	7.32	6.84	19.92	17.62	83.18

Source: Own calculation.

The average of the economic growth, budget deficit, savings and inflation rates variables were 5.57, 5.72, 15.53, and 8.21 respectively for the entire study period. This can be used to compare with the set regional targets of 7, 5, 20, and 5, respectively.

The findings indicate that the region is moving relatively closer to the set target in budget deficit and economic growth rate which is desirable for a monetary union. On the other hand, the countries are far from attaining the target in the other two study elements, savings and

inflation index. The results show that budget deficit has a standard deviation of 0.8 meaning the countries are relatively converging in that variable which is desirable for a monetary union. On the other hand, the standard deviation of inflation rate was 3.8 meaning convergence in that variable is relatively low. This can be attributed to the worldwide financial crisis in 2008

attributed to the worldwide financial crisis in 2008 which led to increased oil and food prices and inflation.

### PANEL ECONOMETRIC ANALYSIS

The panel Hausman test results are shown in Table 3 below.

**Table 3: Hausman Test Results**

Chi <sup>2</sup> (4) = 17.98	Prob > chi <sup>2</sup> = 0.04
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Source: Own calculation.

If the p-value is significant (for example <0.05) then use fixed effects, if not use random effects. From the result, p-value is 0.04, hence the null hypothesis is rejected and the fixed effect model is selected, which allows the intercept to vary among countries in recog-

inition of the fact that each country may have some special characteristics of its own.

The Levin-Lin-Chu panel unit root results are shown in Table 4 below.

**Table 4: Unit Root Test Results**

Variables	LLC test at level	LLC test First Difference	Order of integration
Exchange rate	-4.58***	-	I(0)
Inflation	-6.56***	-	I(0)
GDP	-6.42***	-	I(0)
Budget Deficit	-3.80	-7.21***	I(1)
Savings	-2.76	-8.55***	I(1)

\*\*\*Significance level 1%

Source: Own calculation.

The results from Table 4 show that real exchange rate, economic growth and inflation rate were all stationary while budget deficit and savings were non-stationary at 5 percent level. This implies that there is no enveloping divergence among inflation and economic growth differentials between EAC states. In other words, inflation rates and output growth in EAC countries appear to converge. The latter two variables be-

came stationary after they were differenced, meaning that the variables are integrated to the order of one.

But from the results in Table 4, exchange rate is already stationary I (0). This implies there was no co-integration since the variables are of different integration. Estimation of the co-integrating relationship requires that all time series variables in the model be integrated to the order of one (Nyoni et al., 2021).

## PANEL REGRESSION RESULT

The panel regression findings are presented in Table 5.

**Table 5: Regression Findings**

Variables	Coefficient	Std. Error	t-test	P-Value
SD (y)	-0.440	0.505	-2.870	0.0410
SD (s)	-0.818	0.173	-4.740	0.0000
SD (b)	-0.898	0.418	-2.150	0.0460
SD (i)	-0.616	0.273	-2.257	0.0430
Const	14.892	2.393	6.220	0.0000
F (4, 12) = 10.13			Prob > F = 0.01	
R-squared = 0.72			Adj R-squared = 0.7-	
Panel Diagnostics	Test	Result		
Cross-Sectional Dependence	Breusch-Pagan LM	chi2 (10) = 3.79	Pr = 0.27	
Heteroskedasticity	Modified Wald	chi2 (5) = 1.99	Prob > chi2 = 0.71	
Autocorrelation	Wooldridge	F (1, 4) = 12.48	Prob > F = 0.07	
Misspecification	Ramsey Reset	F = 0.11	P = 0.90	

Source: Own calculation.

Results from Table 5 show that inflation rate convergence has a coefficient of -0.6 and is significant at 5 percent level. This implies that as convergence in inflation rate increases by 1 percent in the EAC, then exchange rate uncertainty is reduced by 0.6 percent. Based on various panel unit root tests, the study found that inflation rates in these countries have been converging. Inflation index is the most basic and visible indicator of imbalance between demand and supply of resources in an economy (Jane & Naftaly, 2019). High and rising inflation demonstrates an imbalance in resource utilization in the economy and serves as an indicator of macroeconomic volatility (Muthui, 2016). The study finding agrees with previous studies by Nguyen and Jemma (2017) and Jane and Naftaly (2019) in EAC region and contradicts Zhang's (2012) results.

From the results in Table 5, convergence in real GDP growth rate in the EAC region has a negatively significant effect on exchange rate uncertainty. This implies that convergence in real economic growth rates among the EAC states will reduce the exchange rate uncertainty. This can be attributed to similarity in growth rates between nations as a result of similar demand conditions and hence they are likely to face shocks in the same way (Kibua, 2007).

Results from the estimated model show that standard deviation of savings has a coefficient of -0.8 and is significant at five percent level. This means that if convergence in national savings/GDP among the EAC countries increases by 1%, then exchange rate volatility within the region is reduced by 0.8. This conforms to the existing studies that convergence in savings of countries within a region aspiring to move into a monetary union reduces exchange rate uncertainty, which makes the common currency stable and sustainable in the long-run (Kabananiye, 2011).

The findings of the estimated result show that coefficient of standard deviation of budget deficit is negative and significant. The result is consistent with those of Patroba and Nene (2013) who established that similarity in budget deficit between nations reduces exchange uncertainty within them. Budget deficit is an indicator of financial failure in which public spending exceeds available revenue. However, recently there has been a gradual improvement in the budget deficit in EAC states as they mobilize more domestic revenue, and more grants (Schulmeister, 2012).

From the regression results, the adjusted R<sup>2</sup> is 0.7 implying that 70 percent of the variations of the de-

pendent variable are explained by the explanatory variables in the model. The F static test result reveals that the null hypothesis is rejected and a conclusion made that the estimators are non zero and therefore are simultaneously significant at one percent level of significance. Further, the regression model passed all panel diagnostic tests.

## CONCLUSION AND RECOMMENDATIONS

The regression results showed that all the explanatory variables had a negative and significant impact on exchange rate uncertainty. This implies that convergence in economic growth rate, budget deficit, national savings, and inflation index in EAC states is significant in reducing exchange rate uncertainty within the region, in readiness for a monetary union. The reason behind this could be that when states harmonize their economies, then they are likely to face similar shocks, hence it will not result in the need for exchange adjustments to restore balance. This helps to slow or eliminate exchange rate volatility within the region. Using a common currency renders the exchange rate adjustments

ineffective as a policy tool to maintain asymmetry of shocks.

Thus, macroeconomic stability, which is a requisite for a stable and sustainable monetary union, requires sound and credible fiscal and monetary policy harmonization within the nations aspiring to have the union. These calls for cooperation between the countries and goodwill form political regimes. Central banks of these countries should be given the independence and support required to ensure financial stability and protect the value of currency. Although the results of the research show that positive progress has been made in achieving the targets of macroeconomic convergence as set out by the EAC states, measures should be put into place to ensure that targets are actually achieved and exchange rate volatility eliminated before establishing a common currency within the region.

## AREAS FOR FURTHER RESEARCH

Comparative research can also be undertaken to compare performance between different regional economic blocs.

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