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RESEARCH STUDY: ECONOMETRIC MODELING

ECONOMETRIC SOFTWARE: Eview

RESEARCH TOPIC: MACROECONOMIC TIME SERIES ANALYSIS IN ZAMBIA

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1. Introduction

The president or prime minister asks you, as the economic advisor, to explain what could be done to improve people's livelihoods in the short and long run by addressing the population’s complaints. Choose five economic variables from any economic database from 1990 to 2020
(Note; Let GDP be the dependent variable while you choose four independent variables to be the explanatory variables).

The variables can either be quarterly, bi-annually, or annually. We write a paper that should contain the following concerning the chosen variables. In this paper, we focus on five time series variables measured annually from the period of 1990 to 2020, one being Gross Domestic Product (GDP) as the dependent variable, and four other independent variables such as Copper Price, Lending interest rate (%), Official exchange rate, and Inflation
To properly understand the variables, we will be working with, let us briefly explain;

1.1. Gross Domestic Product (GDP) per capita

GDP (Gross Domestic Product) is an important and common measurement of an economy's health. It is the total monetary or market value of all the finished goods and services produced within a country’s borders in a specific period.

There are three main types of GDP; Nominal GDP, Real GDP, and GDP per capita. In this study, we will use GDP per capita.

GDP per capita - is a measurement of the GDP per person in a country’s population. It indicates that the amount of output or income per person in an economy can indicate average productivity or average living standards.

1.2. Commodity: Copper Price per Ton

Copper is the backbone of the Zambian economy, accounting for a large portion of its export earnings and employment, with the industry being a significant driver of the country's economy. Zambia is a major global copper producer, currently ranked among the top 10 largest producers, and is the second-largest copper producer in Africa.

Copper accounts for a significant portion of Zambia's GDP (around 10-15%) and is the country's largest export earner. The mining sector, dominated by copper, contributes over 70% of Zambia's export revenue, this revenue from copper exports helps fund government programs, infrastructure development, and public services.

Key players in Zambia's copper mining industry include major copper mines such as Konkola Copper Mines (KCM), Mopani Copper Mines (MCM), Lumwana Mine, Kansanshi, First Quantum Minerals (FQM), Barrick Gold Corporation, and others. Thus, this is an important variable to consider in our study.

1.3. Lending Interest Rate

Lending interest rates represent the cost of borrowing money. They are expressed as a percentage of the loan amount and are charged by lenders to compensate for the risk of lending and to earn a profit.
These rates can vary depending on:

- The type of borrower (individual, business, or government).
- The purpose of the loan (e.g., personal, mortgage, or business loan).
- The duration of the loan (short-term or long-term).
- The perceived risk of the borrower (creditworthiness).

In Zambia, the Bank of Zambia (BoZ), the country's central bank, plays a key role in influencing lending interest rates through its Monetary Policy Committee. They meet every quarter to revise the policy rate (repo rate) by using monetary policy tools. As of today 19th March 2025, the Bank of Zambia (BOZ) sets the Monetary Policy Rate (MPR), which is currently 14.50%.
This increase has been aimed at steering inflation back to the 6-8% target band and anchoring inflation whose annual inflation rate currently stands at 16.8%.

1.4. Inflation Rate

Inflation is the rate at which the general price level of goods and services rises over some time, leading to a decrease in the purchasing power of money.
It is typically measured by indices such as:

- Consumer Price Index (CPI) – Tracks the price changes of a basket of consumer goods.
- Producer Price Index (PPI) – Measures inflation at the wholesale level.

Inflation is often expressed as an annual percentage and is influenced by factors such as demand-supply imbalances, monetary policy, and external shocks (e.g., fuel price changes, and currency depreciation). Inflation is a key macroeconomic indicator for policymakers, businesses, and individuals because it affects:

- Purchasing Power – High inflation erodes consumer purchasing power, reducing affordability.
- Interest Rates – Central banks adjust interest rates to control inflation. High inflation often leads to higher interest rates.

- Wage Growth & Cost of Living – Inflation affects real wages. If wages don’t keep up with inflation, living standards decline.

The central bank of Zambia through the monetary policy committee of the Bank of Zambia has the mandate to control inflation with a target bound set at 6-8 percent of which recent years it has been not achievable, as of today 24TH March 2025 inflation stands at 16.8% which is considered high and its impact has harmed economic stability, discouraged investment, and increased poverty.

1.5. Foreign Exchange Rate (FOREX)

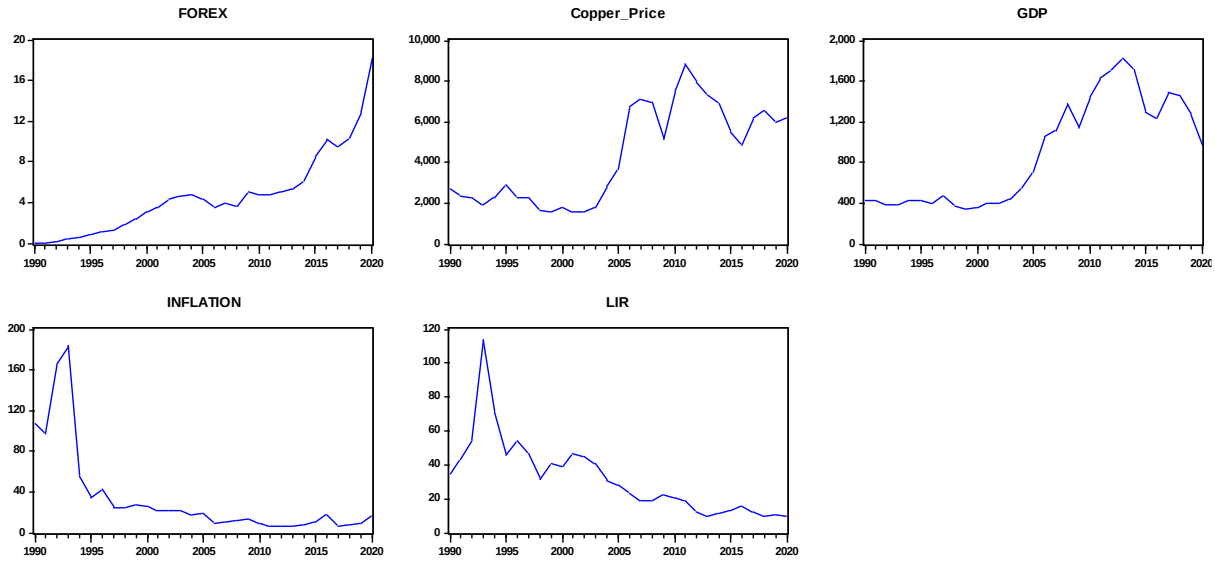
Foreign exchange (forex) in Zambia refers to the trading of foreign currencies, primarily the Zambian Kwacha (ZMW) against other major currencies such as the US Dollar (USD), Euro (EUR), British Pound (GBP), and South African Rand (ZAR). The forex market in Zambia is crucial for facilitating international trade, investment, and economic stability. Stabilizing the exchange rate is important for many reasons such as;

- A stable forex market helps maintain a predictable exchange rate, which is critical for businesses and investors.
- A stable and liquid forex market ensures that investors can repatriate profits and convert local currency into foreign currency without significant losses.
- A stable forex market helps control inflation by preventing excessive depreciation of the Zambian Kwacha, which can lead to higher import costs.

1.6. Economic Insight

Below multiple charts illustrate the time series trend of each macroeconomic indicator of Zambia from the period of 1990 to 2020.

Zambian Economic Indicators 1990 - 2020



The above chart is a measure of the three-decade or 30-year performance of some major economies in Zambia annually. Mr. President without diving into deep analysis, it is of interest to explain a bit about what these trends have been moving during this period through the following insights below;

While GDP growth is a primary indicator of growth, a comprehensive assessment of a developing country's economic performance requires analyzing multiple macro factors.

- During this period Mr. President, we have failed to return to the maximum period GDP of 2013 -2014. As a developing country with full growth potential, it is sad to inform you that we are currently stagnant.
- The reasons include interest rate control measures, which have been good, thanks to the Monetary Policy Committee of the Central Bank of Zambia. Kwacha has depreciated very much, and FDI has been unstable.
- Our main major revenue source and commodity copper prices have been steadily increasing but this is something we can study on its own as this fluctuation is due to supply and demand globally. Along with social, political, and environmental considerations. Each factor provides a piece of the puzzle, helping us form a complete picture of the country's economic health and growth potential.

2. Methodology

The following tests should be conducted and interpreted appropriately at a 5% level of significance; stationarity test, cointegration test, vector error correction model (VECM), stability test, and normality test)

2.1. Stationarity Test

A stationarity test checks whether a time series variable has a constant mean, variance, and autocorrelation structure over time. To check for stationarity, we check for the existence of a unit root in the time series by conducting tests such as the Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test, and KPSS test.

Most financial and econometric data is non-stationary, and non-stationary data can lead to spurious regression results, where relationships between variables appear significant even when they are not.

Therefore, we will have a task to apply some methods to make the five-time series stationary by the method of differencing. If a series is non-stationary, differencing (or transformation) can be applied to make it stationary, which is a key step in time series modeling.

Test Type	**Variable**	**Level Raw Data (Prob)**	**1st Difference (Prob) L(1)**	**2nd Difference (Prob) L(2)**
ADF	**GDP**	0.7017	0.0054	
ADF	**LIR**	0.0890	0.0023	
ADF	**COPPER_PRICE**	0.7021	0.0010	
ADF	**FOREX**	0.7832	0.0035	
ADF	**INFLATION**	0.2192	0.0002	

We carried out the series of Unit Root tests using the **Augmented Dickey-Fuller (ADF)** test with the following hypothesis.

We are carrying out the test for each variable to check for the non-stationary assumption we initially made.
Then normalizing the variable using differencing at the 1st or 2nd level to achieve stationarity at a significance level of 0.05

HYPOTHESIS TEST:

H_0: The variable has UNIT ROOT(Non − stationary)

H_1: No UNIT ROOT

INTERPRETATION:

If our t-statistic prob is > than our significance level, we fail to reject the null hypothesis of that particular time series and at that particular level.

Example (GDP)

At Level:

At level (raw data) we failed to reject the null hypothesis because the t-Statistic probability of 0.7017 is greater than our significance level of 0.05 implying it is non-stationary.

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.102141	0.7017
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

1st Difference

At 1st difference, we reject the null hypothesis because the t-statistic probability of 0.0054 is less than our significance level of 0.05 implying it is stationary.

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.936034	0.0054
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

2.2. Cointegration Test

A cointegration test in econometrics determines if two or more non-stationary time series have a long-run equilibrium relationship.

The purpose of this test is to identify long-run equilibrium relationships between variables, even if they are individually non-stationary, and help validate economic theories that predict stable long-term relationships between variables. Tests that we can conduct include the Engle-Granger two-step method and the Johansen cointegration test. If cointegration is found, Error Correction Models (ECM) or VECM can model both short-term dynamics and long-term relationships. In this study, we will carry out Johansen cointegration to determine whether a group of non-stationary time series variables have a long-run equilibrium relationship at our significance level of 0.05.

Johansen cointegration test results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.812739	112.4246	69.81889	0.0000
At most 1 *	0.662620	63.84224	47.85613	0.0008
At most 2 *	0.493950	32.33239	29.79707	0.0250
At most 3	0.284158	12.57992	15.49471	0.1312
At most 4	0.094705	2.885341	3.841465	0.0894

Trace test indicates 3 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Max-eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.812739	48.58234	33.87687	0.0005
At most 1 *	0.662620	31.50985	27.58434	0.0148
At most 2	0.493950	19.75248	21.13162	0.0770
At most 3	0.284158	9.694576	14.26460	0.2328
At most 4	0.094705	2.885341	3.841465	0.0894

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

INTERPRETATIONS

The test provides the **rank** (r) of cointegration, which indicates the number of long-run relationships between the variables.

TRACE TEST HYPOTHESIS

H_0: At most r cointegrating relationships

H_1: Alternate

- The test rejects the null at **r = 0 (None)** because the Trace Statistic (112.4246) > Critical Value (69.81889) and the p-value (0.0000) is significant at 5%.
- The test also rejects the null at **r = 1 (At most 1)** since Trace Statistic (63.84224) > Critical Value (47.85613) and p-value (0.0008) is just below 0.05.
- The test also rejects the null at **r = 2 (At most 2)** since Trace Statistic (32.33239) > Critical Value (29.79707) and p-value (0.0250) is just below 0.05.
- The test fails to reject the null at **r = 3 (At most 3)** because the Trace Statistic (12.57992) < Critical Value (15.49471) and the p-value (0.1312) is greater than 0.05.
- There are three cointegrating equations at the 5% level, meaning that at least three long-run equilibrium relationships exist among the five variables.

MAX-EIGENVALUE TEST HYPOTHESIS

H_0: At most r cointegrating relationships

H_1: Alternate

- The test **rejects** the null at r = 0 (**None**) because Max-Eigen Statistic (48.58234) > Critical Value (33.87687) and p-value (0.0005) < 0.05.
- The test **fails to reject** the null at r = 2 (**At most 2**) because Max-Eigen Statistic (19.75248) < Critical Value (27.58434) and p-value (0.0770) is slightly above 0.05.

There are 2 cointegrating equations at the 0.05 significance level, indicating at least 2 stable long-run relationships among the variables.

The Trace test suggests three cointegrating relationships, while the Max-Eigen test suggests two. Therefore, this result suggests that a Vector Error Correction Model (VECM) is an appropriate model due to cointegration existence within the variables we are studying.

2.3. Vector Error Correlation Model (VECM)

The VECM is a multivariate time series model used when variables are cointegrated. VECM captures both short-term fluctuations and long-term equilibrium relationships between variables.

Model Specification

To analyze the short-run dynamics and long-run relationships between macroeconomic variables, this study measures the effect of Inflation, Exchange rate (Forex), Interest rate (IR), and Copper Price on Gross Domestic Product per capita (GDP). The theoretical model to be estimated is the ECM, we carried out necessary tests both Unit root and Cointegration tests to justify the applicability of ECM, Johansen, S. (1995).

This investigation is necessary to ensure stability in subsequent econometric modeling. To test for unit roots, Augmented Dickey-Fuller (ADF) tests were used.

The general model form;

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-1} + \varepsilon_t$$

Where;

ΔY_t - : endogenous variables: (GDP, Forex, Inflation, IR, Copper Price).

ΠY_{t-1} : captures the long-run equilibrium relationship.

Γ_i - : captures the short-run dynamics.

ε_t - : Error term.

When variables are non-stationary in levels, stationary in first differences) and others at already stationary like Forex, a **VECM is** not **valid, The Autoregressive Distributed Lag (ARDL)** model allows for a mix of I(0) and I(1) variables.

To solve this, we create a new Forex variable differenced once. The prerequisite for VECM is that variables must be integrated of the same order (in this case, I(1)) and there must be at least one cointegrating relationship among the variables of which we confirmed having 3 cointegration variables.

Vector Error Correlation Model (VEC) Output.

	GDP	Forex	Inflation	IR	Copper_P
R-squared	0.913371	0.415376	0.930415	0.940918	0.859248
Adj. R-squared	0.862413	0.071479	0.889483	0.906164	0.776453
Sum sq. resids	626953.3	23.52636	2090.680	834.0178	22590416
S.E. equation	192.0406	1.176394	11.08969	7.004275	1152.757
F-statistic	17.92392	1.207852	22.73067	27.07373	10.37798
Log likelihood	-179.9602	-37.29312	-100.1128	-87.24698	-230.1419
Akaike AIC	13.64001	3.449508	7.936631	7.017642	17.22442
Schwarz SC	14.16338	3.972874	8.459997	7.541008	17.74779
Mean dependent	942.2780	0.648996	23.84561	30.67096	4571.096
S.D. dependent	517.7309	1.220836	33.35839	22.86543	2438.108

Determinant resid covariance (dof adj.)	5.28E+12
Determinant resid covariance	4.35E+11
Log likelihood	-573.8393
Akaike information criterion	44.91709
Schwarz criterion	47.53392
Number of coefficients	55

The model explains GDP well, with an R^2 of 91.3% and an F-statistic of 17.92. INFLATION and LIR are also well-explained, with high R^2 values (0.93 and 0.94) and strong F-statistics.

FOREX is poorly explained (R^2 = 0.41, Adjusted R^2 = 0.07, F-stat = 1.21), suggesting it may not significantly impact the system.

Copper prices influence GDP but not as strongly as expected (R^2 = 0.86, Adjusted R^2 = 0.77). The overall model is statistically strong, as indicated by the system-wide log-likelihood (-573.839) and relatively low AIC.

2.4. Normality Test

A normality test checks whether the residuals or data follow a normal distribution.

We will use Hansen as our orthogonalization method to transform the residuals into uncorrelated (orthogonal) components. It uses a generalized least squares (GLS) approach to orthogonalize the residuals. It does not rely on a specific ordering of variables, making it more flexible.

The **Jarque-Bera** statistic table below combines skewness and kurtosis to test normality. The p-values;

- Component 2 (p = 0.0000) and Component 5 (p = 0.0065) reject normality.
- The joint test p-value (0.0000) strongly rejects the null hypothesis that residuals follow a normal distribution.

The joint p-values for all tests are very low (below 0.05), meaning we reject the null hypothesis of normality. This suggests that the residuals are **not normally distributed,** which could impact inference in regression models relying on normality assumptions.

Component	Skewness	Chi-sq	df	Prob.*
1	-0.837642	3.918072	1	0.0478
2	1.002853	5.323931	1	0.0210
3	-0.218596	0.306876	1	0.5796
4	0.158041	0.161326	1	0.6879
5	1.323283	8.294909	1	0.0040
Joint		18.00511	5	0.0029

Component	Kurtosis	Chi-sq	df	Prob.
1	4.308107	1.116385	1	0.2907
2	7.443973	14.63035	1	0.0001
3	3.071504	0.938371	1	0.3327
4	3.276599	1.816283	1	0.1778
5	4.585025	1.791750	1	0.1807
Joint		20.29314	5	0.0011

Component	Jarque-Bera	df	Prob.
1	5.034457	2	0.0807
2	19.95428	2	0.0000
3	1.245248	2	0.5365
4	1.977609	2	0.3720
5	10.08666	2	0.0065
Joint	38.29826	10	0.0000

*Approximate p-values do not account for coefficient estimation

2.5. Stability Test

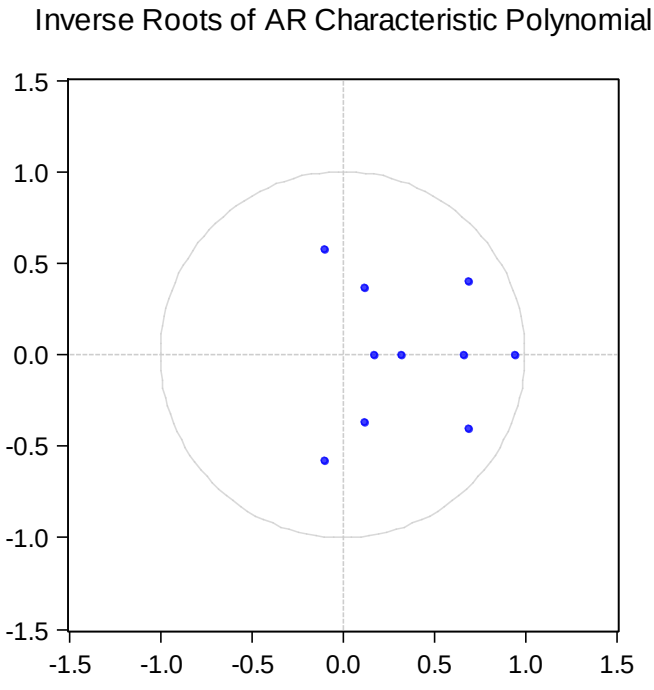
Stability tests verify that the model's predictions or estimates remain reliable and accurate over time or across different datasets, ensuring its effectiveness in real-world applications, tests include the CUSUM test, CUSUMSQ test, and Chow test. Stability tests are essential for detecting structural breaks and ensuring reliable predictions and policy analysis.

This output presents the stability test for a Vector Autoregression (VEC) model, based on the eigenvalues (roots) of the companion matrix

Root	Modulus
0.946907	0.946907
0.689938 - 0.399284i	0.797147
0.689938 + 0.399284i	0.797147
0.660981	0.660981
-0.100389 - 0.576713i	0.585385
-0.100389 + 0.576713i	0.585385
0.115943 - 0.364568i	0.382560
0.115943 + 0.364568i	0.382560
0.316844	0.316844
0.171427	0.171427

No root lies outside the unit circle.
VAR satisfies the stability condition.

The modulus of each root (eigenvalue) is checked to determine if it is inside the unit circle (i.e., less than 1). The unit circle condition ensures the VAR model is stable, meaning that shocks to the system do not lead to explosive behavior over time.



Therefore, the model satisfies the **stability condition**, meaning it is well-behaved over time. This implies that the estimated relationships among the variables are reliable for forecasting and impulse response analysis.

3. CONCLUSION

3.1. Short-run Recommendation [**0-2 Years**]

To address the economic challenges and provide both short-term and long-term interventions, you need to focus on stabilizing the economy, restoring confidence, and fostering sustainable growth

3.1.1. Monetary Policy Tightening

Continue raising interest rates cautiously to curb inflation, but avoid over-tightening, which could stifle economic activity.

Inflation occurs when there is a general and continuous rise in the prices of goods and services in the economy. During inflationary periods opportunity cost of holding money is increased causing inefficient use of real resources in transactions. Therefore, inflation weakens the purchasing power of money and sinks the standard of living of the citizenry, Gbadebo, A. D., & Mohammed, N. (2015).

Therefore, crucial factors that determine the level of inflation in an economy need to be identified. When inflation becomes persistent, these factors will then become the primary target of **policies**, then the government must put in place measures that will reduce the impact of fluctuated prices on domestic inflation.

3.1.2. Exchange Rate Interventions

The foreign exchange rate, which is the value of the money of a country in the currency of another country, is an important factor in determining the real value of the money of a country, Korkmaz, S. (2013). The decision of the Central Bank of a country to foreign exchange can affect the foreign exchange market of another country.

The core factors that are influenced by the exchange rate include export price, consumption, tourism, and productivity are the most direct and remarkable, Zhao, Y. (2020).
To stabilize the Zambian Kwacha (ZMW) depreciation, the Bank of Zambia (BoZ) and the government should prioritize interventions.

- Raise Interest Rates: Higher rates attract foreign investors seeking better returns, increasing demand for the Kwacha.
- Tighten Money Supply: Reduce excess liquidity via open market operations (selling govt bonds) or increasing reserve requirements for banks.
- Inflation Control: High inflation weakens the Kwacha; BoZ must maintain price stability through credible policies.

- Use Forex Reserves: Sell USD/EUR to buy ZMW, boosting its value (limited by reserve levels).
- Exchange-rate pegging can be an especially effective means of reducing inflation quickly if there is a very strong commitment to the exchange-rate peg, Mishkin, F. S. (1998).

To stabilize the Zambian Kwacha (ZMW) from depreciation, the Bank of Zambia (BoZ) can implement several key monetary and forex interventions. Raising interest rates is one of the most direct tools, as higher rates make Kwacha-denominated assets more attractive to foreign investors seeking better returns.

This increased demand for the Kwacha helps strengthen its value. Additionally, the BoZ can tighten the money supply by conducting open market operations, such as selling government bonds, or by increasing reserve requirements for commercial banks. These measures reduce excess liquidity in the economy, curb inflation, and limit speculative trading that could further weaken the currency.

3.1.3. Subsidies and Price Controls.

Introduce temporary subsidies on essential goods (e.g., food, fuel) to mitigate the impact of inflation on vulnerable populations.

While subsidies and price controls offer temporary relief, they should be phased out or carefully targeted to avoid fiscal deficits and market imbalances. Sustainable solutions like increasing local production, improving supply chains, and monetary stability are more effective in the long run.

Example

The Ministry is implementing and currently enhancing a subsidy program - the Farmer Input Support Programme (FISP) A mode of providing finance in the form of agricultural inputs which is matched with a contribution from the beneficiary farmers. Currently, one million farmers have access to this Government Facility (subsidy).

FISP is now operational across all ten provinces and 116 districts of Zambia. The selection of beneficiaries, who are reviewed annually, follows criteria set by the Ministry of Agriculture. To enhance the efficiency and impact of FISP, the Government operationalized the Zambia Integrated Agricultural Management Information System (ZIAMIS) during the 2017/18 agricultural season.

3.1.4. Mitigate the Impact of Drought (GDP and Inflation)

- Emergency Food Imports: Focus on immediate stabilization measures to address inflation, currency depreciation, and drought impacts. Import essential food to address shortages caused by drought and stabilize food prices.
- Energy Diversification: Invest in short-term energy solutions (e.g., solar, diesel generators) to offset the electricity deficit caused by reduced hydropower capacity.
- Support for Farmers: Provide drought-resistant seeds, irrigation equipment, and financial assistance to farmers to prepare for the next planting season.

3.2. Long-run Recommendation [**2-5 Years**]

Begin implementing structural reforms and diversification strategies to reduce vulnerabilities.

3.2.1. Diversifying the Economy

- Reduce Reliance on Copper: Invest in other sectors like agriculture, tourism, manufacturing, and renewable energy to reduce dependence on copper exports, which are vulnerable to price fluctuations.
- Value Addition: Promote local processing of raw materials (e.g., copper, agricultural products) to increase export earnings and create jobs

3.2.2. Building Resilience to Climate Shocks

- Invest in Renewable Energy: Hydropower has generally been viewed as a sustainable, clean, low-carbon source of energy but climate variability is putting its future under threat. Hydropower is particularly vulnerable to the effects of climate change – and the impact of the changes in rainfall and water availability, protracted drought events, significant variation in temperature regimes, and more frequent and severe weather events that are already being seen in sub-Saharan Africa, in particular, Zambia has faced recently drought which has significantly disturbed the economy overall.

- Expand and explore solar, wind, and geothermal energy to reduce reliance on hydropower and mitigate the impact of droughts. The costs of electric power projects utilizing renewable energy technologies (RETs) are highly sensitive to financing terms. Consequently, as the electricity industry is restructured and new renewables policies are created, policymakers need to consider the

impacts of renewables policy design on RET financing projects, Wiser, R. H., & Pickle, S. J. (1998).

- Climate-Smart Agriculture: Promote irrigation systems, drought-resistant crops, and sustainable farming practices to ensure food security.
- Disaster Preparedness: Establish a national fund for disaster response and recovery to quickly address future shocks. This can be done by Building resilience to external shocks and ensuring sustainable growth through climate adaptation, export diversification, and fiscal discipline.

  The Impulse Response Function (IRF) shows how one variable (e.g., GDP) responds over time when another variable (e.g., Forex, Inflation, or Copper Price) experiences a sudden shock.

3.2.3. Assessment, Monitoring, and Evaluation of Policy and Intervention

For policymakers, Assessment, Monitoring, and Evaluation (M&E) are essential tools that ensure policies and programs are effective, efficient, and impactful. Without a structured M&E system, policies risk being ineffective, wasteful, or misaligned with national priorities.

- Assessment is the initial step where policymakers analyze problems, needs, and potential policy solutions before implementation.
- Regularly monitor key indicators (GDP growth, inflation, FOREX reserves, lending rates, and copper prices) to assess the effectiveness of interventions and adjust policies as needed based on economic conditions and external shocks, Prennushi, G., Rubio, G., & Subbarao, K. (2002).

  Assessment, monitoring, and evaluation are essential for ensuring that policies deliver real benefits, remain adaptable to changing conditions, and justify public investment. Without AME, policies risk inefficiency, irrelevance, or failure to meet societal needs. Ensures Policy Effectiveness
  Helps determine whether a policy is achieving its intended outcomes by ensuring the following;

  - Identifies gaps or unintended consequences that need corrective action.
  - Facilitates Evidence-Based Decision-Making
  - Improves Resource Allocation.
  - Enhances Transparency and Accountability.
  - Strengthens Stakeholder Engagement.

BIBLIOGRAPHY

1. TITLE: "Zambia: Monetary Policy and Exchange Rate Stability" (IMF Country Report)
   REFERENCE: Muhanga, I., Zyuulu, I., & Adam, C. S. (2014). Monetary policy and the exchange rate in Zambia. *Zambia: Building Prosperity from Resource Wealth*, *110*.
   RELEVANCE: Discusses interest rate adjustments, forex interventions, and inflation control measures in Zambia.

2. TITLE: Monetary policy and inflation control in Nigeria
   LINK: https://www.academia.edu/download/71560809/21911-24256-1-PB.pdf

3. Title: " Subsidy Reforms and Implications for Social Protection: An Analysis of IMF Advice on Food and Fuel Subsidies "
   Reference: Feltenstein, A. (2017). Subsidy reforms and implications for social protection: An analysis of IMF advice on food and fuel subsidies. IEO Background Paper No. BP/17-01/02 (Washington: International Monetary Fund).
   Relevance: Analyzes how subsidies affect government budgets and inflation in developing economies like Zambia.

4. TITLE: Central Bank Responsibility for Exchange Rate Policy and Implementation
   LINK: https://www.elibrary.imf.org/display/book/9781589061767/ch018.xml

5. TITLE: The impact of climate change on hydropower in Africa
   LINK: https://www.opml.co.uk/insights/impact-climate-change-hydropower-africa

REFERENCES

Bank of Zambia. (n.d.). monetary and financial statistics, FORTNITHLY TIME SERIES: 2025. Retrieved from
Retrieved from https://www.boz.zm/monetary-and-financial-statistics-Dec2022.htm

Federal Reserve Bank of St. Louis. (n.d.). Producer price index for all commodities. Retrieved from https://fred.stlouisfed.org/series/PCOPPUSDM

Gbadebo, A. D., & Mohammed, N. (2015). Monetary policy and inflation control in Nigeria. Journal of Economics and Sustainable Development, 6(8), 108-115.

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. OUP Oxford.

Korkmaz, S. (2013). The effect of exchange rate on economic growth. Conference Paper, October.

Mishkin, F. S. (1998). Strategies for controlling inflation.

Wiser, R. H., & Pickle, S. J. (1998). Financing investments in renewable energy: The impacts of policy design. Renewable and Sustainable Energy Reviews, 2(4), 361-386.

World Bank. (n.d.). Population, total - Zambia. Retrieved from https://databank.worldbank.org/indicator/SP.POP.TOTL/1ff4a498/Popular-Indicators#advancedDownloadOptions

Zambia Statistical Agency. (2024). Monthly inflation: January 2024 - January 2025. Retrieved from https://www.zamstats.gov.zm/monthly-inflation-january-2024-january-2025/

Zhao, Y. (2020). The influence and impact of the exchange rate on the economy. In E3S Web of Conferences, 214, 03007. EDP Sciences.

Prennushi, G., Rubio, G., & Subbarao, K. (2002). Monitoring and evaluation. *A sourcebook for poverty reduction strategies*, 107-30.

Sadeghi, M., & Alavi, S. Y. (2013). Modeling the impact of money on GDP and inflation in Iran: Vector-error-correction-model (VECM) approach. African Journal of Business Management, 7(36), 3423.