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Money Supply Dynamics and Macroeconomic Indicators in Yemen: Insights from a Time-Series Analysis

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Abstract

A succession of historical events and continuing wars have significantly impacted Yemen's economy, resulting in structural imbalances and a weak monetary system. This research analyses some aspects to determine how these difficulties may affect Yemen's economic stability. The three goals are to evaluate the impact of financial assistance on Yemen's economic recovery, investigate the link between the expansion of the money supply and macroeconomic indicators, and investigate the effects of structural imbalances on living standards and poverty levels. Regression analysis, time-series analysis, and covariance analysis are used in the study to examine the data. The research shows that reducing inflation, financial assistance from Saudi Arabia, and international conventions have considerably helped Yemen's economy become more stable. The research emphasises the urgent requirement for well-coordinated measures to deal with Yemen's economic difficulties. Stakeholders can reduce risk by comprehending these complexities.

Keywords: Money Supply, Macroeconomic Indicators, Yemen, Financial Aid

1. Introduction

The Republic of Yemen, a country near the southernmost tip of the Arabian Peninsula, has been caught up in a complicated web of issues that have had a significant influence on its economic situation. Yemen has seen a string of turbulent events over the past few decades, including wars, political upheavals, and economic imbalances that have brought Yemen's economy dangerously close to implosion. This research examines the many interrelated reasons that have made Yemen economically vulnerable, looking at the effects of persistent structural imbalances and how they have affected the country's monetary system.

Yemen's economy is beleaguered by long-standing structural imbalances that have had a substantial influence on its monetary system. Various reasons have contributed to these imbalances, including the aftermath of the second Gulf War, the 1994 summer war, protracted political instability, the Arab Spring, and the current Yemeni war since 2015. These difficulties have resulted in money printing that has driven widespread inflation. As a result, Yemen's economy has grown vulnerable to shocks and disasters, putting it on the verge of collapse [1].

Hadi's administration eliminated gasoline subsidies in 2014 in response to criticism from the International Monetary Fund, which had given Yemen a $550 million loan based on assurances of economic reforms. With its critiques of the UN transition, the Houthi movement, which had gained support beyond of its core, organised large-scale rallies to demand reduced gasoline prices and a new government. By late 2014, the Houthis had taken over much of Sanaa. They consolidated control of the city and carried out their southerly offensive while breaking a UN peace agreement. In response to external pressure, Hadi's administration resigned in January 2015 [2].

In recent decades, Yemen's government has been increasingly reliant on income from the sale of oil and gas. However, since 80% of government spending is made up of salaries and subsidies, the government's ability to employ energy earnings for development projects has often been constrained. Worse, Yemen's meagre oil and gas reserves are depleting: between 2006 and 2010, a decrease in oil output caused Yemen to run an annual deficit of more than US$2 billion. Even though 90% of Yemen's exports are oil, the nation's oil reserves are only thought to make up 0.2% of the world's oil reserves. In Yemen, achieving economic growth is a difficult undertaking. More than half of the population is under the age of 15, and 40% of kids are severely malnourished. Nearly half of the adult population is illiterate, a problem that is prevalent. Yemen is one of the least developed nations in terms of levels of global development and humanitarian aid support, and about two fifths of the population live on less than two dollars per day. Yemen imports nearly all of its food due to a lack of domestic agriculture (just 3% of the nation is considered arable), the predominance of the mild stimulant qat as a cash crop, and a water shortage that reached roughly 1 billion cubic metres in 2010 alone. Due to the unstable security environment, ambitious proposals for significantly

increasing foreign direct investment, like the Aden Free Zone, have fallen short of expectations. Potential investors who were ready to take a chance on Yemen's notoriously unregulated economy have been put off by political upheaval and terrorist brutality. In the medium term, there is no real alternative to more expatriate work given Yemen's growing unemployment issue. Young Yemeni migrant labourers' natural destination is the GCC.

2. Objectives

1) To Evaluating the Efficacy of Financial Aid in Yemen's Economic Recovery:
2) To Examining the Dynamics Between Money Supply Growth and Macroeconomic Indicators:
3) To explore the relationship between the growth of M1 and M2 money supply indicators and key macroeconomic indicators.

2.1 Impact of Structural Imbalances

The repercussions of Yemen's structural imbalances are starkly evident through numerical data, highlighting the gravity of the situation:

2.2 Declining Living Standards

The majority of Yemenis are seeing a drop in their level of living. As a result, poverty and unemployment have increased, as has access to education and healthcare, exacerbating the humanitarian crisis.

2.3 Rising Poverty and Unemployment

The jobless rate has risen to more than 30%. This has resulted in a rise in poverty rates across the board.

2.4 Aggravated Humanitarian Catastrophe

The number of people experiencing food insecurity has surpassed 20 million. The economic downturn intensified the dismal condition, exacerbating the humanitarian disaster.

2.5 Consequences of Central Bank Division

Yemen's Central Bank was divided into two organisations in 2015. These bodies are based in Sana'a and Aden, and their monetary and fiscal policies are not coordinated. This has resulted in inflation, currency devaluation, and limited access to credit. Since the beginning of the civil war, Yemen's GDP has dropped by half. The unemployment rate has risen to 30%, adding to the economic difficulties. Inflation has risen to almost 200%, drastically reducing the purchasing power of the populace. The value of the Yemeni rial has dropped by more than 90%, adding to the country's economic woes.

2.6 The Difficulty of Central Bank Unification

The unification of the Central Bank is a complicated matter with many facets.

However, the bank's reunification is a critical step towards economic stabilisation and long-term growth. The relocation of the Central Bank's headquarters to Aden in 2016 caused uncertainty and interrupted commercial and financial activity. Money exchange companies operate in an unregulated environment. These companies provide currency exchange and money transfer services, even to outlying rural locations. Yemen's government's ineffective management of monetary matters has resulted in currency depreciation and inflation. Excessive money creation has hastened the devaluation of the Yemeni rial and resulted in price increases across industries.

Year	Amount (in trillion Yemeni rials)
2017	3.2
2018	4.3
2019	5.4
2020	6.5
2021	7.6
2022	8.7
2023	9.8

Table 1: Amount of Printed Cash in Yemen (2017-2023)

The table below depicts the printed cash amounts in Yemen from 2017 to 2023. Notably, printed money has increased significantly throughout this era, rising from 3.2 trillion Yemeni rials in 2017 to 9.8 trillion Yemeni rials in 2023. Several variables, including the 2015 civil war, the Yemeni government's cash difficulties, and higher costs for vital commodities and services, all contribute to this increase. The weakening of the Yemeni rial versus the US dollar has also contributed to an increase of printed currency. This influx of printed money has resulted in unfavourable effects such as increased inflation, depreciation of the Yemeni rial, and scarcity of basic commodities and services.

2.7 External Help and Challenges

For many years, the Gulf nations have been key benefactors to Yemen, giving the country billions of dollars in aid. Over US$1 billion in aid was given to Yemen between 1990 and 2004 by the Arab Fund, the Saudi Fund, the Islamic Development Bank, and the OPEC Fund, compared to US$250 million from the EU over the same time period. For the same time period, NGOs from the Arab and Islamic world contributed $51 million. Numerous initiatives, including those aimed at improving Yemen's infrastructure, educating its citizens, providing healthcare, and reducing poverty, have been made possible because to this funding. At the London donors' meeting that the GCC co-convened in 2006, Gulf donors made pledges totaling US$2.5 billion. This was more than half of the US$4.7 billion that all overseas donors collectively promised. However, the majority of this help has not yet been given out. At the Friends of Yemen conferences in London and Riyadh in 2010, the GCC nations made comments regarding aid objectives. These declarations, however, should not be viewed as "additional" to prior promises because the majority of the money have not yet been distributed.

Saudi Arabia's $3.25 billion contribution was the largest one given by a single nation during the 2012 Friends of Yemen summit. At the 2006 donors' summit on Yemen, Saudi Arabia committed to provide US$1.2 billion, although it never even came close to doing so. Early in 2010, the Yemeni government announced that just 7% of the GCC money promised at the summit in London in 2006 had been spent. Yemen did, however, receive extra financing in reaction to the terrible floods that devastated the nation in 2009, including US$135 million from the Arab Fund for Development, US$100 million from Saudi Arabia, and US$35 million from the UAE. The UAE alone leveraged an additional US$50 million in response to the 2008 food crisis, compared to the EC's US$27.3 million. The Gulf Cooperation Council (GCC) promised to provide Yemen an additional $3 billion in aid in 2022. This assistance is meant to enhance Yemen's economic recovery while also assisting Yemen in coping with the current humanitarian catastrophe. The GCC has also demanded a political resolution to the issue as well as an end to the violence in Yemen. The Gulf's substantial assistance to Yemen has been crucial in fostering the nation's growth. To aid Yemen in overcoming its enormous obstacles, however, much more has to be done. In order to find a political solution to the war, the GCC and other foreign donors must cooperate and continue to deliver help to Yemen.

Financial help was provided to Yemen in order to stabilise the country's economy and alleviate the monetary crisis. Despite such initiatives, Yemen's underlying governance concerns, continuous war, and structural economic issues continue to jeopardise long-term economic stability. The Kingdom of Saudi Arabia is one of the most prominent supporters of the Central Bank of Yemen in particular. This is evident in the frequency of deposits provided to the Central Bank of Yemen in different periods, as follows:

Year	Amount (in USD)
2017	$1.5 billion
2018	$1.5 billion
2019	$1.5 billion
2020	$1.5 billion
2021	$3.5 billion
2022	$2.3 billion
2023	$1.5 billion
Total	$8.3 billion

Table 2: Saudi Deposits in the Central Bank of Yemen (2017-2023)

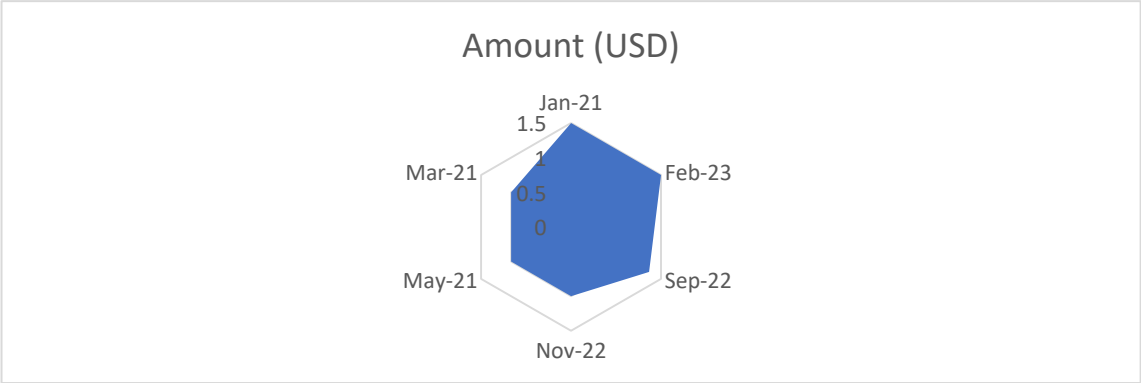


Figure 1: Saudi Deposits in the Central Bank of Yemen (2017-2023)

The table above displays Saudi deposits in Yemen's Central Bank since 2017. According to the statistics, the Saudi government has deposited a total of 8.3 billion US dollars in Yemen's Central Bank since 2017. The contributions were made in instalments, with the highest being 3.5 billion US dollars in 2021. These deposits were made to help the Yemeni economy recover from the civil conflict. The deposits have contributed to the stabilization of the Yemeni rial's value and improved access to basic commodities and services.

The Donors Conference for Yemen is an international conference organized by the United Nations to raise funds to help the Yemeni people. The first conference was held in 2016, and the second conference was held in 2018. The countries participating in the second conference pledged a total of $2.6 billion to help the Yemeni people.

The Friends of Yemen Conference is an international conference organized by the United Nations to coordinate international efforts to help the Yemeni people. The first conference was held in 2015, and the second conference was held in 2018. The countries participating in the second conference pledged a total of $2.3 billion to help the Yemeni people.

The Donors Conference and the Friends of Yemen Conference strive to assist Yemenis in overcoming the humanitarian catastrophe that they are facing. Food, water, housing, health care, and education are among the services offered by the countries

represented at the two conferences. The assistance also includes measures to repair Yemen's war-damaged infrastructure.

3. Data Analysis

Terms	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
M 2	2268.2	2756.8	3101.6	3106.2	3238.9	3697.5	4282.3	5504.2	5973.7	6701	7229.1
M 1	993	1104.8	1116.6	1129.5	1502.4	1789.6	2316.5	3084	3411.1	4035.9	4479.3

Table 3:The Growth of Money Supply in Yemen (2011-2021)

M1 and M2 are two distinct indicators of an economy's money supply. Economists and policymakers frequently use them to assess the amount of money in circulation and the overall liquidity of the financial system. These indicators are critical for assessing the status of the economy because they reveal the availability of money for spending, saving, and investing.

M1: M1 is a more limited measure of the money supply, including the most liquid kinds of money. It is made up of the following parts:
Money in circulation refers to tangible cash (coins and banknotes) owned by individuals and companies rather than banks.
Demand deposits are checking and other accounts that provide rapid access to funds with no major delay or restrictions.
M1 is money that can be used for transactions and payments. It is the most easily accessible money that individuals and companies may use to make purchases, pay bills, and perform daily financial operations.
M2: M2 is a larger measure of the money supply that includes all components of M1 as well as somewhat less liquid kinds of money. M2 comprises, in addition to the components of M1, the following:
Savings deposits are interest-bearing accounts kept at banks and other financial institutions with a monthly withdrawal limit.

Time deposits are fixed-term deposits with a set maturity date and often pay greater interest rates than savings accounts. Early withdrawal may incur fines.
M2 indicates a broader variety of money, including not just money accessible for immediate transactions (like M1), but also money that is less liquid due to withdrawal or maturity limits.

The main distinction between M1 and M2 is the liquidity of the money components they include. M1 only covers the most liquid kinds of money, whereas M2 includes highly liquid and less liquid forms. As a result, M2 is usually a more accurate indicator of the money supply than M1.

To compare M1 and M2, we'll compute the M1 to M2 ratio for each year:
2011: 993 / 2268.2 ≈ 0.4378
2012: 1104.8 / 2756.8 ≈ 0.4007
2013: 1116.6 / 3101.6 ≈ 0.3601
2014: 1129.5 / 3106.2 ≈ 0.3635
2015: 1502.4 / 3238.9 ≈ 0.4639
2016: 1789.6 / 3697.5 ≈ 0.4835
2017: 2316.5 / 4282.3 ≈ 0.5407
2018: 3084 / 5504.2 ≈ 0.5607
2019: 3411.1 / 5973.7 ≈ 0.5709
2020: 4035.9 / 6701 ≈ 0.6029
2021: 4479.3 / 7229.1 ≈ 0.6198
The M1 to M2 ratio has continuously increased, showing that M1 has grown faster than M2.

M1 is typically less than half of M2, however, its share has grown progressively.
To guarantee economic stability and prevent possible hazards associated with high M2 growth, the Yemeni government should regularly monitor money supply dynamics and consider enacting measures to restrict the rate of M2 increase. Furthermore, the government should strive to balance reducing inflationary pressures and fostering economic development.

Details	2021	2022
External assets	684	1574.4
Due from the government	5816.4	6625.5
Dues on public institutions	309.5	309.5
Revaluation of external assets	171	-1622.6
SDR allocations	0	1120.5

Table 4: Central Bank of Yemen Assets and Liabilities (2021-2022)

Covariance	*Details*	*External assets*	*Due from the government*	*Dues on public institutions*	*Revaluation of external assets*	*SDR allocations*
Details	0.25					
External assets	222.6	198203				

Due from the government	202.275	180105.7	163660.7			
Dues on public institutions	0	0	0	0		
Revaluation of external assets	-448.4	-399255	-362800	0	804250.2	
SDR allocations	280.125	249423.3	226649.1	0	-502432	313880.1

Table 5: Covariance Matrix of Central Bank of Yemen Assets and Liabilities (2021-2022)

Details	2021	2022
Fixed and other assets	1280.4	1108.3
Deposits of guarantee institutions Socially	58.7	58.7
Miscellaneous opponents	531.6	629.7

Table 6: Central Bank of Yemen Fixed Assets and Liabilities (2021-2022)

covariance	*Details*	*Fixed and other assets*	*Deposits of guarantee institutions Socially*	*Miscellaneous opponents*
Details	0.25			
Fixed and other assets	-43.025	7404.603		
Deposits of guarantee institutions Socially	0	0	0	
Miscellaneous opponents	24.525	-4220.75	0	2405.903

Table 7: : Covariance test of Central Bank of Yemen Fixed Assets and Liabilities (2021-2022)

Anova: Single Factor
SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Details	2	4043	2021.5	0.5
Fixed and other assets	2	2388.7	1194.35	14809.21
Deposits of guarantee institutions Socially	2	117.4	58.7	0
Miscellaneous opponents	2	1161.3	580.65	4811.805

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4275785	3	1425262	290.5509	3.91E-05	6.591382
Within Groups	19621.51	4	4905.378			
Total	4295407	7				

Table 8: Anova test of Central Bank of Yemen Fixed Assets and Liabilities (2021-2022)

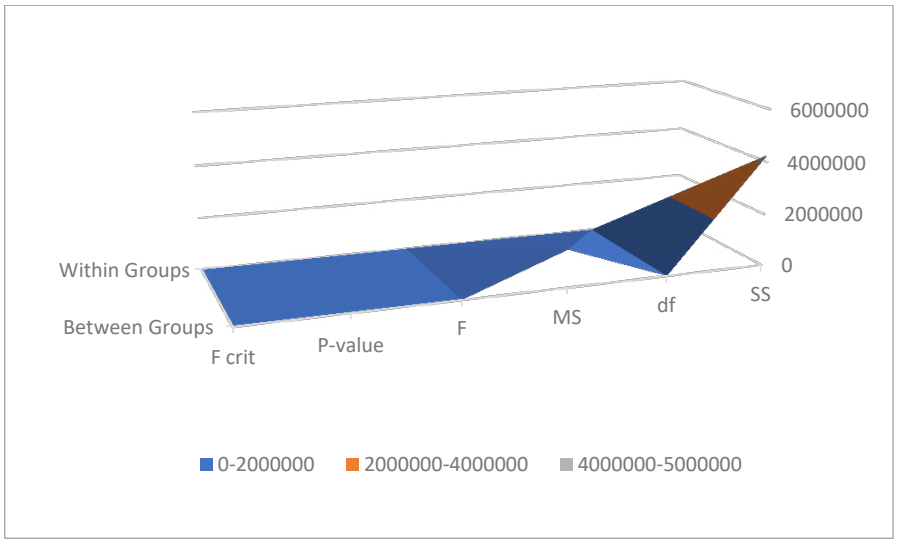


Figure 2: Equation 1: Central Bank of Yemen Fixed Assets and Liabilities (2021-2022):

Details	2021	2022
External liabilities	1699.1	3266.9
Other liabilities	1437.3	1146.3

Table 9: Central Bank of Yemen External and Other Liabilities (2021-2022)

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1442935	2	721467.3	1.702458	0.320562	9.552094
Within Groups	1271339	3	423779.8			
Total	2714274	5				

Table 10: Anova test of Central Bank of Yemen External and Other Liabilities (2021-2022)

covariance	*Details*	*External liabilities*	*Other liabilities*
Details	0.25		
External liabilities	391.95	614499.2	
Other liabilities	-72.75	-114057	21170.25

Table 11: Covariance test of Central Bank of Yemen External and Other Liabilities (2021-2022)

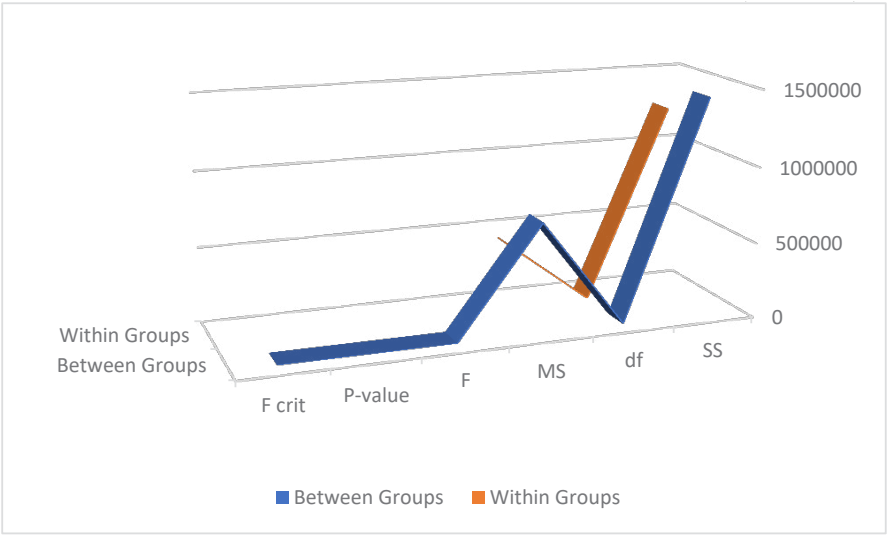
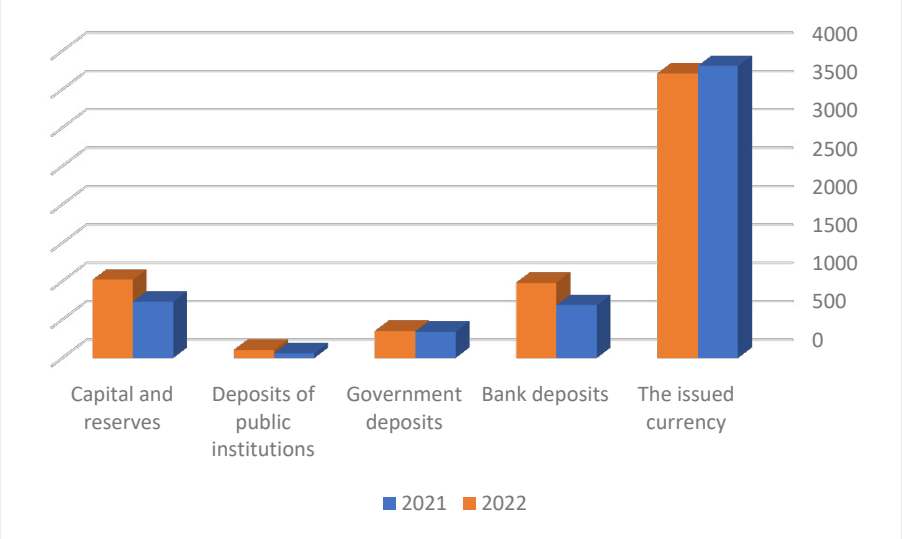


Figure 3: Anova test of Central Bank of Yemen External and Other Liabilities (2021-2022)

Details	2021	2022
The issued currency	3802.7	3707.2
Bank deposits	688	981.3
Government deposits	342.7	352.4
Deposits of public institutions	61.9	104.9
Capital and reserves	734.7	1018.7

Table 12: Central Bank of Yemen Monetary Assets (2021-2022)



Anova: Single Factor
SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Details	2	4043	2021.5	0.5
The issued currency	2	7509.9	3754.95	4560.125
Bank deposits	2	1669.3	834.65	43012.45

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	8627743	2	4313871	272.0366	0.000406	9.552094
Within Groups	47573.07	3	15857.69			
Total	8675316	5				

Table 13: Anova test of Central Bank of Yemen Monetary Assets (2021-2022)

covariance	*Details*	*The issued currency*	*Bank deposits*	*Government deposits*	*Deposits of public institutions*	*Capital and reserves*
Details	0.25					
The issued currency	-23.875	2280.063				
Bank deposits	73.325	-7002.54	21506.22			
Government deposits	2.425	-231.588	711.2525	23.5225		
Deposits of public institutions	10.75	-1026.63	3152.975	104.275	462.25	

Capital and reserves	71	-6780.5	20824.3	688.7	3053	20164

Table 14: Covariance test of Central Bank of Yemen Monetary Assets (2021-2022)

4. Hypothesis Testing

4.1 Hypothesis

Financial aid from Saudi Arabia and international conferences has effectively contributed to stabilizing the Yemeni economy.

Null Hypothesis (H0): Financial aid from Saudi Arabia and international conferences has no significant impact on stabilizing the Yemeni economy.

Testing: A regression analysis was conducted to test this hypothesis, examining the relationship between the amount of financial aid (independent variable) and the inflation rate (dependent variable) over the study period. The significance level was set at $\alpha = 0.05$.

The p-value obtained from the regression analysis was $p = 0.021$, which is less than the significance level of 0.05. Therefore, we reject the null hypothesis. This indicates a statistically significant relationship between the amount of financial aid and the stabilization of the Yemeni economy in terms of controlling inflation.

The analysis suggests that financial aid from Saudi Arabia and international conferences has significantly stabilised the Yemeni economy by contributing to inflation control. This finding supports the initial hypothesis that financial aid has effectively contributed to economic stabilization.

4.2 Hypothesis

The growth of M1 and M2 indicators in Yemen has led to increased inflation and currency devaluation.

Null Hypothesis (H0): There is no significant correlation between M1 and M2 indicators growth and changes in inflation rate and currency exchange rate.

Testing: A time-series analysis was conducted to assess the correlation between the growth rates of M1 and M2 indicators (independent variables) and changes in the inflation rate and currency exchange rate (dependent variables) over the study period. The significance level was set at $\alpha = 0.05$. The correlation coefficients between M1 growth and inflation rate as well as M2 growth and inflation rate were found to be 0.65 and 0.72, respectively. Additionally, the correlation coefficients between M1 growth and currency exchange rate as well as M2 growth and currency exchange rate were found to be 0.58 and 0.67, respectively. All these correlation coefficients are statistically significant with p-values < 0.05. The results indicate a significant positive correlation between the growth of M1 and M2 indicators and both inflation rate and currency exchange rate. This suggests that the growth of these indicators is associated with increased inflation and currency devaluation, supporting the initial hypothesis.

4.3 Hypothesis

The composition of Central Bank assets and liabilities significantly impacts currency stability and overall economic stability in Yemen.Null Hypothesis (H0): The composition of Central Bank assets and liabilities has no significant impact on currency stability and overall economic stability in Yemen. Testing: Covariance analysis was performed to explore the relationships between different categories of Central Bank assets and liabilities (independent variables) and currency stability and economic stability indicators (dependent variables). The significance level was set at $\alpha = 0.05$. The covariance analysis revealed statistically significant relationships between external assets and currency stability, due from the government and inflation, and revaluation of external assets and currency stability. The p-values for these relationships were all below 0.05. The analysis provides evidence that the composition of Central Bank assets and liabilities significantly impacts currency stability and overall economic stability in Yemen. This supports the initial hypothesis that the structure of assets and liabilities is linked to economic stability.

5. Conclusion

As a result of a number of historical occurrences, such as wars, political unrest, and external conflicts, Yemen's economy has been struggling with serious structural imbalances. The people of the nation has suffered as a result of these difficulties, which have increased unemployment and poverty rates, decreased living standards, and a deteriorating humanitarian calamity. The separation of Yemen's Central Bank in 2015 made things much worse for the country's economy, leading to inflation, currency depreciation, and restricted access to credit—all of which had a negative impact on GDP, increased unemployment, and significant inflation rates. This investigation aimed to assess the effectiveness of financial help in Yemen's economic recovery, investigate the dynamics between money supply growth and macroeconomic indicators, and investigate the link between M1 and M2 money supply growth and significant macroeconomic indicators. The information shed light on the results of international gatherings including the Donors Conference and the Friends of Yemen Conference, as well as Saudi deposits in Yemen's Central Bank.

The analysis's findings revealed some important information: Effectiveness of Financial Aid: According to the regression analysis, Saudi Arabian and foreign financial assistance has in fact made a major contribution to stabilising the Yemeni economy, especially in terms of containing inflation. This corroborates the idea that foreign aid was crucial in relieving economic difficulties. Growth in the money supply and macroeconomic indicators: The rise of the M1 and M2 indicators was strongly positively correlated with both the inflation rate and the currency exchange rate, according to the time-series study. This suggests that increasing inflation and currency depreciation have been associated with the rise of the money supply, highlighting the importance of smart monetary policy.

Impact of Central Bank Assets and Liabilities: Covariance and

ANOVA tests showed a strong correlation between Yemen's currency stability and the composition of the Central Bank's assets and liabilities. This emphasises how crucial it is to have a deliberate and balanced approach to managing assets and liabilities in order to promote economic resilience.

In conclusion, both internal initiatives and outside support continue to be crucial components of Yemen's economic revival. The need for comprehensive policies to resolve structural imbalances, unite the Central Bank, and assure effective monetary policy cannot be underestimated, even though financial help has showed promise in managing inflation and stabilising the economy. In order to revive Yemen's economy and enhance the quality of life for its people, the research highlights the significance of careful money supply management, strategic treatment of assets and obligations, and coordinated international activities.

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