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Evaluating the Effectiveness of Macroeconomic Indicators to Influence the Stability of Jordanian Banking System

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Abstract

This research is primarily aimed at investigating the long as well as short-run causalities, which are running from the movements of macroeconomic indicators towards the stability of Jordanian banking system, as captured by debt ratio and the Z-score index. Thus, through analyzing a time series data covering the period from Q1/2001 to Q4/2017, the results show that only after including the second difference, the series of variables became stationary. Thereafter, findings from Johansen co-integration test as well as the single equation of the error correction model confirm that the stability of banks is found to be significantly related to the quarterly change in macroeconomic indicators, over the long-run. However, results from Wald χ^2 test proved that except for inflation, the z-score index is found not to be related to the volatility in macroeconomic indicators during the short-run. By contrast, the results show a short-run causality that is running from inflation as well as income per capita towards debt ratio. Moreover, the study concludes that indicators such as inflation, income per capita, and the rate of interest are conducting a vital role to influence the stability of Jordanian commercial banks, during both the short and long terms.

Keywords: Banks' Stability, Z-Score Index, Macroeconomic Indicators, Income Per Capita, Error Correction Model.

Introduction

This research concerns assessing the long as well as short-run causalities, those are assumed to be run from macroeconomic indicators such as interest rate "IR", inflation "INFL", and income per capita "IPC" towards banking stability, over the period Q1/2001-Q4/2017. Based on the function of funds' mobilization, banks exert a positive activity in nations' economies as well as contributing in economic growth and development. Similarly, since banks of Jordan are seen as an important base for the country's economy; evaluating the effectiveness of macroeconomic indicators seems to be imperative to influence the stability of Jordanian banking system. In this regard, the available statistics revealed that banks' total assets relative to GDP constituted 86.4% in 2000, compared with 106.86% and 111.59% in 2007 and 2014, consecutively (ASE, 2019)(1). However, since the recent unstable political and economic challenges in neighboring countries resulted in influencing the financial environments of MENA region economies as a whole, the recent statistics indicated that the case of Jordanian banking system was not an exception. Accordingly, the most related statistics showed that the Z-Score index of Jordanian banking sector dropped from 37.5 in 2006, to 31.07 by the end of 2016, and similarly the total loans/deposit ratio grew negatively by -12%, during the same period. However, since the country's economy witnessed strict variations, the statistics proved that macroeconomic variables including the rate of interest, inflation as well as IPC fluctuated considerably [2]; [3]. However, although there are many studies that assessed the impact of macroeconomic indicators in the stability of banks [4]; [5], the review of literature showed a gap regarding the effectiveness of macroeconomic indicators such as interest rate, inflation and IPC to portray the stability of Jordanian banking system. Therefore, this research endeavors to strengthen the growing body of literature through evaluating the long as well as short-run causalities, which are hypothesized to be run from the change in macroeconomic indicators towards the stability of Jordanian banking system. For this purpose, the study analyzed a quarterly time series data, covering the period Q1/2001-Q4/2017. Thereby, results from this research are estimated to assist the management of banks to understand the role of macroeconomic indicators to affect the behavior of their clients, as well as the stability of Jordanian banking system as a whole.

Research Problem and the Key Question(s)

Compared with the economies of MENA region countries, the economy of Jordan is considered as the smallest Arab economy that is highly based on banking system's performance. Thus, due to the vital role of banks to affect the stability of nations' economies, the review of literature has shown

intensive studies; those are concerned with the determinants of banking stability. For examples, authors including [6]; [4] confirmed that the stability of banks is significantly related to macroeconomic indicators such as GDP growth rate, inflation as well as interest rate. However, a study by [7]argued that the stability of banks is not related to GDP growth rate. However, some other studies showed that variables including interest and inflation rates are statistically impacting the profitability as well as the liquidity of banks [8]; [9]. Although, the available literature glorified the power of interest as well as inflation rates to influence banks' performance, however, there is no previous study searched for the effect of macroeconomic variables in the stability of Jordanian banking system. To fill this gap in literature, the study seeks to answer the following main questions:

- Does the quarterly change in macroeconomic indicators affect the stability of Jordanian banking system, during the long-run?
- Are there granger causalities running from the change in macroeconomic indicators towards the stability of Jordanian banking system, during the short-run?

After answering these questions, the study estimates not only helping investors to realize the role of macroeconomic variables to affect investment decisions, but also assisting the managements of banks to hedge against the undesirable volatilities in macroeconomic indicators. Consequently, that will strengthen the financial soundness of banks as well as the country's economy as a whole. Additionally, through updating the growing body of literature, the study will help further researchers to find more studies; those are focused on banks' performance and banking stability.

Research's Contribution

Since the stability of banks is vulnerable to be affected by the movements of economy as well as financial variables, previous studies including [5]; [9]; [8] confirmed that the liquidity and the profitability of banks are significantly relating to the change in interest rates. While according to [10] the liquidity of banks is found to be insignificantly associated with the rate of interest. Nevertheless, [11] showed a positive relationship between interest rate and banks' size along with banks' liquidity, while, the rate of inflation is found to be conversely impacting the liquidity of banks. Further studies showed a significant integration between GDP, interest as well as inflation rates along with banks' stability [4]; [6]. By contrast, [7] argued that the stability of Romanian banking system as captured by the Z-score index is not related to the GDP growth. Thus, since the available literature has not provided an evidence to support the impact of the fluctuations in macroeconomic variables in the stability of Jordanian banking system, this research is primarily aimed at evaluating the impact of IR, INFL and IPC in banks' stability as measured by the ZSI and the debt ratio. Theoretically, results from this study will widen the available literature that is focused on the potential determinant of banks' stability, as well as helping further researchers to find more studies regarding the role of macroeconomic variables to influence the stability of banks. Quantitatively, the study will help further researchers to adopt the used ECM in order to identify the other variables, which are affecting banks' stability. Beyond that, the study expects to assist investors and banks' managers to make more rational investment decisions. As a result, that is expected to be positively impacting the stability of banks, which will be in turn positively influencing economic growth and development.

Literature Review

In an attempt to evaluate the way of how banking stability's indicators responds to the quarterly change in macroeconomic indicators, the study reviewed a set of the most related researches, which are concerned with the influential factors of banking stability and banking performance. In this regard, researchers including [5] studied the impact of deposit interest rates in the performance of Syrian banking sector, as measured by time and saving deposits. Consequently, the study showed a positive correlation between banks' liquidity and interest rates. [11] showed a positive association between interest rate and banks' size along with banks' liquidity. Conversely, the rate of inflation is found to be negatively linked with banks' liquidity. However, in an attempt to provide empirical evidence regarding the impact of macroeconomic indicators in banks' stability [4] categorized the study's sample into three models namely, commercial banks model, Islamic banks model and the model of overall banking industry. Thus, through running the ARDL test the results presented a long-run correlation between macroeconomic variables such as interest rates, inflation and GDP growth along with the stability of commercial banks as well as the overall banking industry as proxied by the Z-score model.

By contrast, a study by [7] argued that the stability of Romanian banking system as captured by the Z-score index is not associated with GDP growth rate, while it is adversely correlated with loans to deposit ratio. On the other hand, findings from regression test revealed that variables including operational expense as well as GDP growth rate are significantly impacting banks' profitability as captured by the return on assets' ratio. Alternatively, through regressing the stability of Islamic as well as commercial banks on a set of macroeconomic and bank specific's variables, the study of [6] revealed that variables including bank size, equity to total assets

and income diversification are significantly impacting banks' stability. Additionally, results from the OLS test showed that the stability of banks as proxied by the Z-score index is adversely linked with macroeconomic indicators such as inflation.

An earlier study by [10] investigated the impact of banks' specific characteristics and macroeconomics variables in the liquidity of Slovakian banks, as measured by liquid assets to total assets, total loans to total assets and total loans to total deposits + current liabilities. Consequently, the results confirmed negative correlations between liquid asset to total assets along with banks' profitability, capital adequacy and banks' size. By contrast, the findings showed a non-significant correlation between banks' liquidity along with interest rates, inflation rates, net interest margin and non-performing loans. Along similar lines, [9] finds a positive association between banks' liquidity along with lending interest rates, capital adequacy, and banks' profit as proxies by ROE. However, the results stated that the liquidity of Hungarian banks, as measured by liquid asset to total asset, and liquid assets to total deposits, is negatively related to interest rate, interest margin, bank size, and interbank rate. Continuously, through measuring the impact of banks' characteristics and macroeconomic indicators in the profitability of Romanian commercial banks, [8] proved that banks' profitability as gauged by ROA and ROE is significantly related to the rate of interest. However, the study found that banks' profitability as captured by ROA is not affected by banks' credit risk, asset size or the ratio of total deposits to total assets. Likewise, [12] showed that factors such as interest rates' spread, saving deposits' ratio, GDP growth, and liquid assets to total assets are positively impacting the performance of Kenyan banks as captured by the ROA ratio.

However, through using a questionnaire and a quarterly data set, [13] examined the influential indicators of banks' liquidity, over the period Mar/2002-Dec/2011. As a result, the findings showed an adverse correlation for banks' liquidity along with capital adequacy. In addition, the study finds that banks' liquidity is negatively related to inflation rate, non-performing loans, GDP growth rate, short-term interest rate, and the liquidity premium, which is paid by borrowers. However, the results showed a positive correlation between banks' performance as proxied by ROA along with the liquidity premium. In an attempt to evaluate the determinants of banks' liquidity, [14] asserted that factors including interest rate, liquid assets to current liabilities and the lagged loans to total deposit ratios are significantly impacting the liquidity of banks, as monitored by loans to deposits ratio. Anyway, [15] showed that interest rates, banks' assets and the adverse political situations are significantly influencing the deposits of non-resident investors as denominated by both, the domestic and foreign currencies during the period Jan/2002-Jan/13.

Methodology and Data Sources

Through processing a time series data set covering the period Q1/2001-Q4/2017, the study endeavors to check the long as well as short-run causalities, which are assumed to be run from the quarterly change in IR, INFL or IPC towards the stability of Jordanian banking system. However, since Islamic regulations prevent Islamic banks from including the rate of interest in their banking operations, through following a purposive selection method, the study's sample is only consisted of the listed Jordanian commercial banks, which are 13 commercial banks in total. Accordingly, the used data set was primarily drawn from the financial statements as well as periodic reports, which are published at the official sites of Amman stock exchange, the central bank of Jordan and the global economy [1,3]; [2]. However, since time series variable are vulnerable to fluctuate over time, the study employed the Augmented Dickey Fuller test to check for data stationary. Thereafter, the Johansen co-integration, ECM as well as the Wald tests were applied to find-out the impact of macroeconomic indicators in banking stability during both the short and long-run periods. Additionally, the study used the descriptive test to describe data's means, variances, standard deviations, kurtosis and skewness. Moreover, to attain the core aim of this research, the following hypotheses are tested:

The Study's Hypotheses

To achieve the core aim of this research, the study aims at testing the following main hypotheses:

H_{01}**:** There are no long-run causalities running from the volatility in macroeconomic indicators towards the stability of Jordanian commercial banks.

H_{02}: There are no short-run causalities running from the volatility in macroeconomic indicators towards the stability of Jordanian commercial banks.

Estimation Procedure

Since results from ADF test confirmed that the used series variables became stationary only after including the second difference, the study concerned of accomplishing the main aim of this research through estimating the following single equation of the error correction model (2), instead of the linear regression model (1):

$$Ln(BS) = \beta 0 \pm \beta_1(\sigma IR\%) \pm \beta_2(\sigma INFL\%) \pm \beta_3(\sigma IPC\%) + \varepsilon t \ldots\ldots\ldots\ldots (1)$$

$$Ln\,BS_{it} = \beta_0 \pm \sum_{i=1}^{k-1}\beta_{1i}\Delta BS_{t-i} \pm \sum_{i=1}^{k-1}\beta_{2i}\Delta\,\sigma.IR_{t-i} \pm \sum_{i=1}^{k-1}\beta_{3i}\Delta\,\sigma.INFL_{t-i} \pm \sum_{i=1}^{k-1}\beta_{4i}\Delta IPC_{t-1} \pm \sum_{i=1}^{k-1}\gamma_1\,\sigma.IR_{t-i} \pm \sum_{i=1}^{k-1}\gamma_2\,\sigma.INFL_{t-i} \pm \sum_{i=1}^{k-1}\gamma_3\,\sigma.IPC_{t-i} \pm \psi_i\varepsilon_{t-1} \pm \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where, $\Delta^{\text{Ln } BS_{it}}$ is the difference operator of banking stability as captured by debt ratio and the ZSI. β_i: i= 1..., 4 are the parameters to be estimated, and they are related to the coefficients of the short-run dynamics. While the γi: i=1...3 parameters, refer to the long-run multipliers. $\Psi_i\ \varepsilon_{t-1}$ is the first lagged period of the error correction term, and μ_t refers to the white noise error term with usual properties. However, to check whether the volatility in macroeconomic indicators causes a granger to the stability of banks, over the long-run the model assumed that the coefficient of the error term equals zero. Thus, this null hypothesis is tested against the alternative one, which posits that the error term ≠ 0. According to this research, macroeconomic variables comprise of IR, INFL and IPC. These variables are calculated as shown below:

– **Time Deposit Interest Rate** $= \frac{\sum IR^{JB}}{13}$

Researchers including Ali (2018)[16] used this formula to calculate the time deposit interest rate for three months. Where, the $\sum IR^{JB}$ relates to the summation of time deposit interest rates, divided by the total number of Jordanian commercial banks.

– **INFL** = $\frac{\text{CPMBP}}{\text{BPMBP}}$ *** 100**

The CPMBP relates to the current period market basket price and the BPMBP refers to the base period market basket price. However, due to the significant association between interest and inflation rates, the study assumed that the stability of banks, is not only affected by interest rates, but it is also affected by inflation movements. Maybe this view holds true for Jordanian banks, since there is a significant relationship between inflation and interest rates [17].

– **Income Per Capita=** $\frac{\sum National\ Income}{Jordanian\ Population}$

This variable relates to the country's national income divided by the country's population, therefore, this formula used to calculate the amount of money, which is received individually. However, in order to capture the stability of Jordanian commercial banks, the following variables are utilized:

– **Debt Ratio=** $\frac{\mu TL}{\mu CTD}$

Where, the μ. TL refers to the average total loans, divided by the average of customers' total deposits $\mu.CTD$. The study assumes that this ratio is negatively related to the movements in macroeconomic indicators. However, Authors including [14] recommend this ratio as a valid measure to assess the liquidity of banks.

– **Z-Score Index=** $\frac{\sum ROA+\left(\frac{\sum EQUITY}{\sum ASSETS}\right)}{\sigma.ROA}$

Where, the ∑ROA represents the aggregated figures of banking system's return on assets ratio, the ∑Equity relates to the aggregated figures of banks' equity, the ∑Assets refers to the total amount of banking assets, and the σ.ROA is the standard deviation of return on assets ratio. However, through evaluating the impact of macroeconomic indicators in banking stability, as captured by debt ratio and the ZSI, results from this study are discussed in the coming section:

Analysis of Results

– Findings

Results from descriptive test confirmed that the examined variables exhibit significant variations in terms of magnitude. Specifically, except for debt ratio, the standard deviations of other variables are found to be relatively high. Additionally, the results revealed that the distribution of debt ratio is found to be highly skewed to the right. The distribution of INFL and IR are approximately symmetric. By contrast, the distribution of ZSI and IPC is found to be skewed to the left. On the other hand, the kurtosis findings signified that since the data of ZSI, IR, INFL and IPC are less than 3, the data seem to have flatness as well as lighter-than-normal tails. The findings also revealed that the kurtosis value of debt ratio is found to be sharply peaked and having heavier-than-normal tails. Briefly, the table demonstrated that variables including IR, INFL, and IPC are normally distributed and approximately symmetric. Furthermore, the debt ratio is found to be significantly skewed to the right with a kurtosis value more than 3.

However, since results from ADF proved that the used series variables became stationary only after including the second difference I (2), the study ran the Johansen co-integration test, and subsequently it is showed a long-run integration among the variables. Thus, to make sure that this long-run integration is not an illusion, the single equation of the error correction model was applied. Consequently, findings from ECM showed long-run causalities, those are running from the quarterly change in IR, INFL and IPC towards banks' stability, as captured by the ZSI and the debt ratio. Beyond that, results from Wald test (χ^2) discovered that except for inflation, there is

no short-run causality running from macroeconomic indicators towards the Z-score index. Inconsistently, the study confirmed that the stability of banks as captured by debt ratio is not related to the change in INFL or IPC, over the short-run. See tables 1-8, in appendix A, (p. 11-14) for the results of summary statistics, ADF, Johansen co-integration, ECM and the Wald χ^2 granger causality tests. In appendix B, (p. 15) see graphs 1-10, which are describing the data trends before as well as after converting the study's variables into the second difference.

Conclusion and Recommendations

Although the stability of banks is supposed to be significantly related to the change in macroeconomic indicators, however, there is no research answered the impact of IR, INFL and the IPC in the stability of Jordanian banking system as proxied by debt ratio and the ZSI. Therefore, the present study aimed at evaluating the long as well as short-run causalities, which are running from the quarterly change in macroeconomic indicators towards banks' stability. However, since results from ADF test affirmed that the used series variables only became stationary after including the second difference, the co-integration Johansen test was applied. Consequently, the findings revealed long-run causalities; those are running from the volatility in IR, INFL and IPC towards banking stability. Consistently, that agrees with Abdul Karim, et al. [4], as they detected a long-run correlation between macroeconomic indicators like GDP, interest rates and CPI along with banking stability. However, results from ECM rejected the first null hypothesis, which in other words mean that there are long-run causalities running from the change in macroeconomic indicators towards banking stability.

More specifically, the results indicated that the change in IR is positively impacting the stability of banks as captured by the ZSI, while negatively influencing the debt ratio. Therefore, the study concluded that the Jordanian investing public is highly relied on the rate of interest in order to determine the most suitable time for making a fixed-term deposit. By contrast, the results showed that the stability of banks as gauged by the ZSI is negatively related to the quarterly change in CPI and that agrees with the study of [6]. Through relying on this result it can be concluded that the central bank of Jordan is not highly based on the rate of interest to monitor the rate of inflation, which in other words means that the increase in inflation is not necessarily to be accompanied with an increase in the rate of interest. Paradoxically, since the results showed that the stability of banks as captured by debt ratio is adversely related to the change in interest rates, the study induced that investors of Jordan behave rationally towards the change in IR, during the long-run, because the increase in these rates stimulate them to increase their deposits, instead of asking for new loans. In other words, the results revealed that the Jordanian investing public reacts rationally towards the change in interest rates. Thus, since the more rational investment decisions is the greater banking stability, the study recommends Jordanian investors to rely on interest rates in order to participate in strengthening the Jordanian banking sector. However, since results from Wald χ^2 test confirmed that the stability of banks is significantly related to the change in inflation during the short-run, the second null hypothesis was replaced by the alternative one, which in other words means that there are short-run causalities running from INFL towards banking stability.

Furthermore, the study recommends the central bank of Jordan to strengthen the stability of banks, through adjusting the exaggerated movements in interest as well as inflation rates. However, since banking stability is supposed to be highly relied on economic stability, it seems to be necessary to recommend further researchers to evaluate the impact of economic development in the stability of banking system in the context of financial crises, since these crises are also able to affect economic development as well as banking stability. Moreover, the current research recommends further researchers to conduct intensive studies in order to determine the other economic and financial factors, which are affecting the stability of developing banking systems.

Research's Limitations

In an attempt to assess the impact of macroeconomic indicators in banks' stability, the study analyzed a quarterly time series data covering the period Q1/2001-Q4/2017. However, since it is normal for empirical researches to encounter some curbs, similarly the current study was not exempted from encountering this negative phenomenon. For instance, in order to get a clearer image regarding the impact of macroeconomic indicators in banking stability, the study's period supposed to cover Jan/ 1997-Dec/2018, however, due to data unavailability and inconsistency the study restricted to deal with a quarterly data set covering the period Q1/2001-Q4/2017. One more barrier is the exclusion of Islamic banks from the study's sample, due to the Islamic regulations, which are preventing these banks from including the rate of interest in their banking operations. Additionally, the study's sample is also excluded the foreign banks, which are operating in Jordan, because it was difficult to get all needed data, since these banks are not listed at the stock market of Jordan. Moreover, the sample of this research encompasses all listed Jordanian commercial banks, which are thirteen in total, during the period Q1/2001-Q4-2017.

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Appendix A

This study is primarily aimed at evaluating the impact of quarterly change in macroeconomic variables such as IR, INFL, and IPC in the stability of Jordanian commercial banks. Thus, after running the descriptive analysis test, the study implemented the ADF test to analyze a quarterly time series data covering the period Q1/2001-Q4/2017. Consequently, the results proved that the data became stationary only after converting them into the second different. Therefore, the study moved on to run the Johansen co-integration tests, and thereafter, the single equation of the error correction model as well as the Wald χ^2 Granger causality test to check for both long as well as short-run causalities. Thereby, findings from these tests are illustrated as shown in tables 1-8:

This table presents results from Descriptive test, which is used to portray the data's number of observations, means, standard deviations, variances, skewness and kurtosis.

Table 1: Descriptive Test

Variable	# Of Obs.	Mean	Std.	Variance	Skewness	Kurtosis
ZSI	68	28.57	6.469	41.85	-0.513	1.772
Debt Ratio	68	0.605	0.166	0.027	1.470	5.617
IR	68	4.261	1.199	1.438	0.442	2.411
INFL	68	89.93	17.30	299.3	0.079	1.430
IPC	68	3007	939.4	872819.5	-0.051	1.308

The following tables proved that the used variables are found to be non-stationary when they are tested at levels (see Panel A). However, after converting them into the second difference the null hypothesis was rejected. This, in other words, means that the study's variables are not including unit roots. Check Panel B for results from ADF test, which used to check for data stationarity after converting the variables into the second difference.

Table 2: Augmented Dickey Fuller's Results

Panel A

The following table shows that when the variables tested at their levels the null hypotheses were accepted. Which in other words mean that the variables are found to be not stationary at the level of 5%.

Variable	# Of Lags	T-Statistics	Level 5%	P-Value	H_0
IR	5	-2.414	-3.488	0.3720	Accepted
INFL	5	-0.920	-3.488	0.9540	Accepted
IPC	5	-1.289	-3.488	0.8907	Accepted
Debt Ratio	5	-2.126	-3.488	0.5313	Accepted
Z-Score	5	-1.466	-3.488	0.8406	Accepted

Panel B

The following table confirms that after including the second difference the null hypotheses were rejected, which in other words mean that the variables are found to be stationary as well as integrated of the same order I (II).

		T-Statistics	Level 5%	P-Value	2nd Diff	Remark	H_0
IR		-3.542	-3.490	0.007	2	I (II)	Rejected
INFL		-4.390	-3.490	0.002	2	I (II)	Rejected
IPC		-4.775	-3.490	0.000	2	I (II)	Rejected
Debt Ratio		-4.109	-3.490	0.007	2	I (II)	Rejected
Z-Score		-4.080	-3.490	0.001	2	I (II)	Rejected

Note: ***** indicates that the time series variables are significant at 5 per cent level of significance.**

The following table demonstrates results from Johansen test, which was performed to check whether the volatility in IR, INFL and IPC is integrated with banking stability, over the long-run. Consequently, the findings confirmed that the stability of banks as captured by the ZSI is Significantly co-integrated with macroeconomic variables.

Table 3: Johansen Co-integration Results

VEC-rank Z-Score, IR, INFL, IPC, trend(trend) Lags (3) max Johansen Co-integration Test				
Trend: Constant		No. of Obs. = 65		
Sample: Q4/2001-Q4/2017		Lags= 3		
Maximum				
Rank	**Eigen-value**	**H_0**	**Trace Statistics**	**1% Critical**
0	0.385	R=0	70.46	61.21
1	0.297	R ≤1	38.82*	40.49
2	0.199	R≤2	15.88	23.46
3	0.021	R≤3	1.396	6.40
4	0.021	.	.	.

This test was employed to check the long-run causalities, which are running from macroeconomic indicators towards banking stability. Thus, since the error term is found to be negative as well as the P-value is significant, results from ECM test confirmed that the ZSI is significantly related to the quarterly change in IR, INFL and the IPC, over the long-run.

Table 4: Error Correction Model

	Coef.	**Std. Error**	**Z**	**P > /Z/**	**99% Conf.**	**Interval**
D_ZSI						
_Ce1						
L1	-0.108	0.034	-3.11	0.002	-0.197	-0.018
ZSI						
LD.	0.607	0.173	3.50	0.000	0.160	1.054
L2D.	-0.615	0.191	-3.22	0.001	-1.107	-0.123
IR						
LD.	1.044	0.660	1.58	0..14	-0.656	2.745
L2D.	1.113	0.706	1.57	0.115	-0.707	2.934
INFL						
LD.	-3.258	0.933	-3.49	0.000	-5.663	-0.853
L2D	-2.499	0.932	-2.68	0.007	-0.096	-4.902
IPC						
LD	0.070	0.023	2.99	0.003	0.009	0.131
L2D	-0.060	0.026	-2.33	0.020	-1.128	-0.006
_Trend	-0.000	0.010	-0.08	0.934	-0.028	0.026
_Cons	-0.063	0.476	-0.13	0.894	-1.291	1.163

The following table proves that banking stability as captured by debt ratio is significantly co-integrated with macroeconomic indicators.

Table 5: Johansen Co-integration Results

VEC-rank Debt Ratio, IR, INFL, IPC, trend(trend) Lags (3) max Johansen Co-integration Test				
Trend: Constant		No. of Obs. = 65		
Sample: Q4-2001-Q4-2017		Lags= 3		
Maximum				
Rank	**Eigen-value**	**H_0**	**Trace Statistics**	**1% Critical**
0	0.531	R=0	88.64	61.21
1	0.300	R ≤1	39.30*	40.49
2	0.185	R≤2	16.10	23.46
3	0.041	R≤3	2.735	6.40
4	.	.	.	.

The following table confirmed that there are long-run causalities running from the quarterly change in IR, INFL and IPC towards the stability of banks as gauged by debt ratio.

Table 6: Error Correction Model

	Coef.	**Std. Error**	**Z**	**P > /Z/**	**99% Conf.**	**Interval**
D_Debt Ratio						
_Ce1						
L1	-0.301	0.073	-4.09	0.000	-0.491	0.-111
Debt Ratio						
LD.	0.809	0.171	4.72	0.000	3.676	1.250
L2D.	0.032	0.174	0.19	0.853	-0.417	0.481

	Coef.	Std. Error	Z	P > /Z/	99% Conf.	Interval
IR						
LD.	-0.024	0.041	-0.58	0.559	-0.083	0.132
L2D.	-0.016	0.040	-0.39	0.694	-0.121	0.089
INFL						
LD.	-0.264	0.081	-3.23	0.001	-0.276	-0.053
L2D	0.234	0.083	2.82	0.005	0.020	0.448
IPC						
LD	0.783	0.208	3.75	0.000	0.245	1.320
L2D	0.357	0.131	2.71	0.007	0.018	0.696
_Trend	-0.000	0.000	-0.13	0.896	-0.001	0.001
_Cons	0.009	0.023	0.40	0.693	-0.050	0.069

After running the Wald χ^2 Granger causality test, the findings confirmed a short-run causality that is running from the quarterly change in INFL towards the stability of banks as captured by the ZSI, over the period Q1/2001-Q4/2017.

Table 7: Wald χ^2 Test's Results

Variables	Chi2 (2)	Prob. > Chi2
IR	3.12	0.209
INFL	10.8	0.004
IPC	1.84	0.398

Results from the following table demonstrated that banking stability as measured by the debt ratio, is significantly relating to the quarterly change in INFL and IPC, during the short-run.

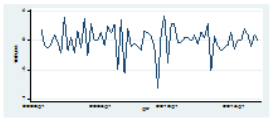
Table 8: Wald Test

Variables	Chi2 (2)	Prob. > Chi2
IR	0.34	0.842
INFL	10.51	0.005
IPC	14.12	0.000

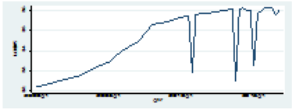
Appendix B

Graphs from 1-10 confirm that the examined variables are found to have unit roots, when they are tested at levels, while after including the second difference I(2) the unit roots were eliminated.

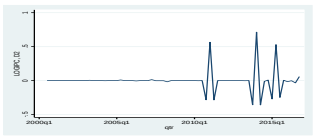
Graph (1): IR



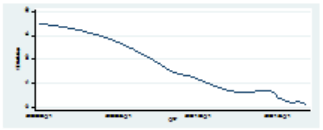
Graph (2): D2.IR



Graph (3): IPC



Graph (4): D2. IPC

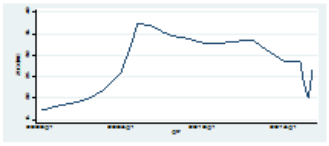


Graph (5): INFL

Graph (6): D2. INFL

Graph (7): Debt Ratio

Graph (8): D2. Debt Ratio



Graph (9): ZSI

Graph (10): D2. ZSI