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Macroeconomic instability and interest rate spreads in Ghana

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Abstract

This paper investigates the extent to which interest rate spreads is associated with macroeconomic instability in Ghana. Using the Maastricht Criteria, quarterly data on inflation, budget deficit, prime rate, external debt and exchange rate were collected from 2008 to 2018 to construct a composite macroeconomic instability index. The resulting index was used to evaluate the long-run and short-run relationship between macroeconomic instability and interest rate spreads with the aid of the auto-regressive distributed lag and bounds test approach to cointegration. The results revealed that macroeconomic instability had a positive long-run and short-run relationship with interest rate spreads. Non-performing loans and loan-to-deposit ratio are found to be negatively related to interest rate spreads both in the short and long run, although the relationship is not statistically significant. From a policy-oriented point of view, it is recommended that policy makers concentrate on managing macroeconomic instability as a means of boosting savings and investment.

KEYWORDS

cointegration, Ghana, interest rate spreads, macroeconomic instability

1 | INTRODUCTION

During the 2017–2018 period, Ghana experienced what could be called the worse banking crises since the liberalization of the banking sector in the 1990s. The crises became evident to the general public in August 2017 when all the deposits and selected assets of two universal banks (UT bank and Capital bank) were transferred to GCB bank in a purchase and assumption transaction approved by the central bank. Later in 2018, five other banks (Unibank, Construction bank, Premium bank, Beige bank, Royal bank, Sovereign bank) were merged into a new bank called the Consolidated Bank of Ghana (CBG). Additionally, about 347 microfinance companies, and 23 savings and loans companies including Finance houses were placed under receivership in late 2019. According to Bank of Ghana (2019) different reasons including bad corporate governance practises, excessive intra-group dealings as well as bad credit risk management impaired the solvency of these financial institutions.

Even though macroeconomic conditions in Ghana were not explicitly mentioned as contributing factors, available data shows that, periods leading to the crises exhibited volatilities in some key macroeconomic variables. For example, real economic growth increased from 4.8% in 2009 to 14% in 2011 after the country commenced commercial production of crude. This figure declined year on year to about 2.2% in 2015 before a little rise to about 3.4% in 2016. Over the same period, average annual inflation was about 18.9% in 2009. This fell to about 8.7% in 2011 but moved up to 17.5% by the end of 2016. Exchange rate was more unstable than the rest of the macroeconomic indicators. Average deprecation of the local currency against the United States dollar was about 25% in 2009. After easing to and stabilizing between 2 and 5% from 2010 to 2011, it rose to about 33% in 2014 before easing to 21% in 2015 then to about 16% in 2016. From the movement in the various macroeconomic variable in periods preceding the crises, there appears to be a strong evidence of macroeconomic instability.

The aforementioned outcomes notwithstanding, it is a fact that net interest income is an important contributor to the profitability of banks. It is also a fact that macroeconomic factors are linked to the size of interest rate spreads of banks of which banks in Ghana are not an exception. The dealership model of interest rate spreads by Ho and Saunders (1981) view banks as risk averse entities that maximize their

returns from the intermediation process considering the risks they are exposed to. In this model, spreads is posited to be a direct function of interest rate. Additionally, the liquidity preference theory, the Austrian Schools theory, the loanable fund theory and the neoclassical theory among others link interest rate spreads to other macroeconomic variables such as output, labour, capital, investments, inflation, consumption and government activities (revenue, expenditure and borrowing) (Ho & Saunders, 1981). Aside the aforementioned theoretical linkage, many empirical studies have found macroeconomic variable to be significant determinants of interest rate spreads around the world. For example, Demirgüç-Kunt and Huizinga (1999) used bank level data of 80 advanced and developing economies and found macroeconomic variables like real interest rate and inflation to be important determinants of bank interest rate spreads. In Ghana, Seriff and Amoako (2014) found inflation and treasury bill rate to be significant determinant of interest rate spreads.

Even though the above-mentioned studies and many others link macroeconomic variables to interest rate spreads in Ghana and around the world, none to the best of author's knowledge, has been devoted to the impact of macroeconomic instability on interest rate spreads of banks. In many cases, where authors want to infer macroeconomic instability, they only include proxies like inflation, output and exchange rate without specifically measuring instability. Recent studies on macroeconomic instability have used composite index of macroeconomic instability to explain various economic phenomena. However, none of such studies have used the index to explain the impact of instability on interest rate spreads of commercial banks around the world. Additionally, there is no known study in Ghana that has constructed an index of macroeconomic instability for Ghana. This study therefore seeks to construct an index of macroeconomic instability and investigate its relationship with interest rate spreads in Ghana. Globally, the study will be the first to use this index to explain interest rate spreads of commercial banks. In Ghana, it will serve as a possible start to understanding the role of macroeconomic instability and alert policymakers on how to avert the impact of a future crisis.

The rest of the paper is organised as follows: The next section provides a review of existing literature. The estimation methods are outlined in Section 3. This is followed by analysis and discussion of findings. The last section concludes the paper and offers some policy suggestions.

2 | RELATED LITERATURE

Banks differ in modern times from country to country, and what they can do, is a matter of law. In the United States, banks range from savings and loans organizations to large money centres. In the United Kingdom, banks can be entities as small as building societies to large shareholding banks (Heffernan, 2005). In Ghana, what is a bank is determined by the Bank and Special Deposit (taking) institutions act of 2016 (Act 930). Notwithstanding the lack of a uniform legal definition of a bank, from a macroeconomic perspective, three mutually exclusive theories—fractional reserve, credit creation and financial intermediation—underlie what a bank is and determines the implication for macroeconomic policy and decision making (Werner, 2016).

Fractional reserve theory of banking postulates that banks individually cannot create credit/money. Individually, banks are intermediaries between lenders and borrowers. However, in their collective capacity as a banking system, they have the ability to create money through multiple deposit expansion process. The credit creation theory does not view banks individually or collectively as financial intermediaries. Instead, proponents of this theory see banks as money creation entities that can create money from their activities out of nothing. This money creation is done through an accounting operation and that, the actual money creation occurs through the act of lending. The financial intermediation theory, however, view banks as financial intermediaries which are not in any significant way different, when compared to other financial institutions that engage in the intermediation business. By this theory, a bank creates liquidity when it borrows short-term funds and lends them to their clients for long-term (Werner, 2016). Irrespective of the banking theory applicable within an economy, the prosperity of a bank is linked to its profitability, of which interest rate spreads, that dependents on the behaviour of banks and depositors, is an important determinant.

The behaviour of banks and that of interest rate spreads are explained by two main theories—the Monti-Klien and the dealership models (Nanjunga, Ntsosa, & Motlaleng, 2016). The Monti-Klien model proposed by Klein in 1971 and Monti in 1972 takes an industrial organization approach to banking and considers a bank as an entity that maximizes profit by offering deposit and loan services to clients. According to the model, banks have some degree of monopoly in the supply of loans and deposits products. As a profit maximizing organization, such a power will affect their pricing and other operations. As a result, bank spreads fundamentally reflect the degree of competition within the industry. Generally speaking, industries with lower competition have more incentive to charge prices higher than marginal cost of production. This model is therefore extremely popular for two main reasons. First, the model is popular for its simplicity and second the fact that it has more predictive power when used in modelling relevant issues concerning banks and banking including banking regulation.

The dealership model, proposed by Ho and Saunders (1981), views banks as intermediaries rather than firms. Within this context, the ultimate borrowers and lenders are firms and household, respectively. From this perspective, banks are exposed to two main uncertainties that have implications for the determination of their interest rate spreads. Banks, by virtue of being intermediaries, face the uncertainty of lack of coordination between deposits and loans which then exposes them to interest rate risk (Nanjunga et al., 2016). Another uncertainty inherent in their operations is the fact that, they have insufficient knowledge of their loan customers and hence are unable to determine either they will be able to repay both principal and interest as or when they fall due. As a result, banks become exposed to credit risk or the risk of default. Interest rate spreads therefore widens as the risk of default becomes higher to serve as a compensation for taking on such risk. What is crucial to note is that, the kinds of risk that the banks face under the dealership model includes those that

emanate from the macroeconomic environment like inflation and exchange rate (Nanjunga et al., 2016).

Leaving aside the theoretical reasoning discussed afore, empirical studies have found macroeconomic factors as key drivers of interest rate spreads for both developed and developing economies. For example, Demirgüç-Kunt and Huizinga (1999) used bank level data of 80 advanced and developing economies and found macroeconomic variables like real interest rate and inflation and to be associated with interest rate spreads of banks. Bawumia, Belnye, and Ofori (2005) also found inflation to positively influence the size of bank interest rate spreads in Ghana.

Focusing on more recent studies Were and Wambua (2013) collected data on banks in Kenya from 2002 to 2011 and used a panel data regression estimation technique to investigate factors that explain in a significant manner interest rate spreads of banks in that country. From their investigations, they concluded that, individual bank characteristics like total assets of banks in currency units, asset quality, return on company assets and the cost of operating were significant positive drivers of interest rate spreads. However, liquidity position negatively affected interest rate spreads. Additionally, while banking sector concentration or competition significantly influenced interest rate spreads, macroeconomic variables such as monetary policy rates, inflation and real output were insignificant in explaining interest rate spreads.

Seriff and Amoako (2014) used the autoregressive distributed lag bounds test and the error correction models to evaluate the impact of macroeconomic variables on interest rate spreads in Ghana. The estimations was done with the aid of monthly date for the period 1999 to 2010. They concluded that, macroeconomic variables like inflation and government local borrowing positively influence the size of interest rate spreads in both the long- and short run, while treasury bill rates are negatively associated with interest rate spreads. They also found that in the long run, bank deposits are positively related to interest rate spreads in a significant manner. However, in the short run, the association between total deposit and interest rate spreads was not significant. Similarly, Obeng and Sakyi (2017) investigated the macroeconomic factors that affect interest rate spreads in Ghana with the aid of data from 1980 to 2013 and the autoregressive distributed lag bounds test and the error corrections model. From their analysis they found exchange rate volatility, real output growth, fiscal deficit and public sector borrowings to be positively associated with interest rate spreads in the long- and short run. Additionally, quality of institutions had a decreasing impact on interest rate spreads in the long run. However, in the short run, volatilities in lending rate and monetary policy had decreasing effect on interest rate spreads.

From the discussions afore, it is evident no study has considered a composite index of macroeconomic instability to investigate its impact on interest rate spreads like the one proposed in this paper. This paper therefore hopes to fill this important research gap by investigating macroeconomic instability and interest rate spreads in Ghana.

3 | METHODOLOGY

This section of the paper is devoted to a description of the methodology employed. It is divided into two subsections. The first one is about the index construction, model specification, measurement issues and data while the second describes the estimation strategy.

3.1 | Macroeconomic instability index

Even though macroeconomic stability is important to businesses and policy makers alike (Ali & Rehman, 2015), its precise definition and measurement remains under immense debate. Earlier economists tried to define and measure macroeconomic instability using a single macroeconomic indicator (see Azam, 1999; Yiheyis, 2000). Later, a combination of proxies was used. In recent times, attempts have been made to use a single index (see Blance, 1998). However, according to Ali and Rehman (2015) most of the existing index constructed does not state the method for choosing variables considered. They therefore used the early warning signal to select four variables (inflation, budget deficit, unemployment, trade deficit) in the construction of macroeconomic instability index.

In this study, macroeconomic instability was measured using a constructed composite index following the work of Ali and Rehman (2015). However, unlike Ali and Rehman (2015) who used early warning signal to select the variables to be included in the index, this study used stability indicators as prescribed by the Maastricht criterion. As such, macroeconomic instability index (MII) was constructed from inflation (Inf), exchange rates (Ex), budget deficit to GDP ratio (BD), prime rate (PR) and changes in external debt (ED). The various sub-indices were weighted following their relative standard deviations after which the following normalized formula is used to compute the index.

$$\mathrm{MII}_t = \delta_1\left(\frac{\mathrm{Inf}_t - \mathrm{minInf}}{\mathrm{maxInf} - \mathrm{minInf}}\right) + \delta_2\left(\frac{\mathrm{Ex}_t - \mathrm{minEx}}{\mathrm{maxEx} - \mathrm{minEx}}\right) + \delta_3\left(\frac{\mathrm{PR}_t - \mathrm{minPR}}{\mathrm{maxPR} - \mathrm{minPR}}\right) + \delta_4\left(\frac{\mathrm{BD}_t - \mathrm{minBD}}{\mathrm{maxBD} - \mathrm{minBD}}\right) + \delta_4\left(\frac{\mathrm{ED}_t - \mathrm{minED}}{\mathrm{maxED} - \mathrm{minED}}\right)$$

where δ is the relative standard deviation.

The value of MII is normalized between zero (0) and one (1). Where instability is low as the value of the MII approaches zero (0) but high as the value approaches one (1).

3.2 | Model specification

Based on the bid-ask spreads of dealers in the securities market, the dealership model assumed among other things that banks were passive risk-averse intermediaries who determined the prices of deposits and loans to reflect the stochastic behaviour of both loans and deposit. As a result, interest rate spreads was a function of four main variables—managerial risk aversion, market structure, average size of transactions and the variance in interest rates (Ho & Saunders, 1981). Other authors modified these assumptions to allow the inclusion of other determining factors like heterogeneous loans and deposits, credit default risk and other macroeconomic variables (Angbazo, 1997; McShane & Sharpe, 1985). This study concentrate on industry specific and macroeconomic determinants of interest

rate spreads. To do so, we specify our empirical model in the following form.

$$\text{IRS} = f(\text{MII}, \text{NPLR}, \text{LDR}), \quad (1)$$

where IRS is interest rate spreads, MII represent macroeconomic instability index, NPLR denote non-performing loans ratio—a measure of asset quality, and LDR is loan-to-deposit ratio—a measure of asset liquidity. The estimable form of the model is specified as:

$$\text{IRS}_t = \beta_0 + \beta_1 \text{MII}_t + \beta_2 \text{NPLR}_t + \beta_3 \text{LDR}_t + \varepsilon_t, \quad (2)$$

where β_0 is the intercept; $\beta_1, \beta_2, \beta_3$ are model parameter for MII, NPLR and LDR respectively, ε_t is the error term and t is the time series dimension of the data.

Researchers usually refer to a difference between ex-ante interest rate spreads and ex-post interest rate spreads (Seriff & Amoako, 2014). Ex-ante interest rate spreads is simply the difference between the agreed rate charged on the loans (and other earning assets) a bank gives to customers and the deposit rate the bank agrees to pay on the deposits they take from their customers. Ex-post interest rate spreads is the difference between the actual interest income a bank earns on the portfolio of loans and the actual interest expenses incurred on the portfolio of customer deposits with the bank. In practise ex-ante interest rate spreads often tend to be higher than ex-post interest rate spreads due to the suspension of interest on non-performing earning assets in line with prudential guidelines and the provisions of accounting standards. Thus, the size of the bank interest rate spreads is a function of their lending rates, deposit rates and other factors like the quality of loans and earning assets within the portfolio of the bank. In this study, ex-ante interest rate spreads—the difference between the average lending rate on loans and the average interest rate on savings deposits of banks is used.

It is expected that the value of MII will have a mixed association with interest rate spreads. Asset quality measured by non-performing loans ratio (NPLR) is expected to have a mixed association with interest rate spreads. Likewise, asset liquidity measured as loan-to-deposit ratio (LDR) is expected to have a mixed association with interest rate spreads.

Quarterly time series data on macroeconomic variables (inflation, exchange rates, budget deficit, prime rate and external debt), interest rate spreads (average lending rate on loans of banks and average interest rate on savings deposits of banks), non-performing loans ratio and loan-to-deposit ratio of banks in Ghana were collected for the period 2008–2018. These data were sourced from the Ghana Statistical Service and the Bank of Ghana.

There were 44 observations for all the variables. We can observe (see Table 1) that, apart from loan-to-deposit ratio, which is negatively skewed, all the other variables are positively skewed. Again, Table 1 shows that all the variables had positive kurtosis and may deviate from normal distribution. Figure 1 shows the trend for macroeconomic instability index and interest rate spreads. Macroeconomic instability index is shown on the secondary axis with the interest rate spreads on the primary axis. As evident, the two variables move closely together indicating potential association. Interestingly, these variables do not show any sign of having a trend over time. That stated, a more rigorous test of stationarity is required to determine if they are mean reverting.

TABLE 1 Descriptive statistics of variables

Variable	IRS	MII	NPLR	LDR
Observations	44	44	44	44
Mean	0.220	0.446	0.150	0.720
Maximum	0.262	0.696	0.226	0.896
Minimum	0.183	0.217	0.076	0.519
SD	0.019	0.131	0.042	0.096
Skewness	0.161	0.193	0.150	−0.146
Kurtosis	2.483	1.849	2.084	2.248

[a]*Source:* Authors.

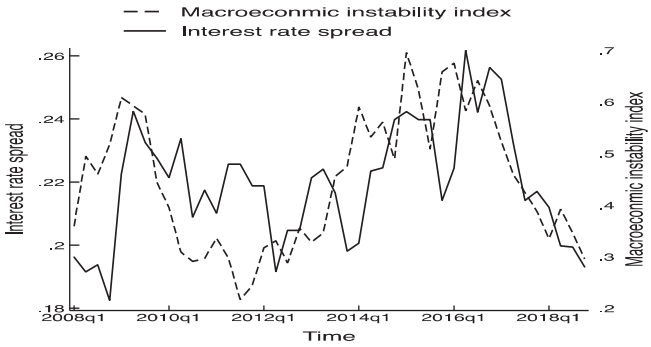

FIGURE 1 Trend of macroeconomic instability index and interest rate spreads. *Source:* Authors

3.3 | Estimation strategy

In order to obtain consistent estimation of the parameters in Equation (2) cointegration procedures are used. While there are many cointegration procedures including, Engle and Granger (1987), and Johansen and Juselius (1990) among others, this study used the autoregressive distributed lag (ARDL) and bounds test proposed by Pesaran, Shin, and Smith (2001) which addresses significant number of challenges associated with the afore mentioned approaches. For example, both the Engle and Granger (1987) and Johansen and Juselius (1990) cointegration approaches have the same requirement that, the variables in the cointegration equation should be integrated at order one (i.e., *I* (1)) for the estimated model to be valid and efficient. In addition, both tests are unable to provide useful information about structural breaks in the time series (Ali & Rehman, 2015). The ARDL approach is able to accommodate variables of different orders of integration and still remains valid and efficient. Apart from that, it is more suited for small sample size investigations like the one considered in this paper. It also allows the selection of appropriate lags that reflect the process of data

generation. Again, it can give valid information about the existence of potential structural breaks in the time series. As a result, it is only prudent to determine the order of integration of the variables to ensure that none is integrated above *I* (1). To do so, two main test of unit root the Augmented Dickey–Fuller (ADF) test (Dickey and Fuller, 1981) and the Phillip–Perron (PP) tests (Phillip and Perron, 1988) are conducted.

After testing for the order of integration and satisfying the order of integration required to make the model valid and efficient, the study proceeded to conduct the bounds test to cointegration. To conduct the bounds test, the model is stated in the unrestricted vector error correction model of the following form.

$$\Delta \mathrm{IRS}_t = \vartheta + \sum_{i=1}^{P_1} \alpha_i \Delta \mathrm{IRS}_{t-i} + \sum_{i=0}^{q_1} \beta_i \Delta \mathrm{MII}_{t-i} + \sum_{i=0}^{q_2} \pi_i \Delta \mathrm{NPL}_{t-i} + \sum_{i=0}^{q_3} \omega_i \Delta \mathrm{LDR}_{t-i} + \varphi_1 \mathrm{IRS}_{t-1} + \varphi_2 \mathrm{MII}_{t-1} + \varphi_3 \mathrm{NPL}_{t-1} + \varphi_4 \mathrm{LDR}_{t-1} + \mu_t, \quad (3)$$

where Δ is first difference, ϑ is the constant term, p represents the number of lags of the dependent variable, φ_i denote the long-run model parameters, q_i is the number of lags of the independent variable, α_i, β_i, π_i, ω_i represents the short-run model parameters. Conclusion on the existence of cointegration is based on the computed *F*-statistic. The null hypothesis for the bounds test is that, there is no cointegration among the variables in the model.

Once cointegration is found, the ARDL model is then reparametrized for the error correction model with the aim of estimating both the long- and the short-run relationships. The reparametrized error correction model is of the following form.

$$\Delta \mathrm{IRS}_t = \vartheta + \sum_{i=1}^{P_1} \alpha_i \Delta \mathrm{IRS}_{t-i} + \sum_{i=0}^{q_1} \beta_i \Delta \mathrm{MII}_{t-i} + \sum_{i=0}^{q_2} \pi_i \Delta \mathrm{NPL}_{t-i} + \sum_{i=0}^{q_3} \beta_i \Delta \mathrm{LDR}_{t-i} + \varpi \mathrm{ECT}_{t-1} + \varepsilon_t, . \quad (4)$$

where ϖ is the speed of adjustment parameter which has to be negative to give evidence of long-run convergence, and ECT is the error correction term.

Finally, diagnostic tests are conducted to determine whether the residuals of the model estimates are normally distributed. Additionally, the model is tested for serial correlation, heteroskedasticity and functional form. The stability of the model is also tested to know whether the estimated model is stable over time. As a result, the cumulative sum (CUMSUM) and the cumulative sum of the squares (CUMSUMSQ) were employed to test the stability of the estimates.

4 | RESULTS

This section of the paper presents and discusses the unit root tests, cointegration tests and the long- and short-run results. In addition to this, the statistical fit and appropriateness of the estimations are discussed.

Results of the ADF and PP tests are reported in Table 2. As evident, the ADF and PP test results shows none of the variables are stationary after first differencing. Based on these results we can concluded that all the variables considered are either *I* (0) or *I* (1) processes. Given the mixture of *I* (0) or *I* (1) variables, it is justifiable to use the ARDL and bounds test for the estimations. As a requirement for running the ARDL model, there was the need to select an optimal lag length. Table 3 reports the lag length selection criteria considering the number of observations and the model variables. As evidenced, all the selection criteria used indicate an optimal lag length of one (1). Based on this outcome, an optimal lag structure of (1,1,0,0) was selected by Akaike information criteria for the estimations.

Having selected the optimal lag structure, the bounds test is conducted. From Table 4, it can be observed that, the *F*-statistic from the bounds test [F_{IRS}(IRS/MII, NPLR, LDR) = 5.494] is above the upper bounds of 4.35 critical value at 5% significance level. Based on this outcome, and in line with the rules associated with the bounds test, the null hypothesis of no cointegration is rejected at 5% significance level. This confirms that, the variables used in the model are cointegrated. As a result, the long- and short-run relationships among the variables under consideration are investigated.

The long-run results are shown in Table 5. As evident, in the long-run macroeconomic instability is associated with interest rate spreads with a significant positive coefficient of 0.1046. This means that, one-unit increase in macroeconomic instability will cause 0.1046% increase in interest rate spreads in the long run. Even though there is no study yet that uses a composite macroeconomic instability index

TABLE 2 Unit root test

	Augmented Dickey–Fuller test				Philip–Perron test			
	Level		First difference		Level		First difference	
Variable	Drift	Trend	Drift	Trend	Const.	Trend	Const.	Trend
IRS	−2.80***	−2.51	—	−5.18***	−2.82	−2.61	−7.27***	−7.46***
MII	−1.42	−1.32	−4.90***	−4.89***	−1.88	−1.7	−7.51***	−7.44***
NPLR	−2.08**	−2.14	—	−3.05	−1.74	−1.87	−4.15***	−4.13***
LDR	−1.30	−1.49	−5.00***	−4.95***	−1.22	−1.53	−6.92***	−6.84***

**Significant at 5% statistical significance level.

***Significant at 1% statistical significance level.[a]*Source:* Authors.

TABLE 3 Optimal lag length: by selection criteria

Lag	Log L	LR	FPE	AIC	HQIC	SBIC
0	275.11	N/A	1.5E−11	−13.56	−13.49	−13.39
1	373.49	196.75*	2.5E−13*	−17.67*	−17.37*	−16.83*
2	386.18	25.39	3E−13	−17.51	−16.96	−15.99
3	394.84	17.32	4.7E−13	−17.14	−16.35	−14.95
4	407.85	26.01	6.2E−13	−16.99	−15.95	−14.12

Note: N/A means not applicable. "*" Indicate the lag level selected.
[a]*Source:* Authors.

TABLE 4 ARDL bounds test approach—ARDL (1,1,0,0)

	F-statistic 5.494	
Critical value (%)	Lower bound	Upper bound
99	4.29	5.61
95	3.23	4.35
90	2.72	3.77

Note: Critical values based on Pesaran, Shin, and Smith (2001).
[a]*Source:* Authors.

TABLE 5 Long-run relationship—ARDL (1,1,0,0)

Regressor	Coefficient	Standard error	*t*-ratio	Prob
MII	0.1046**	0.4784	2.1900	0.0350
NPLR	−0.0352	0.1518	−0.2300	0.8180
LDR	−0.0028	0.0773	−0.0400	0.9720

Note: Dependent variable: IRS.
**Significant at 5% statistical significance level.
[a]*Source:* Authors.

to determine interest rate spreads, the findings are comparable to studies that used other instability indicators to explain interest rate spreads. In that regard, this observation is supported by the works of Seriff and Amoako (2014) who found a significant positive long-run association between inflation volatility (proxy for instability) and interest rate spreads in Ghana. Similarly, Obeng and Sakyi (2017) found a significant positive long-run association between exchange rate volatility (proxy for instability) and interest rate spreads in Ghana.

Moving on to the findings on non-performing loans ratio and loan-to-deposit ratio, there is a negative long-run relationship between non-performing loans ratio and interest rate spreads. The long-run coefficient of −0.0352 means that a 1% increase in non-performing loans ratio is associated with 3.52% decrease in interest rate spreads in Ghana. This relationship however is not significant at any conventional level. Again, a negative but insignificant long-run relationship is observed between loan-to-deposit ratio of banks and interest rate spreads in Ghana. The coefficient of −0.003 means that, a 1% increase in the loan-to-deposit ratio leads to 0.3% decrease in interest rate spreads in the long run.

The results of the short-run dynamics are shown in Table 6. As evident, the speed of adjustment (ECT[−1]) from short run to the long run is significant with a coefficient of −0.484. The sign of the adjustment coefficient is correct in theory as it signifies that, there exists convergence in the long run. It indicates that, about 48.4% of the deviation in one quarter is adjusted in each subsequent quarter until there is convergence. By this, it takes a little over two quarters for convergence to occur in the long run. Further, it is observed that the coefficient of first lag of interest rate spreads of 0.516 is significant in explaining current interest rate spreads. This means that a 1% increase in the first difference of interest rate spreads for last quarter results in 51.6% increase in the first difference interest rate spreads for the current quarter, all other things remaining constant.

With reference to macroeconomic instability, it is observed that the effect of this variable is positive and significant with a coefficient of 0.09. This means that a unit increase in macroeconomic instability is associated with 9% increase in the current difference of interest rate spreads. This short-run observation is intuitively expected as banks will react to changes in the macroeconomic stability by charging higher risk premium in the case of deteriorating stability in subsequent quarters and vice versa. As stated in the long-run observation, this outcome is consistent with the priori expectation and in line with theory and empirical findings. In Ghana, this is supported by the works of Bawumia et al. (2005), Seriff and Amoako (2014) and Obeng and Sakyi (2017) who found positive relationship between macroeconomic instability proxies like inflation and exchange rate volatilities on one hand and interest rate spreads on the other. That stated, the short-run association is contrary to the evidence from Were and Wambua (2013), and Nanjunga et al. (2016) who did not find inflation to be of much relevance in the explanation of interest rate spreads in Kenya, Solomon Islands and Botswana respectively.

In the short run, asset quality is negatively related to interest rate spreads in Ghana. A 1% increase non-performing loans ratio is seen to be associated with 1.7% decrease in interest rate spreads. This is in line with the priori expectation and from the depositors' perspective, the conclusion is logical. Depositing customers of banks who are assumed to be rational, perceive banks to be risky as they get higher non-performing loan portfolio. As a result, these customers will demand higher rates on deposits as compensation. From the banks' perspective, even though they are expected to increase lending rates when credit risk is generally high, which they do mostly, it is possible for banks, as a matter of strategy, to marginally decrease rates to their key customers to lessen their burden and enhance their ability to settle their indebtedness to the banks. From these two perspectives, the negative relationship is reasonable. A third possibility is the simultaneous increase in both deposit rate and lending rate due to the higher

TABLE 6 Short-run dynamics—ARDL (1,1,0,0)

Regressor	Coefficient	Standard error	*t*-ratio	Prob
D (IRS (−1))	0.516***	0.1269011	4.06	0.000
D (MII (−1))	0.090***	0.0299879	3	0.005
D(NPLR)	−0.0170406	0.0719256	−0.24	0.814
D(LDR)	−0.0013387	0.0374243	−0.04	0.972
EC (−1)	−0.484***	0.1269011	−3.82	0000
C	0.0872**	0.0356554	2.45	0.019
R-squared	0.5992		*F* (5, 37)	11.06
Adj. *R*-square	0.5451		Prob (*F*-stat)	0000
Log likelihood	130.5731		DW (6, 43)	1.827

Note: Dependent variable: IRS.
**Significant at 5% statistical significance level.
***Significant at 1% statistical significance level.[a]*Source:* Authors.

credit risk. Depending on the magnitude of the increase on both cases, interest rate spreads could decrease but in a very insignificant manner. These could be the reason for the insignificant nature of the observed negative short-run relationship as observed in Table 6. Contrary to this insignificant observation, Were and Wambua (2013) found non-performing loans ratio to be significant determinant of interest rate spreads in Kenya.

Finally, we find that asset liquidity of banks is negatively related to interest rate spreads in the short run, all things being equal. As evident, loan-to-deposit ratio has a coefficient of −0.0013 which means that a 1% increase in this variable results in 0.13% decrease in interest rate spreads all things being constant. Intuitively, in the short run a higher loan-to-deposit ratio which indicates, lower liquidity position threatens the existence of banks. The quickest way to resolve such a situation is to encourage more savings from customers. In a competitive banking market like the one in Ghana, higher rates on deposits is a low hanging fruit to achieve higher liquidity. Even though higher loan-to-deposit ratio also means that there is a higher demand for funds on the loans side of the banking business and hence banks may be charging higher rates on loans as a means of allocating the limited liquidity, it appears the increase in savings rate during liquidity challenges are higher than that of the increase in lending rates and hence the negative relationship. Again, the simultaneous movement in both sides of the spreads in the same direction may have contributed to the insignificance in the observed negative association as shown in Table 6.

It is important to note that the validity and efficiency of the estimated coefficients discussed afore depends on model diagnostics and stability tests (Table 7). For this reason, the estimated model was tested for normality, autocorrelation, heteroscedasticity, functional form, multicollinearity and model stability. The tests showed that, the model is free from serial correlation as confirmed by the Breuch-Godfrey LM test. The errors are normally distributed as confirmed by Jarque-Bera normality test. Additionally, the model does not suffer from the problem of heteroskedasticity as confirmed by the white heteroskedasticity test. The Ramsey RESET test shows that the model has no omitted variable. Finally, the variance inflation factor (VIF) test confirms the model is free from multicollinearity.

TABLE 7 Diagnostic and stability tests

Diagnostic test	Results	Prob
Serial correlation	2.757	0.4306
Normality	0.882	0.6434
Heteroscedasticity	21.76	0.3535
Functional form	0.22	0.8833
Mean VIF	2.29	
CUSUM	Stable	
CUSUMSQ	Stable	

[a]*Source:* Authors.

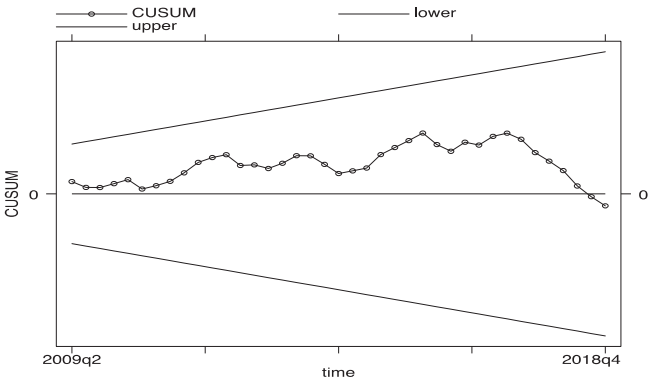

FIGURE 2 Plot of cumulative sum

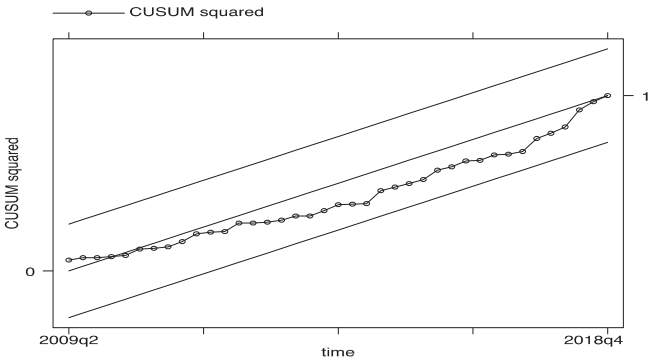

FIGURE 3 Plot of cumulative sum of squares

In addition to the above tests, the model was also tested for stability. According to Pesaran, Shin, and Smith (2001), a model is stable if the plot of the CUSUM and CUSUMSQ lies within the 5% significance boundaries. The result of the stability test is shown in Figures 2 and 3. From these figures we observe that the plot of the residual as represented by CUSUM and CUSUMSQ lies within the aforementioned boundaries. This shows that the model is stable at 5% significance level.

5 | CONCLUSION

This paper investigated the long- and short-run association between macroeconomic instability and interest rate spreads in Ghana. To do so, quarterly data from the first quarter of 2008 to the last quarter of 2018 was used. In line with the Maastricht Criteria, inflation, budget deficit, prime rate, external debt and exchange rates were used to construct a macroeconomic instability index following the Human Development index computational methodology. Using the ARDL bounds test, there was significant evidence of cointegration. The estimated long- and short-run models revealed that macroeconomic instability had a positive long- and short-run relationship with interest rate spreads. These relationships were found to be significant at 5% significance level. The fact that the short-run result was significant suggests that, banks and depositors incorporate past macroeconomic information into their pricing decisions. The study also found negative long- and short-run association between nonperforming loans and loan-to-deposit ratio and interest rate spreads. These negative associations were however not statistically significant.

From a policy-oriented point of view, it is recommended that the policy makers concentrate on managing macroeconomic instability as a means of boosting savings and investment. It is further recommended that the development of a more robust index of macroeconomic instability with better interpretation and relevance be encouraged. Such an index will enhance planning and decision-making, both in the public and private sectors. It is also believed that the manipulation of a single variable for political gains is easier than the manipulation of a composite index with many variables. Finally, the management of banks are advised to incorporate forward-looking economic information into their decision making and planning activities. This is crucial as forward-looking information add value to the risk management and compliance requirements of banks and SDIs especially in the era of IFRS and Basel Compliance.

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