Investigating the Determinants of Commercial Bank Interest Rate Spreads in Lesotho: Evidence from ARDL and Non-Linear ARDL Approaches

By Moeti Damane[a,*]

Abstract

THIS ARTICLE investigates the determinants of commercial bank interest rate spreads in Lesotho using monthly time series data from January 2009 to December 2018. The Autoregressive Distributed Lag (ARDL) bounds testing approach is used to measure long-run cointegration while the non-linear ARDL (NARDL) model is used to test validity of long-run symmetric effects. The bounds tests revealed existence of long-run cointegration between the study variables. Inflation and the Treasury bill rate have a positive and statistically significant impact on interest margins while the deposit rate has a negative and significant effect. The pass-through of inflation and the deposit rate to interest margins is less than one, respectively. This confirms that inflation affects banks' lending rates with a second round effect while deposit liabilities are not the only source of credit financing for banks. The null hypothesis of long-run symmetry is rejected for Treasury bill rates. Authorities are advised to ensure price and general macroeconomic stability while also pursuing policies aimed at maximising savings.

Keywords: Interest rate spreads, Banks, Cointegration, Lesotho
JEL classification: G2; G21

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1 INTRODUCTION

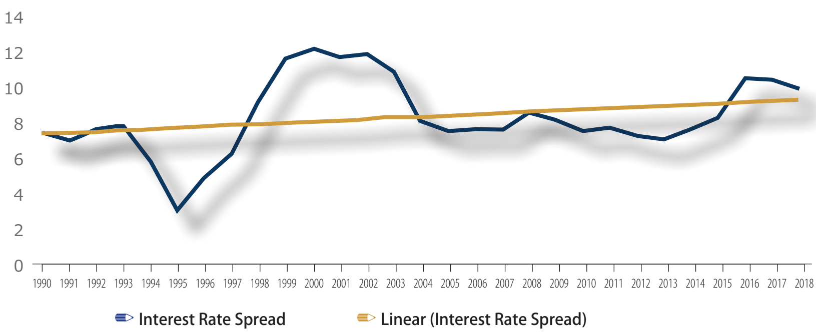
1.1 Background

THE IMPORTANCE of the financial intermediary role of commercial banks in the economy of any country cannot be overstated. This is especially true in less developed countries where most individuals and firms rely heavily on bank credit for financing as opposed to a mix of bank-based and market based finance. The business of commercial banking involves mobilising funds from the public in the form of demand, time and savings deposits or in the form of borrowing from the public or other banks then using the acquired funds in whole or in part to extend loans, advances and credit facilities and / or for investing by other means. Banks pay interest to the depositors and charge interest to the borrowers. The interest rate spread or interest margin is the difference between the interest charged on loans and the interest paid on deposits. As profit making institutional units, banks would want to pay lower interest on deposits while charging higher interest on borrowers thus creating a positive spread (Tarus *et al.*, 2012; Männasoo, 2013; Sheriff and Amoako, 2014; Molapo and Damane, 2016; Obeng and Sakyi, 2017; Damane *et al.,* 2018; Damane, 2019ab and Khan and Jalil, 2020).

Given that the role of commercial banks in the economy is to transfer funds from lenders to borrowers, they have to do so with efficiency and effectiveness to promote economic growth and the improvement of social welfare. There is great value in the close monitoring of banks' interest rate spreads due to their inherent use as indicators of efficient price signals to market players. Narrow interest rate spreads are often associated with a relatively competitive and efficient banking sector. Such a sector promotes investment and savings on the back of affordable credit extensions to the borrowers and satisfying returns to the depositors. Conversely, wider interest margins impede the deepening of financial intermediation in the country since lower deposit rates deter savings while high rates on loans reduce demand from borrowers. In order to promote economic growth, commercial banks have to provide intermediation services at the lowest possible cost. This is most important in developing economies where capital markets are underdeveloped and commercial banks are the main supplier of financing for firms and individuals (Tarus *et al.*, 2012; Männasoo, 2013; Sheriff and Amoako, 2014; Chirwa and Mlachila, 2004; Obeng and Sakyi, 2017 and Khan and Jalil, 2020).

Figure 1 reflects the interest rate spread in Lesotho from 1990 to 2018. On average, Lesotho's interest rate spread was 8.32 per cent over the period under consideration. The lowest point in the interest margin was in 1995, at 3.03 per cent, while the peak was reached in the year 2000 at 12.19 per cent. Although the bank spreads have shown volatility over time, they have generally exhibited an upward trend, as shown by the trend line in the figure.

Figure 1 Interest Rate Spread CMA (%)



Source: Authors Own Calculations based on data from World Bank Development Indicators

Numerous studies have investigated the determinants of commercial bank interest rate margins in a mix of developed and developing countries (see, Ho and Saunders, 1981; Allen, 1988; McShane and Sharpe 1985; Demirgüç-Kunt and Huizinga, 1999; Saunders and Schumacher, 2000; Brock and Suarez, 2000; López-Espinosa, 2011; Tarus *et al.*, 2012; Männasoo, 2013; Sheriff and Amoako, 2014; Chirwa and Mlachila, 2004; Obeng and Sakyi, 2017 and Khan and Jalil, 2020). The literature advances that bank spreads are determined by factors that include the macroeconomic environment, the banking sector's market structure, bank-specific factors and financial regulation.

The continued economic and policy relevance of such studies is without question. Previous empirical investigation into the factors that determine interest rate spreads in Lesotho have largely relied on a multi-country panel data approach (see, Crowley, 2007; Folawewo and Tennant, 2008; Ahokpossi, 2013 as well as Motelle and Biekpe, 2014). While worthwhile lessons can be garnered from these studies, their analytical frameworks lend themselves to the possibility that some country specific heterogeneities might not be adequately captured in the analysis. In addition, to the best of our knowledge, no study has yet been undertaken to empirically investigate the relationship between bank spreads, bank-specific factors and macroeconomic variables in Lesotho in both the short and long-run with a focus on the symmetric and asymmetric nature of this relationship. The objective of this study is therefore to investigate the short and long-run symmetric and asymmetric relationship between commercial bank interest rate spreads and a handful of macroeconomic and bank-specific variables in Lesotho. Our study's main contribution is in the use of the latest linear and non-linear cointegration techniques and the inclusion of high frequency (monthly) narrow money growth and inflation rate observations (these variables are of great import in the Central Bank of Lesotho's monetary policy regime[1]) among a list of variables to determine commercial banks' interest rate spreads in Lesotho.

The remainder of the paper is organised as follows: Section 2 gives an overview of Lesotho's financial sector; Section 3 provides a discussion of the relevant literature; Section 4 describes the data and analytical technique used in the study; Section 5 presents and discusses the results of the study, last, Section 6 concludes and offers policy recommendations..

2 OVERVIEW OF LESOTHO'S FINANCIAL SECTOR

Lesotho is a small and mostly mountainous country that is largely rural with a population of approximately 2 million people. It is completely enveloped by South Africa and through its membership in the Common Monetary Area (CMA)[2], its currency; the Loti (plural Maloti), is pegged at par to the South African Rand. Apart from CMA membership, the country is also a member of Southern African Customs Union (SACU)[3] and Southern African Development Community (SADC).The lion's share of the financial sector's total assets in Lesotho is accounted for by Other Depository Corporations (ODCs) followed by Other Financial Corporations (OFCs). In 2010, Lesotho's financial sector comprised of 450 corporations (except the Central

[1] The Central Bank of Lesotho's (CBL's) primary mandate, as spelled out in Section 5 of the Central Bank of Lesotho Act of 2000, is to achieve and maintain price stability in Lesotho. This objective is achieved through the CBL's fixed exchange rate monetary policy regime that ensures the one-to-one peg between Lesotho's currency (Loti) and the South African Rand. As a result, financial markets and the public are assured that every Loti in circulation is backed by an equivalent amount of foreign currency (Damane, 2020).

[2] Other CMA member countries are Namibia and Swaziland.

[3] Other SACU member countries are Botswana, South Africa and Swaziland, Namibia.

Bank of Lesotho) with total assets worth M14.1 billion, 60.16 per cent of which were the assets of ODCs. Out of this, 56.68 per cent were the assets of the country's four commercial banks, three of which are subsidiaries of South African banks[4]. In line with its dominance in the financial sector, the banking sector remains the primary distributor of financial services and products in the country. For example, the supply of investment finance to firms in Lesotho is dominated by commercial bank credit. The size of the banking system balance sheet grew by 8.3 per cent from M16.1 billion in 2017 to M17.4 billion in 2018. This was mainly on account of the credit portfolio. The credit portfolio of banks grew by 12. 4 per cent from M5.8 billion in 2017 to M6.5 billion in 2018 (Molapo and Damane, 2016; Damane *et al.*, 2018; Damane, 2019a and CBL, 2019).

Lesotho's financial sector, much like that of other countries within the SADC region has undertaken a host of financial sector reforms since the 1980s with the intention to improve its structure and efficiency. These financial system reforms were necessitated by such developments as evolving macroeconomic dynamics (e.g. variable inflation rates, the establishment of a central bank[5], growing overlap in services offered by financial institutions etc.), parliamentary legislative initiatives to protect depositors and foster economic development, conversion of the Post Office Savings Bank to the Lesotho Commercial Bank as well as changes in technology that enables a broadening of financial services and geographical areas over which financial services are delivered (Ayaya, 1997; Mowatt, 2001; Anchang, 2016; Molapo and Damane, 2016; Damane et al., 2018; Damane, 2019a and CBL, 2019). Between 2014 and 2018, domestic banks introduced and launched mobile and internet banking services that allow banks' clients to access various financial services remotely. This took place in the wake of announcements and deployments of mobile money services (EcoCash in October 2012 and M-Pesa in July 2013) by telecoms companies in the country. Between 2015 and 2018 registered mobile money accounts in Lesotho have grown by around 26 per cent, a signal of growing access[6] to financial services by

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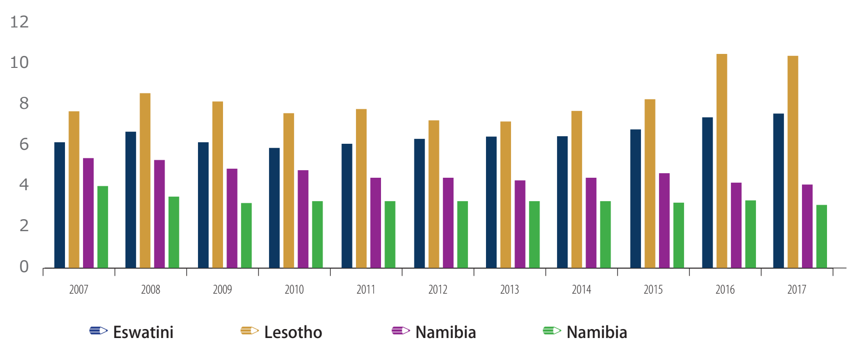
[4] These are Standard Lesotho Bank, Nedbank and First National Bank.

[5] The Central Bank of Lesotho (the Bank) was first established as the Lesotho Monetary Authority in 1978, under the Lesotho Monetary Authority Act of 1978 starting operations in 1980. In 1982, through the Act of Parliament, the name Lesotho Monetary Authority was changed to the Central Bank of Lesotho and the Bank was conferred additional functions and responsibilities. In August 2000, the Central Bank of Lesotho Act 2000 (the Act) came into force and bestowed a fair amount of autonomy on the Bank, and defined the primary objective of the Bank as achievement and maintenance of price stability.

[6] A 2011 FinScope Survey on financial inclusion among consumers in Lesotho revealed that access to both formal and informal financial products stood at 80.9 per cent of the population (Sekantsi, 2019). Similarly, in the 2014 FinScope consumer survey report for Zimbabwe pointed out that financial inclusion in Zimbabwe increased from 38 per cent in 2011 to 69 per cent in 2014 on account of mobile money.

the country's previously unbanked population. Similarly, in 2017, domestic deposit taking banks, including the Central Bank of Lesotho (CBL) successfully updated their core banking[7] systems in a move that signalled an important milestone in the country's digital transformation journey (Damane and Sekantsi, 2020). Process innovations improve payment systems used in borrowing and lending of funds and ultimately ameliorate risk, increase the availability of credit to borrowers and provide financial institutions with a new and cost effective way of raising capital (Bhatt, 1988 and Tahir *et al.*, 2018, Damane and Sekantsi, 2020). Despite the reforms, Damane (2019b) points out that when a handful of banking sector development indicators (indicators of banking sector size[8], efficiency[9], depth[10] and reach[11])are used to compare Lesotho's banking sector to that of its fellow members in the CMA over the period 2007 to 2017, the country consistently lags behind the other countries in most of these indicators. Figure 1 presents the efficiency of the banking sector in CMA countries as measured by the interest rate spread.

Figure 2 Interest Rate Spread CMA (%)



Source: Authors Own Calculations based on data from IMF-FAS

[7] Core banking entails the improvement of back-end system processing of all banking transactions including, but not limited to, deposit, loan and credit processing together with teller services, sales, loans orientation, payments systems, automatic teller machines (ATMs) and electronic services (Central Banking, 2017).
[8] Commercial banks' loans to GDP ratio and commercial banks' deposits to GDP ratio.
[9] Interest rate spread.
[10] The Ratio of broad money to GDP.
[11] The ratio of commercial bank branches per 100,000 adults.

Between 2007 and 2017 the interest rate spread in South Africa averaged 3.36 percent followed by Namibia with an average of 4.63 per cent then Eswatini with a 6.51 per cent average and last, Lesotho with an average interest rate spread of 8.24 per cent. When the growth rates[12] in individual country interest rate spreads are considered, the South African and Namibian interest rate spreads experienced a 22.03 per cent and 22.39 per cent decline between 2007 and 2017, respectively. Conversely, Eswatini and Lesotho exhibited positive growth rates in their interest rate spreads at a rate of 23.52 per cent and 35.06 per cent, respectively. The findings reveal that Lesotho's banking sector is the least efficient out of the four CMA countries while South Africa's is the most efficient.

3 LITERATURE REVIEW

This section provides a brief review of theoretical and empirical literature linking interest rate spreads and macroeconomic variables from the perspective of developed and developing countries.

3.2 Theoretical Review

The theoretical underpinning of the literature reviewed in this study significantly draws from the bank dealership model as proposed by Ho and Saunders (1981) and later augmented by other authors such as Allen (1988), McShane and Sharpe (1985) and Maudos and De Guevara (2004). The model's development borrows from the literature on bid-ask prices for security market dealers. In it, banks are considered as "dealers" that perform the function of risk-averse intermediators in the credit market. They pay for funds (deposits) at a particular price (a "bid" price) and lend funds out at another price (an "ask" price). Under this context, banks are faced with two realities. First, uncertainty and costs arise from the stochastic behaviour of deposit suppliers and loan demanders. For example, suppliers of deposits and demanders of loans tend to arrive at dissimilar times causing banks to either hold a long or short position in the short-term money market. Second, banks deal with loan demands and offers of deposits in money market environments characterised by interest rate volatility. In both cases, the assumption is

[12] Growth rates in the interest rate spread are calculated in 2017 with 2007 as a base year.

that banks temporarily invest funds in the money market at given interest rates. Should the interest rate on their money market investments decline, they will be faced with reinvestment risk since deposits might increase at a faster pace than the demand for loans. Similarly, in cases where the demand for loans grows at a quicker rate than the supply of deposits, banks will be forced to borrow the shortfall from the money market. If the rate of interest in the money market rises, banks will be faced with refinancing risk. Notwithstanding the afore mentioned risks, further credit risk can manifest itself in failure by loan demanders to pay back money lent to them in principal and in interest. As a consequence, banks will set their interest rate as a margin relative to the interest rate of the money market. In addition, they will demand a positive interest margin as a cost of providing intermediary services in an uncertain environment caused by the asynchronous nature of deposit supplies and loan deposits (Ho and Saunders, 1981; Allen, 1988; McShane and Sharpe 1985; Demirgüç-Kunt and Huizinga, 1999; Saunders and Schumacher, 2000; Chirwa and Mlachila, 2004; Tarus et al., 2012; Männasoo, 2013; Sheriff and Amoako, 2014; Obeng and Sakyi, 2017 and Khan and Jalil, 2020).

2.3 Empirical Review

Demirgüç-Kunt and Huizinga (1999) make use regression analysis and bank-level data (income statements and balance sheets) for 80 industrial and developing countries spanning 1988- 1995 to investigate the determinants of bank interest margins and profitability. The findings of the study reflect that interest margins are affected by determinants that include bank characteristics, macroeconomic conditions, deposit insurance regulation, overall financial structre, explicit and implicit bank taxation and the underlying legal and institutional indicators. Specifically, increases in the ratio of bank assets to GDP and lower market concentration ratio were discovered to lead to lower interest margins. Further evidence suggests that an increase in the level of inflation as well as credit risk leads to higher interest rate margins. Similarly, higher corporate tax burden on banks is fully passed onto bank customers (i.e. lead to higher interest margins) while a higher reserve requirements are not.

Brock and Suarez (2000) investigate the determinants of bank spreads in the Caribbean[13] using unbalanced panel data regression techniques and data that spanned 1989 to 2004. In a similar way to Demirgüç-Kunt and Huizinga (1999), their study includes a variety of bank specific factors as well as macroeconomic factors as predictor variables of commercial banks' interest rate spreads in their analysis. The findings of the study show that monetary policy variables, namely; reserve requirements and capital controls (as well as the control variables inflation and the corporate tax rate) play a more significant role in the determination of interest margins, accounting for over 76 per cent of the variation, than do bank specific factors such as bank size and provisions of non-performing loans.

Saunders and Schumacher (2000) extend on the dealership model by Ho and Saunders (1981) to investigate the determinants of bank margins in a sample of banks in seven of the major countries of the Organisation of Economic Corporation and Development (OECD) over the period 1988 – 1995. Much like Demirgüç-Kunt and Huizinga (1999) as well as Brock and Suarez (2000), Saunders and Schumacher (2000) underscore that interest margins can be affected by bank specific factors as well as macroeconomic factors. Their analysis decomposes determinants of bank interest margins into three components. Namely (i) indirect "tax" / regulatory effect (i.e. reserve requirements); (ii) market structure effect (reflecting relative degree of monopoly power) and (iii) the risk premium effect (reflecting the extent of interest rate risk borne by bank in intermediation). The findings of the paper were similar to those by Brock and Shock (2000) in that they indicate that an increase in reserve requirements and interest rate volatility leads to a widening of interest margins.

Chirwa and Mlachila (2004) focus their attention on financial sector reform and its impact on interest rate spreads in Malawi's commercial banking system. Their study uses monthly panel data from five Malawian commercial banks and covers the period 1989 – 1999. The analytical framework is similar that taken by Demirgüç-Kunt and Huizinga (1999), Brock and Suarez (2000), as well as Saunders and Schumacher (2000) in that it explains interest margins as a function of bank and market specific factors, the regulatory environment and macroeconomic characteristics. One of the main contributions is in the use of both narrow and wide definitions of interest margins as dependent variables. Notably, results of the study show that increases

[13] The list of Caribbean countries includes Barbados, a country that operates under a fixed exchange rate regime where its currency the Barbados dollar is pegged with the United States dollar.

in bank specific factors such as the provision for doubtful debts widen interest margins. The same goes for regulatory factors such as the liquidity reserve requirement and macroeconomic factors such as price instability, represented by inflation.

Crowley (2007) recognises that most studies on interest margins in the literature pay very little attention to evidence from the African continent. Their study fills this gap by investigating the determinants of interest rate spreads in English-speaking African countries using panel data regression techniques and data for the period 1975 – 2004. Just as Demirgüç-Kunt and Huizinga (1999) and Chirwa and Mlachila (2004), Crowley (2007) notes the presence of various definitions of interest rate spreads and elects to use a narrow definition. The study also includes macroeconomic factors such as inflation as well as bank specific factors such as non-performing loans as predictor variables in the regression analysis. A notable finding is that unlike the conclusions of Demirgüç-Kunt and Huizinga (1999) and Chirwa and Mlachila (2004), the results reflected that an increase in inflation led to lower interest rate margins in English-speaking African countries.

Tarus *et al.* (2012) use panel data regression techniques and data spanning from 2000 – 2009 on a sample of 44 banks to investigate the determinates of interest margins of commercial banks in Kenya. Just as other studies reviewed previously, the research explains interest rate spreads in terms of macroeconomic together with bank and market-specific factors. Operating expect and credit risk are found to have a positive impact on the interest rate margin. On the same token, the study discovers that high levels of inflation translate in wider commercial bank interest rate spreads in Kenya. This evidence is contrary to the findings of Crowley (2007) and similar to those by Demirgüç-Kunt and Huizinga (1999) coupled with Chirwa and Mlachila (2004).

Ahokpossi (2013) examines the determinants of bank interest margins in sub-Saharan Africa using a sample of 456 banks in 41 sub-Saharan African countries coupled with panel data regression techniques and data spanning 1995 – 2008. Interest margins are explained as a function of bank-specific factors, market structure and macroeconomic factors. The study finds that when market concentration is interacted with bank efficiency, its impact on bank interest spreads is positive and significant while positive and insignificant when it is not interacted with bank efficiency. This shows that the impact of bank concentration on interest margins depends on bank efficiency. Inflation was also found to have a positive and significant impact on interest rate margins while the growth in GDP was insignificant.

Sheriff and Amoako (2014) use of monthly time series data from 1999 to 2010 and the Autoregressive Distributed Lag (ARDL) model to investigate the macroeconomic determinants of commercial bank spreads in Ghana in the short and long run. The study's variables included consumer price inflation, treasury bill rates, total banking sector deposits and a proxy for public sector crowding out. Findings reveal the existence of cointegration between the variables. An increase in the consumer price inflation leads to a widening of interest rate spreads in the short and long-run. The relationship between total banking sector deposits and the interest margin was found to be positive and significant in the long run while insignificant in the short-run. Conversely, T-bill rates exert a negative influence on the interest rate spread in the short-run but are statistically insignificant determinants of the interest margin in the long-run.

In a similar way to Sheriff and Amoako (2014), Obeng and Sakyi (2017) study the factors that affect interest rate spreads in Ghana in the short and long-run using the ARDL bounds test approach to cointegration. They extend on the work by Sheriff and Amoako (2014) by introducing, among the predictor variables, money growth and a measure of institutional quality. The study uses annual data covering the period 1980 to 2013. Its findings reaffirm the existence of a long run relationship between the study's variables in Ghana. In addition, inflation, fiscal deficit, crowding out effect, exchange rate volatility, deposit interest rate volatility, money growth as well as the monetary policy inters rate exert a positive and statistically significant influence on the interest margin in the short and long-run.

Much like Ahokpossi (2013), Tarus and Manyala (2018) investigate the determinants of bank interest rate spreads in sub-Saharan African countries using fixed effects estimations and data drawn from a sample of 20 sub-Saharan African countries for a period spanning ten years from 2003 – 2012. The determinants of interest margins are categorized into macro-specific, bank-specific and institutional variables. Unlike the study by Ahokpossi (2013), findings of the research show that inflation has a negative and significant effect on the interest rate spread whereas operating costs and bank concentration have a positive and significant effect on the interest margin.

Khan and Jali (2020) explore the determinants of the net interest margin (NIM) in Pakistan using a two-step system generalised method of moments (GMM) and unbalanced quarterly panel data from forty-six commercial banks spanning from 2003Q3 to 2017Q. The data comprise a combination of commercial banks' data (e.g. operation cost, credit risk, managerial efficiency) and data on macroeconomic indicators (growth in broad money, national saving, inflation, taxation). Notable findings of the study are that the money supply, operating costs, T-bill rate and national savings are positively and statistically significantly related to the NIM whereas managerial efficiency and risk aversion have no significant effect on the NIM in Pakistan's banking sector.

The studies reviewed in the literature reflect that the pricing behaviour of commercial banks can be affected by a wide array of factors that include the structure of the capital market, the nature of the regulatory environment as well as bank specific and macroeconomic factors. An overarching consistency in the literature is the importance of the role of macroeconomic and bank-specific factors in the determination of commercial banks' interest rate spreads. To capture the impact of such factors on banks' pricing, interest spread equations often include money market rates (Treasury bill and discount rates), credit risk, consumer inflation and monetary aggregates (i.e. growth of money supply) as control variables. In general, findings show that increases in these variables lead to wider commercial bank spreads across both developed and developing economies.

4 EMPIRICAL FRAMEWORK

4.1 The Data

The study makes use of monthly data from January 2008 to December 2018, making it a total of 120 months of data. Table 1 shows the names of the variables included in the study as well as their sources. According to Demirgüç-Kunt and Huizinga (1999), Brock and Suarez (2000) as well as Chirwa and Mlachila (2004), the interest rate spread can be defined both in a narrow and wide way, with the main distinction lying in the inclusion or exclusion of fees and commissions relating to the loan and deposit transactions in each case. Our study defines the commercial bank interest rate spread in Lesotho on a narrow basis in the same way as Demirgüç-Kunt and Huizinga (1999) and Crowley (2007). Specifically, it is defined as the difference between the industry average prime interest rate earned on loans and the industry average interest rate paid on 1 year deposits by banks. This definition is chosen due to its wide applicability.

Table 1 Variable Names and Sources

Nature of Variable		Name of Variable	Abbreviation	Variable State	Source of Data
Dependent Variable		Interest Rate Spread	SP	Percentage	CBL*
Independent Variables	Macroeconomic Factors	Consumer Price Inflation	INF	Percentage	BOS**
		91-day Treasury Bill Rate	TB	Percentage	CBL
		Growth in Narrow Money	M1g	Percentage	CBL
		1 year Deposit Rate	DR	Percentage	CBL
		Credit Risk	CR	Percentage	CBL

Source *CBL: Central Bank of Lesotho *BOS: Bureau of Statistics

From the table, the independent variables are grouped into macroeconomic factors and bank specific factors. Under the macroeconomic factors, the rate of inflation is measured by changes in the consumer price index (CPI). Narrow money comprises the currency outside banks and demand deposits. Considering the bank-specific factors, the credit risk is proxied by the ratio of total loans by banks to total bank assets. All variables are in percentage terms. Table 2 presents the study's Apriori expectations.

Table 2 Monthly Account Maintenance Fees

Relationship between:	Expected Sign	Rationale	Source
SP and INF	Positive	The inflation rate is considered to be an indicator of the cost of doing business. Thus, higher levels of inflation are expected to lead to higher lending rates especially in developing countries where inflation is high and variable.	Demirgüç-Kunt and Huizinga, (1999); Brock and Suarez (2000); Chirwa and Mlachila (2004); Crowley, (2007); Folawewo and Tennant, (2008); Ahokpossi (2013); Sheriff and Amoako (2014); Obeng and Sakyi (2017); Khan and Jali (2020).
SP and TB	Positive / Negative	**Positive**: Owing to its strong relationship with the commercial bank rates as a benchmark for rates charged by banks, the 91 day TBill rate is considered an indicator of government interest rate policy. The expectation is that a higher TBill rate will lead to higher interest rate spreads through its positive influence on the lending rate for a given level of the deposit rate.	Demirgüç-Kunt and Huizinga, (1999); Brock and Suarez (2000); Chirwa and Mlachila (2004); Folawewo and Tennant, (2008); Sheriff and Amoako (2014); Tarus and Manyala (2018); Khan and Jali (2020).
		Negative: Treasury bills act as alternative investment vehicles for savers. As such, increases in the T-bill rate negatively affect banks' interest margins. Savers, with the option of choosing between low savings and high T-bill returns will force banks to offer competitive savings rates to attract them (given that banks cannot attract any more lenders due to tight competition). This will lead to a narrowing of the interest rate margin	
SP and M1g	Positive	The growth in narrow money creates inflationary pressures and thus increases the risk premium of banks which will lead to an increase in the lending rates and therefore the interest rate spread at a given level of the deposit rate.	Sheriff and Amoako (2014); Obeng and Sakyi, (2017); Khan and Jali (2020).
Source	Central Bank of Lesotho		

Table 2	Monthly Account Maintenance Fees (continued)		
Relationship between:	**Expected Sign**	**Rationale**	**Source**
SP and DR	Negative	An increase in the deposit rate is expected to encourage greater demand for deposits that will translate into a greater supply of loanable funds and a reduction in the lending rate and thus the interest margin.	Sheriff and Amoako (2014); Obeng and Sakyi, (2017).
SP and CR	Positive	The higher the credit risk ratio (as, defined in our study as the ratio of loans to total assets – to capture the risks in lending) the more banks are exposed to loan default risk. This can also be used to measure asset quality. An increase in the credit risk ratio translates into weaker asset quality and as such banks will want to make up for past losses by charging higher lending rates for a given level of the deposit rate and cover this risk.	Demirgüç-Kunt and Huizinga, (1999); Maudos and De Guevara, (2004); Tarus *et al.* (2012); Ahokpossi (2013); Jamaludin *et al.*, (2015).
Source	Central Bank of Lesotho		

3.1 Model Specification

The generalized model for examining the relationship between interest rate spread and a handful of macroeconomic variables in Lesotho is presented as follows:

$$SP_t = a_0 + \beta_1 INF_{t-} + \beta_2 TB_t + \beta_3 M1g_t + \beta_4 DR_t + \beta_5 CR_t + \varepsilon_t \quad (1).$$

where variables are as explained in Table 1, $a_0$0 is the constant term, β_1, β_2, β_3, β_4 and β_5 are the long-run coefficients while ε_t is the error term, which is assumed to be white noise.

The Autoregressive Disturbed Lag (ARDL) bounds testing approach to co-integration and Error Correction Model (ECM) based on the ARDL procedure developed by Pesaran and Shin (1999) and advanced by Pesaran et al. (2001) is used to investigate the symmetric relationship between the interest rate spread and a handful of macroeconomic variables. The ARDL bounds testing approach offers the following advantages over other alternative cointegration techniques such as the Johansen (1998) and the Johansen and Juselis (1990). First, unlike the

Johansen conventional cointegration method that estimates the long-run relationship under the restrictive assumption that all of the model's variables are integrated of order 1, that is it [*I* (1)], the ARDL approach can be applied irrespective of whether the underlying regressors are integrated of order one [*I* (1)], order zero [*I*(0)] or mutually cointegrated. This means that it avoids the pretesting of variables to identify their order of integration (although pretesting is recommended to ensure the variables are not [*I* (2)]. Second, it provides for the possibility that different variables have difference optimal lags, which is impossible under the conventional Johansen approach. Third, it produces robust results even in cases of small samples. Fourth, this technique has finite-sample critical values as opposed to other cointegration approaches for which the distribution of the test statistic may not be known in finite samples. Narayan (2005) develops a set of sample-specific critical value bounds for the sample sizes ranging from 30 to 80 using the same approach and GAUSS code used by Pesaran *et al.,* (2001) in generating the asymptotic values. Furthermore, it provides unbiased estimates of the long-run model and valid t -statistics even in the presence of endogenous regressors. This will prove important in the study because of the potential endogeneity of regressors such as inflation. Last but not least, ARDL framework allows the derivation of an ECM through a simple transformation, which generates short-run adjustment with long-run equilibrium without losing the long-run information (Sheriff and Amoako, 2014; Nkoro and Uko, 2016; Obeng and Sakyi, 2017 and Zhang *et al.,* 2017).

In order to carry-out the bounds test the following unrestricted error correction model (UECM) is estimated.

$$\Delta SP_t = \alpha_0 + \Omega_1 SP_{t-1} + \Omega_2 INF_{t-1} + \Omega_3 TB_{t-1} + \Omega_4 M1g_{t-1} + \Omega_5 DR_{t-1} + \Omega_6 CR_{t-1} + \sum_{i=1}^{p} \beta_1 \Delta SP_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta INF_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta TB_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta M1g_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta DR_{t-i} + \sum_{i=1}^{q} \beta_6 \Delta CR_{t-i} + \varepsilon_t \quad (2)$$

where all variables are as previously defined, Δ is the first difference operator, p and q are the lag lengths, a_0 is the drift component and ε_t is the random error term. The ARDL framework, evaluates the long-run relationship between variables in the model through the Wald test of coefficient restriction by testing the null hypothesis; $H_0 : \Omega_1 = \Omega_2 = \Omega_3 = \Omega_4 = \Omega_5 = 0$ against the alternative hypothesis; $H_1 : \Omega_1 \neq \Omega_2 \neq \Omega_3 \neq \Omega_4 \neq \Omega_5 \neq \Omega_6 \neq 0$. The computed F-statistic derived from the Wald test is compared with two sets of critical values (lower and upper bound values) for a given level of significance reported in Pesaran *et al.* (2001) and Narayan (2005) for large samples and small sample sizes, respectively. The lower bound values assume that all variables in ARDL model are $\boldsymbol{I}(0)$ while the upper bound values assume that the variables are $\boldsymbol{I}(1)$. Therefore, if the computed F-statistic is less than the lower bound value, the null hypothesis of no cointegration cannot be rejected. On the other hand, if the computed F-statistic is greater than the upper bound value, the null hypothesis of no cointegration is rejected and it is concluded that the variables are cointegrated. Nonetheless, the test becomes inconclusive in cases where the computed F-statistic falls between the two critical bound values.

Once cointegration is proven to exist between the variables of interest, the long-run and error correction models are estimated using the ARDL framework as shown in equation 3 and 4, respectively:

$$SP_t = \alpha_0 + \sum_{i=1}^{m} \Omega_1 SP_{t-i} + \sum_{i=1}^{n} \Omega_2 INF_{t-i} + \sum_{i=1}^{r} \Omega_3 TB_{t-i} + \sum_{i=1}^{v} \Omega_4 M1g_{t-i} + \sum_{i=1}^{w} \Omega_5 DR_{t-i} + \sum_{i=1}^{x} \Omega_6 CR_{t-i} + \varepsilon_t \quad (3)$$

$$\Delta SP_t = \alpha_0 + \sum_{i=1}^{m} \psi_1 \Delta SP_{t-i} + \sum_{i=0}^{n} \psi_2 \Delta INF_{t-i} + \sum_{i=0}^{r} \psi_3 \Delta TB_{t-i} + \sum_{i=0}^{v} \psi_4 \Delta M1g_{t-i} + \sum_{i=0}^{w} \psi_5 \Delta DR_{t-i} + \sum_{i=0}^{x} \psi_6 \Delta CR_{t-i} + \psi_7 ECT_{t-1} + \mu_t \quad (4)$$

where all the variables are as previously defined. ε_t and μ_t are the random error terms while $\Omega_1 \ldots \Omega_6$ and $\psi_1 \ldots \psi_7$ are the parameters of each model while m, n, r, v, w and x are the maximum lag lengths[14] and ψ_7 is the coefficient of the lagged error correction term (ECT_{t-1}). The ψ_7 coefficient measures the speed of adjustment to long-run equilibrium following a shock to the system in the previous period.

3.2 Nonlinear ARDL Approach

Equation 1 is a representation of the long run relationship between the interest rate spread and selected macroeconomic variables with the assumption that the explanatory variables linearly affect the dependent variable[15]. However, according to Shin *et al.*, (2014), Michis (2016),

[14] The maximum lag lengths are normally selected by means of information criteria such as Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn information criterion (HQ).

[15] That is, equation (1) assumed the existence of a symmetric relationship between the variables.).

Lacheheb and Sirag (2016), Zhang *et al.,* (2017), Kwasi Obeng (2018), as well as Qamruzzaman and Jianguo (2018), the assumption of a linear relationship between dependent and independent variables may not always be sufficient to properly explain macroeconomic relationships. In light of this, the study further examines asymmetric relationship between the interest rate spread and the handful of macroeconomic variables identified in Table 1. To do this, the study adopts the Nonlinear ARDL (NARDL) cointegration approach advanced by Shin *et al.* (2014). The NARDL is an asymmetric extension of the ARDL model that is capable of simultaneously and coherently modelling asymmetries in both the short and long run. Moreover, it can be used to derive asymmetric cumulative dynamic multipliers that allow for the tracing out of the asymmetric adjustment patterns of the dependent variable given positive and negative shocks to the independent variables (Karantininis et al., 2011; Shin *et al.,* 2014 and Zhang *et al.,* 2017). Similar to Shin *et al.,* (2014), Qamruzzaman and Jianguo (2018), Zhang *et al.,* (2017) as well as Kwasi Obeng (2018), the asymmetric pass-through of specific macroeconomic variables on the interest rate pass through is represented by decomposing the macroeconomic variables into positive and negative shocks, where, for example, considering only the proxy for inflation, INF; INF^{+} and INF^{-} represent the partial sums of positive and negative changes in the INF variable. These partial sums are calculated as follows:

$$\left.\begin{aligned} INF_t^{+} &= \sum_{i-1}^{t} \Delta INF_t^{+} = \sum_{i-1}^{t} max(\Delta INF_{i,} 0) \\ INF_t^{-} &= \sum_{i-1}^{t} INF_t^{-} = \sum_{i-1}^{t} min(INF_{i,} 0) \end{aligned}\right\} \quad (5)$$

$$SP_t = \alpha_0 + \beta_1^{+} INF_t^{+} + \beta_2^{-} INF_t^{-} + \beta_3 TB_t + \beta_4 M1g_t + \beta_5 DR_t + \beta_6 CR_t + \varepsilon_t \quad (6)$$

where variables are as explained in Table 1, α_0 is the constant term, $\beta_1^{+}, \beta_2^{-}, \beta_3, \beta_4 \ldots \beta_6$ are the long-run coefficients while ε_t is the error term, which is assumed to be white noise. To test the existence of asymmetric long-run relationship between the interest rate spread and the inflation rate, the study estimates the following nonlinear conditional error correction model (NECM):

$$\Delta SP_t = \alpha_0 + \pi_1 SP_{t-1} + \pi_2^+ INF_{t-1}^+ + \pi_3^- INF_{t-1}^- + \pi_4 TB_{t-1} + \pi_5 M1g_{t-1} + \pi_6 DR_{t-1} + \pi_7 CR_{t-1} + \sum_{i=1}^{p} \psi_1 \Delta SP_{t-i} + \sum_{i=0}^{q} \psi_2^+ \Delta INF_{t-i}^+ + \sum_{i=0}^{q} \psi_3^- \Delta INF_{t-i}^- + \sum_{i=0}^{q} \psi_4 \Delta TB_{t-i} + \sum_{i=1}^{q} \psi_5 \Delta M1g_{t-i} + \sum_{i=1}^{q} \psi_6 \Delta DR_{t-i} + \sum_{i=1}^{q} \psi_7 \Delta CR_{t-i} + \phi_t \quad (7)$$

where $\psi_1 \ldots \psi_7$ are the short-run coefficients and the long-run coefficients are represented by $\pi_1 \ldots \pi_7$.

Just as was done under the ARDL model, after establishing the existence of cointegration using the NARDL bounds testing procedure, which is similar to the ARDL bounds testing procedure outlined earlier, the following nonlinear long-run and nonlinear error correction models are estimated.

$$SP_t = \alpha_0 + \sum_{i=1}^{m} \Omega_1 SP_{t-i} + \sum_{i=1}^{n} \Omega_2^+ INF_{t-i}^+ + \sum_{i=1}^{q} \Omega_3^- INF_{t-i}^- + \sum_{i=1}^{r} \Omega_4 TB_{t-i} + \sum_{i=1}^{v} \Omega_5 M1g_{t-i} + \sum_{i=1}^{w} \Omega_6 DR_{t-i} + \sum_{i=1}^{x} \Omega_7 CR_{t-i} + \varphi_t \quad (8)$$

$$\Delta SP_t = \alpha_0 + \sum_{i=1}^{m} Ψ_1 \Delta SP_{t-i} + \sum_{i=0}^{n} Ψ_2^+ \Delta INF_{t-i}^+ + \sum_{i=0}^{q} Ψ_3^- \Delta INF_{t-i}^- + \sum_{i=0}^{r} Ψ_4 \Delta TB_{t-i} + \sum_{i=0}^{v} Ψ_5 M1g_{t-i} + \sum_{i=0}^{w} Ψ_6 DR_{t-i} + \sum_{i=0}^{x} Ψ_7 CR_{t-i} + Ψ_8 ECT_{t-1} + \mu_t \quad (9)$$

The existence of long-run and short-run symmetry is tested using the Wald test with the null hypothesis $H_0 : \Omega_2^+ = \Omega_3^-$ and $H_0 : \sum_{i=0}^{q} Ψ_2^+ = \sum_{i=0}^{q} Ψ_3^-$, respectively. Should the null hypothesis of symmetry be rejected, the asymmetric dynamic multipliers[16] of a change in INF^- and INF^+ can be developed, respectively. The cumulative dynamic multiplier effects of INF^- and INF^+ on SP are evaluated using the following formulae:

$$m_h^+ = \sum_{i=0}^{h} \frac{\partial SP_{t+i}}{\partial INF_t^+}; \; m_h^- = \sum_{i=0}^{h} \frac{\partial SP_{t+i}}{\partial INF_t^-} \quad (10)$$

According to Shin *et al.,* (2014), as $h \to \infty$ then $m_h^+ \to \Omega_2^+$, $m_h^- \to \Omega_3^-$, where Ω_2^+ and Ω_3^- are the asymmetric long-run coefficients.

[16] The dynamic multipliers show the traverse of the interest rate spread variable from an initial equilibrium to a new equilibrium given positive and negative shocks to the inflation variable.

5 DATA ANALYSIS AND INTERPRETATION

5.1 Descriptive Statistics

A graphical depiction of the variables is provided in Appendix A1. Table 3 highlights the descriptive statistics (means and standard deviations as well as tests for normality) for all the variables under consideration.

Table 3 Descriptive Statistics

	SP	INF	TB	MIG	DR	CR
Mean	7.73	5.22	6.19	0.58	3.28	35.17
Median	7.71	5.20	6.25	1.25	3.22	37.93
Maximum	9.26	10.70	10.01	19.91	6.74	48.00
Minimum	6.97	2.00	4.94	-53.50	2.34	20.17
Std. Dev.	0.45	1.64	0.84	7.80	0.80	6.71
Skewness	0.56	0.81	1.96	-2.69	1.60	-0.82
Kurtosis	3.16	4.32	9.67	21.12	7.41	2.36
Jarque-Bera	6.36	21.83	299.11	1786.20	148.54	15.75
Probability	0.04	0.00	0.00	0.00	0.00	0.00
Sum	928.15	626.00	743.39	69.93	393.18	4220.84
Sum Sq. Dev.	24.36	319.39	83.78	7231.63	75.98	5371.77
Observations	120	120	120	120	120	120

Source Central Bank of Lesotho

From the table, the average interest margin over the review period is 7.73 per cent while the average level of inflation is 5.22 per cent[17]. The mean 91-day TBill rate is 0.97 per cent higher than the average rate of inflation. Holders of TBills during the period under consideration were compensated for the loss of value resulting from increases in prices. The banking sector's total loans as a ratio of its total assets measures the credit risk and it averaged approximately 35.17 per cent with a maximum of 48 per cent and a minimum of 20.17 per cent. This shows that

[17] This falls within the upper bound of the 3-6 per cent inflation target band of Lesotho's fixed exchange rate anchor economy, South Africa.

credit extension is an important part of banks' business. The growth in narrow money averaged 0.58 per cent with a of negative 53 per cent[18] and a maximum of 19.91 per cent.

We tested for the correlation between the variables. The results are presented in Table 4 and offer a preliminary assessment of the Apriori expectations discussed under Table 2. In general, the Apriori expectations of the relationship between interest margins and inflation as well as between interest margins and treasury bill rates are supported by the correlation coefficient results. On the other hand, the correlation coefficient between interest rate spreads and the growth in narrow money, credit risk and the deposit rate, respectively, go against Apriori expectations.

Table 4 Correlation Results

Correlation	SP	INF	TB	MIG	CR	DR
SP	1					
INF	0.47801	1				
TB	0.49601	0.450785	1			
MIG	-0.06294	-0.01896	-0.05621	1		
CR	-0.55238	-0.1364	-0.37659	0.098568	1	
DR	0.252787	0.369549	0.892561	-0.04921	-0.30944	1

Source Central Bank of Lesotho

5.2 Unit Root Test

Unlike other econometric techniques, the ARDL approach does not require pre-testing for unit roots. Although the technique works well when variables are integrated of different order, I(0), I(1) or a combination of both, unit root testing is conducted to ensure that the variables are not integrated of order two, that is I (2), since the ARDL technique crashes in the presence of I(2) variables (Sheriff and Amoako, 2014, Nkoro and Uko, 2016, Obeng and Sakyi, 2017 and Damane *et al.,* 2018). The study made use of the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller,1981) and the Phillips and Perron (PP) test (Phillip and Perron, 1988) to determine the order of integration of the variables. The results of the ADF and PP unit root tests are presented in Table 5.

[18] The minimum corresponds to a drastic fall in currency in circulation in 2011.

Table 5	Standard Unit Root Tests							
Variable	ADF				PP			
Descriptor	Level		1st Difference		Level		1st Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept
SP	0.0187**	0.0761*	-	-	0.0193**	0.0778*	-	-
INF	0.0004***	0.0029***	-	-	0.0053***	0.0385**	-	-
TB	0.0000***	0.0001***	-	-	0.0000***	0.0000***	-	-
MIG	0.0000***	0.0000***	-	-	0.0000***	0.0000***	-	-
CR	0.2337	0.7857	0.0000***	0.0000***	0.1988	0.6621	0.0000***	0.0000***
DR	0.0000***	0.0000***	-	-	0.0004***	0.0000***	-	-

Note: ***, ** and * denote that a series is stationary at 1%, 5% and 10% level of significance, respectively.

Source Central Bank of Lesotho

The results of both the ADF and PP tests provide evidence that the interest rate spread, inflation, Treasury bill rate, growth in narrow money and the deposit rate are stationary in levels. Conversely, the credit risk variable is stationary after first difference. Given that none of the variables are integrated of order two, the study proceeded to carry-out ARDL bounds testing approach to cointegration.

5.3 Results of the Bounds Test for Cointegration

After confirming that none of our model variables are integrated of order two, the next step is to investigate for the existence of long-run cointegration between model variables under the null hypothesis of no cointegration using the bounds test approach. Table 6 displays the results.

Table 6	ARDL Bounds Testing to Cointegration Results				
F-Bound Test	*Null Hypothesis: No Levels Relationship*				Evidence of Cointegration
Test Statistic	*Value*	*Significance*	*I(0)*	*I(1)*	Yes
Calculated F-Statistic	7.955213*	10%	2.26	3.35	
K	5	5%	2.62	3.79	
Actual Sample Size	111	1%	3.41	4.68	

Note: Critical values were generated by Eviews 11 and they are in line with those extracted from Narayan (2005); k is the number of regressors. * denotes the level of statistical significance at 1%.

Source Central Bank of Lesotho

The calculated F-Statistic of 7.96 is greater than the upper bound critical values at all levels of significance. The findings offer overwhelming evidence of the existence of a long-run steady relationship between the interest rate spread and chosen predictor variables in Lesotho. This finding is in harmony with the findings of Sheriff and Amoako (2014) and Obeng and Sakyi (2017).

5.4 Long-Run Coefficient Estimation

Since cointegration has been established between the model variables, next, the study estimated the long-run coefficients using the ARDL framework. The results of the long-run model are presented in Table 7.

Table 7 ARDL Results of the Long-Run Relationship Estimation

Explanatory Variable	Coefficients	T-statistics	(P-Value)
INF	0.193620***	7.896859	(0.0000)
TB	0.996124***	9.246192	(0.0000)
M1g	0.002266	0.588332	(0.5578)
CR	0.002363	0.356614	(0.7222)
DR	-0.816829***	-8.001820	(0.0000)
C	3.099173***	5.886072	(0.0000)

Note: Dependent Variable = SP. ***, **, * denote the level of statistical significance at 1%, 5% and 10%, respectively. The values in parentheses are the probability values. The selected model is ARDL (1, 0, 9, 0, 0, 8).

Source Central Bank of Lesotho

Using the Akaike information criteria (AIC), the following specification of the model was chosen; ARDL (1, 0, 9, 0, 0, 8). Consistent with the findings of Demirgüç-Kunt and Huizinga, (1999); Brock and Suarez (2000); Chirwa and Mlachila (2004); Crowley, (2007); Folawewo and Tennant, (2008); Ahokpossi (2013); Sheriff and Amoako (2014); Obeng and Sakyi (2017) and Khan and Jali (2020), the macroeconomic indicators included in our study conform to Apriori expectations. Our results indicate a positive and highly statistically significant relationship between inflation (INF) and interest rate spreads in the long-run. This confirms that banks in Lesotho perceive the inflation rate to be an indicator of the cost of doing business in the country and thus price it into their interest margins. Although the coefficient of inflation is positive and highly statistically significant in the long-run, it is considerably less than one. This is a reflection that deviations from average inflation rates are not fully passed through into lending rates. The finding is consistent with results discovered by Jamaludin *et al.,* (2015), Sheriff and Amoako (2014) together with Obeng and Sakyi, (2017). The implication is that deviations in inflation affect the interest rate spread with only a secondary effect owing to the possibility that banks expect them to be temporary.

We also find, consistent with Tarus and Manyala (2018) that the coefficient of the 91-day TBill rate is positive and statistically significant in the long-run. A one per cent increase in the TBill rate is expected to lead to an increase of 0.99 per cent increase in the interest margin in the long-run, holding all else constant. The finding confirms that commercial banks view the TBill rate as an indicator of government interest rate policy with the expectation that positive changes in the TBill rate will translate in an increase in their cost of borrowing and as such they price it into the services they offer. Even though the growth of narrow money is positive as per our Apriori expectations, it is not statistically significant in the long-run. A similar finding was obtained by Folawewo and Tennant, (2008) for countries in sub-Saharan Africa and by Obeng and Sakyi, (2017) in Ghana. The implication of this finding is that banks appear not consider the growth in money supply to result in any permanent deviations of inflation from its average. As a result, they do not price in any risk premium into their lending rate as a result of money supply growth.

Evidence from the bank specific factors reveals that the credit risk variable as measured by the ratio of total loans by banks to total bank assets is positive as per Apriori expectations but is not statistically significant. A possible explanation lies in the consistently low levels of non-performing loans that averaged around 3.04 per cent over the period from January 2009 to December 2018. In addition, according to the IMF (2018), Lesotho's banks are quite well capitalised such that even in the face of extreme fiscal shocks such as expenditure cuts, salary freezes, retrenchment of personnel and increasing arrears to service providers, banks would easily be able to cushion against the first round impact of the shock. We also find, consistent with Jamaludin et al., (2015) and in a similar way to the coefficient of inflation discussed earlier, that the coefficient on the deposit rate is highly statistically significant, but considerably smaller than one. The less than one-for-one pass-through from deposit to lending rates is a reflection that deposits, while being an important source of bank funding, are not the only one.

5.5 Short-Run Dynamics Estimation based on ARDL

The short-run dynamics of the relationship between interest rate spreads, macroeconomic factors and bank-specific factors were investigated by following the ECM-ARDL model. Table 8 reports the results of estimated short-run coefficients together with the associated model diagnostic tests. The coefficient of the lagged error correction term (ECT), which represents the speed of adjustment to the long-run equilibrium following a shock in the previous period, is negative and statistically significant at 1 per cent level of significance. It shows that any shock in the previous period associated with the model is adjusted back to equilibrium in the long-run with at an approximate speed of 32 per cent.

Table 8 Results of the Short-Run Relationship Estimation

Part A: Error Correction Model			
Explanatory Variable	**Coefficients**	**T-statistics**	**(P-Value)**
D(INF)	0.062126***	5.187288	0.0000
D(TB)	0.052423	0.742109	0.4600
D(M1g)	0.000727	0.582531	0.5617
D(CR)	0.000758	0.364668	0.7162
D(TB(-8))	-0.0411**	-2.628	0.0142
D(DR)	-0.738038***	-9.536436	0.0000
D(DR(-2))	0.202966*	1.846192	0.0683
D(DR(-5))	-0.202519*	-1.860308	0.0662
D(DR(-7))	0.132923*	1.824816	0.0715
ECT(-1)	-0.320865***	-6.088737	0.0000
Part B: Diagnostic Tests			
Test	**Test Statistic**		**Probability Value**
R-Squared	0.957231		-
Adjusted R-Squared	0.945924		-
Bai and Ng Long-run Normality test	2.591408		0.2737
Breusch-Godfrey-LM test	0.370862		0.8307
BPG Heteroskedasticity test	21.92859		0.5228
Ramsey-RESET test	0.136441		0.7128

Note: Dependent Variable = SP. ***, **, * denote the level of statistical significance at 1%, 5% and 10%, respectively. The values in parentheses are the probability values. The selected model is ARDL (1, 0, 9, 0, 0, 8).

Source Central Bank of Lesotho

From Table 8, the coefficients of inflation and the deposit rate in the short-run behave in a similar way to how they behaved in the long-run. The impact of inflation on interest rate spread is still positive and highly statistically significant. However, the magnitude is much smaller than it is in the long-run results. These findings are in line with those obtained by Sheriff and Amoako (2014) coupled with Obeng and Sakyi, (2017) and suggest that banks price-in inflation to a lesser extent in the short-run than they do in the long-run. They also rely less on deposit liabilities to finance credit extension in the short-run than in the long-run.

Model diagnostic tests for serial correlation, heteroskedasticity, the Ramsey RESET and the long-run normality are presented in Appendices A2 to A5. These diagnostic tests results indicate that the model residuals are normally distributed in the long-run and that they have no serial correlation and no heteroscedasticity. Moreover, results of the Ramsey RESET show no evidence of model misspecification. Appendices A6 and A7 report the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests, respectively. The tests reflect that the model is robust and stable since test recursive residuals remain within the boundaries of the 5 per cent critical lines.

5.6 Results of the NARDL Bounds Test for Cointegration

The possibility of the existence of an asymmetric impact of macroeconomic and bank-specific factors on interest margins in Lesotho was further examined. The NARDL model is used to capture positive and negative shocks in inflation (INF), the deposit rate (DR) and the Treasury bill rate (TB). Table 9 reports the empirical findings of the NARDL bounds test for cointegration. In the same way as the ARDL model, the F-statistic for testing the existence of long-run cointegration within the NARDL framework provides evidence of the existence of a long-run steady state relationship between model variables at all levels of significance.

Table 9 NARDL Bounds Testing to Cointegration Results

F-Bound Test	*Null Hypothesis: No Levels Relationship*				Evidence of Cointegration
Test Statistic	*Value*	*Significance*	*I(0)*	*I(1)*	
Calculated F-Statistic	5.852350*	10%	1.85	2.85	**Yes**
K	8	5%	2.11	3.15	
Actual Sample Size	110	1%	2.62	3.77	

Note: Critical values were generated by Eviews 11 and they are in line with those extracted from Narayan (2005); k is the number of regressors. * denotes the level of statistical significance at 1%.

Source: Central Bank of Lesotho

5.7 NARDL Long-Run Coefficient Estimation

The establishment of the presence of cointegration between the model variables allows for the estimation of the long-run coefficients associated with NARDL model. Table 10 presents the long-run estimates of the NARDL model.

Table 10	Long-Run NARDL Results		
Explanatory Variable	Coefficients	T-statistics	(P-Value)
INF_POS	0.179074	6.069676	(0.0000)
INF_NEG	-0.128463	-3.077055	(0.0031)
TB_POS	0.153496	2.051129	(0.0446)
TB_NEG	0.875928	5.588960	(0.0000)
DR_POS	-1.259538	-7.891793	(0.0000)
DR_NEG	-0.377585	-1.270050	(0.2089)
C	10.588110	16.926584	(0.0000)
Diagnostic Tests			
Test		**Test Statistic**	**Probability Value**
R-Squared		6.069676	(0.0000)
Adjusted R-Squared		-3.077055	(0.0031)
Bai and Ng Long-run Normality test		2.051129	(0.0446)
Breusch-Godfrey-LM test		5.588960	(0.0000)
BPG Heteroskedasticity test		-7.891793	(0.0000)
W^{INF}_{LR}		-1.270050	(0.2089)
W^{TB}_{LR}		16.926584	(0.0000)

Note: Dependent Variable = SP. ***, **, * denote the level of statistical significance at 1%, 5% and 10%, respectively. The values in parentheses are the probability values. The selected model is ARDL (1, 9, 1, 1, 9, 3, 7, 1, 8). W^{INF}_{LR} and W^{TB}_{LR} refer to the Wald tests of long-run and short-run symmetry in inflation and the Treasury bill rate, respectively.

Source Central Bank of Lesotho

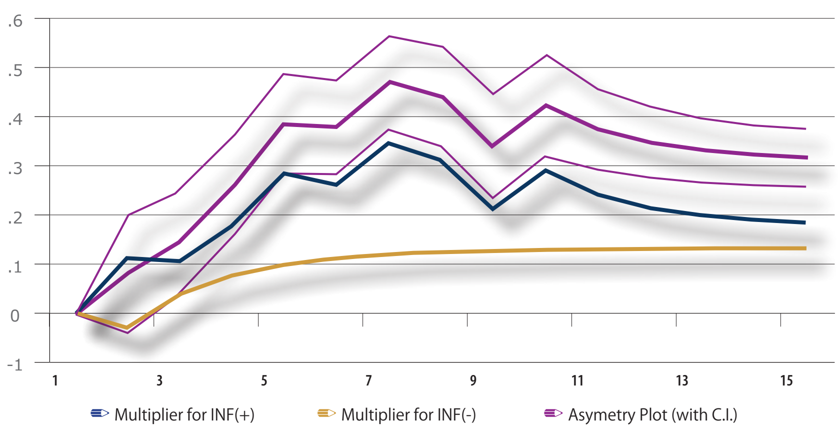
Positive and negative shocks in inflation lead to highly statistically significant positive and negative developments in interest margins in the long-run, respectively, with differing magnitudes. In each case, just as in the ARDL long-run results, the coefficients are considerably less than one. A one per cent increase in the level of inflation leads to a 0.18 per cent increase in the interest rate spread while a one per cent decline leads to only a 0.13 per cent decline. This shows that positive shocks to inflation have more impact on the interest margin than the negative shocks. Interestingly, positive and negative shocks to the Treasury bill rate lead increases to the interest margin. However, the incremental effect of the negative shock outweighs a similar effect from the positive shock. According to Demirgüç-Kunt and Huizinga, (1999) and Brock and Suarez (2000) this could be a reflection of banks' hedging activities against reinvestment risk. Although a negative shock to the deposit rate is statistically insignificant, a one per cent increase in the deposit rate under the NARDL results in a negative and highly statistically significant decline of

1.26 per cent in the interest margin. This magnitude is greater than it was in the ARDL long-run results.

The NARDL model diagnostic test results are presented in Appendices A8 to A12. They show that the model residuals are normally distributed with no signs of serial correlation and heteroskedasticity. Moreover, there is no evidence of model misspecification and as far as the CUSUM and CUSUMSQ stability tests are concerned, the model is found to be robust and stable. It is also important to note that from the Wald test, the null hypothesis of long-run symmetry is only rejected for the Treasury bill rate at the five per cent level. This offers proof of the long-run asymmetric effects of the Treasury bill rate on interest rate spreads in Lesotho.

The dynamic multipliers (that is, the asymmetric adjustments) of inflation, the Treasury bill rate and the deposit rate from an initial long-run equilibrium to a new long-run equilibrium following a one per cent positive and negative shock are presented in Figures 3, 4 and 5, respectively. The results echo those discussed in Table 10. From The figures, each variable attains a new equilibrium after approximately 15 months after each positive or negative unitary shock.

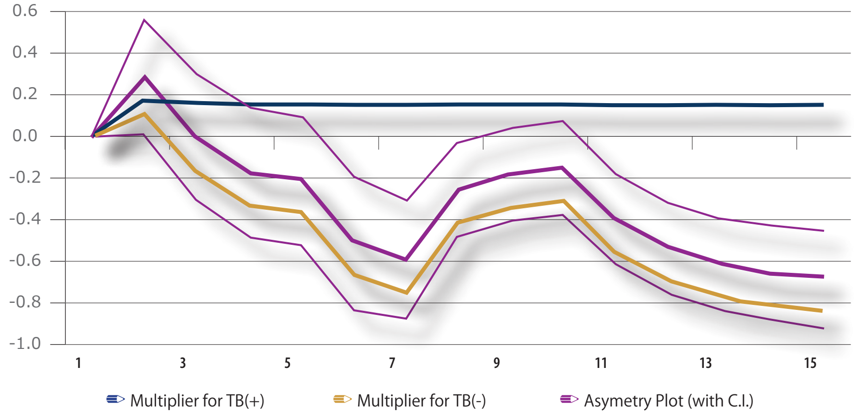
Figure 3 Long-Run Dynamic multiplier of INF on SP



Note: INF denotes inflation. The horizontal axis indicates months taken to achieve the long-term equilibrium association. The vertical axis indicates the magnitude of negative and positive shocks in INF.

Source: Long-Run Dynamic multiplier of INF on SP

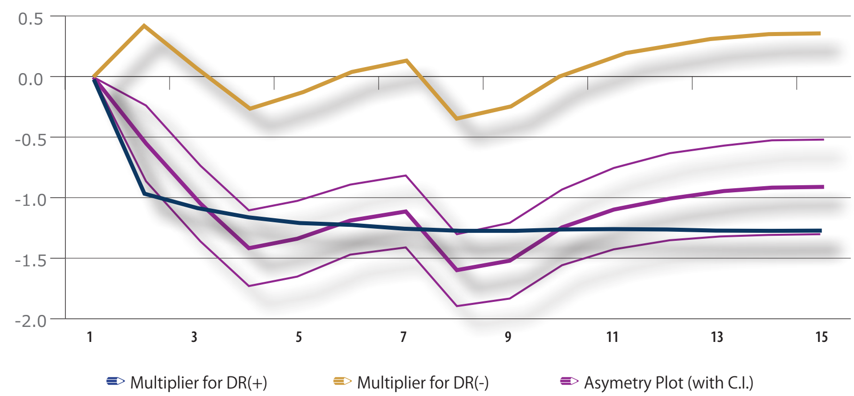
Figure 4 Long-Run Dynamic multiplier of TB on SP



Note: TB denotes inflation. The horizontal axis indicates months taken to achieve the long-term equilibrium association.
The vertical axis indicates the magnitude of negative and positive shocks in TB.

Source: Long-Run Dynamic multiplier of TB on SP

Figure 5 Long-Run Dynamic multiplier of DR on SP



Note: DR denotes inflation. The horizontal axis indicates months taken to achieve the long-term equilibrium association.
The vertical axis indicates the magnitude of negative and positive shocks in DR.

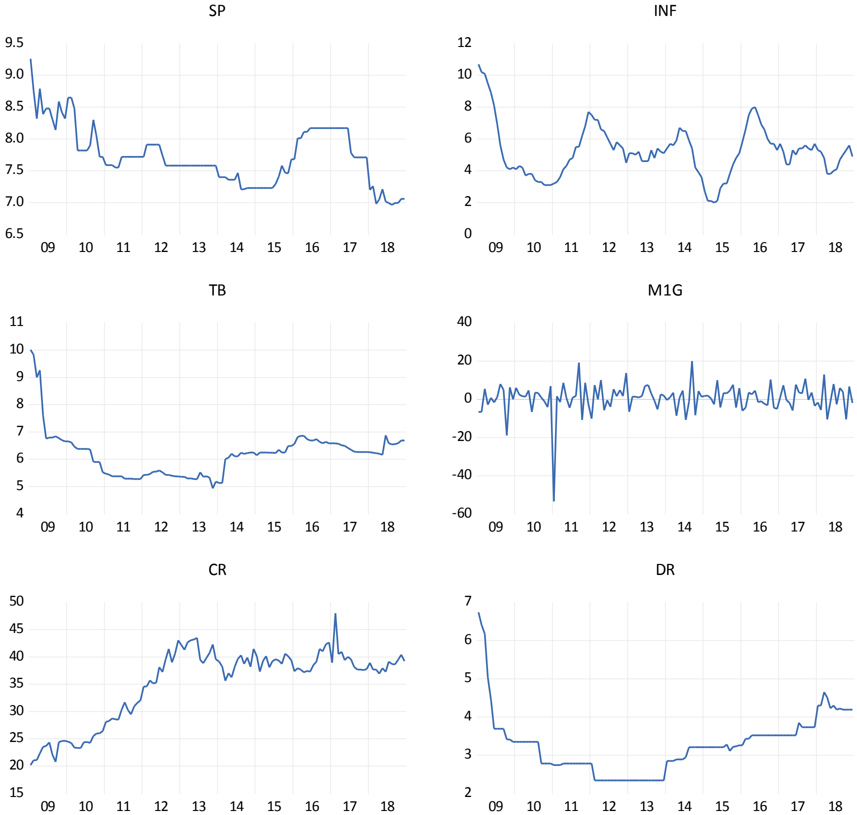
Source: Long-Run Dynamic multiplier of DR on SP

6 CONCLUSIONS AND RECOMMENDATIONS

The aim of this paper was to investigate the macroeconomic and bank-specific determinants of interest rate margins in Lesotho with a focus on the short and long run symmetric and asymmetric nature of this relationship. To achieve this, the study used monthly time series data from January 2009 to December 2018 together with the ARDL bounds testing approach proposed by Pesaran et al. (2001) to test the existence of long-run cointegration. In addition, the existence of nonlinearity in the relationship between interest margins and the predictor variables was evaluated using the NARDL model pioneered by Shin *et al.* (2014). The empirical findings associated with both the ARDL and NARDL models revealed the existence of a steady long-run relationship between the variables considered in the study. In consistency with the literature, the Treasury bill rate and inflation were found to have a positive and highly statistically significant impact on interest margins in Lesotho in the short and long-run. In addition, the deposit rate had a negative and highly statistically significant effect on the interest rate spread in the short and long-run. Further evidence suggests that the pass-through of inflation and the deposit rate to the interest rate spread was less than one in both in the short and long-run, signalling an incomplete pass-through. This confirms two things. First, inflation affects banks' lending rates with a second round effect. Second, deposits are not the only source of credit financing for banks in Lesotho. The magnitude of the respective impact of inflation and deposit rates on the interest rate spread was found to be smaller in the short-run than it is in the long-run. This suggests that banks price-in inflation to a lesser extent in the short-run than they do in the long-run. They also rely less on deposit liabilities to finance credit extension in the short-run than in the long-run. The empirical findings based on the NARDL model rejected the null hypothesis of symmetric relationship between interest margins and the Treasury bill rate. Positive and negative shocks to the Treasury bill rate lead to increases in the interest rate spread with the positive shocks having less of an impact than the negative shocks. Inflation's impact on the interest margin conforms with theory. However, positive shocks to inflation have more of an impact on the interest margin than do negative shocks.

In the main, the study's findings reflect that macroeconomic instabilities and bank specific factors such as high and volatile prices and deposit rates sustained at low levels are more likely to create a widening of interest rate spreads in Lesotho. In light of these results, authorities and policy makers are advised to ensure price and general macroeconomic stability while also pursuing policies aimed at maximising savings. Failure to do so is likely to result in elevated financial sector risk and uncertainty that can lead to wider interest rate margins.

A 1 Graphical Depiction of Study Variables



Source: Authors Own Calculations based on data from IMF-FAS

A 2	Breusch-Godfrey Serial Correlation LM Test		
F-statistic	0.142473	Prob. F(2,85)	0.8674
Obs*R-squared	0.370862	Prob. Chi-Square(2)	0.8307

A 3 Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.932833	Prob. F(23,87)	0.5567
Obs*R-squared	21.95859	Prob. Chi-Square(23)	0.5228
Scaled explained SS	41.68541	Prob. Chi-Square(23)	0.0099

A 4 Ramsey RESET Test

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.369379	86	0.7128
F-statistic	0.136441	(1, 86)	0.7128

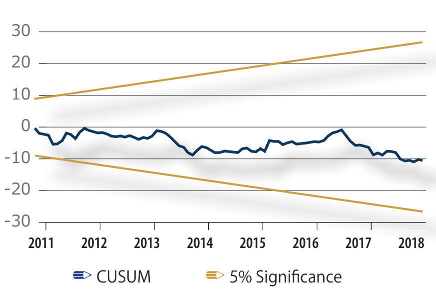
F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.001152	1	0.001152
Restricted SSR	0.727505	87	0.008362
Unrestricted SSR	0.726353	86	0.008446

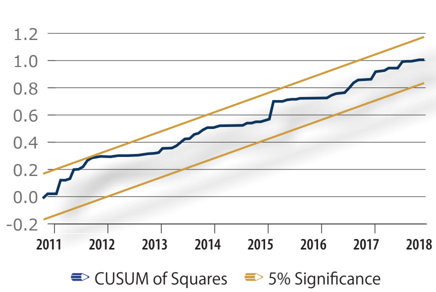
A 5 Bai and Ng (2005) Long-Run Normality Test

	Statistic	Prob.
Skewness	-0.28478	0.612094
Skewness 3/5	3.139727	0.000846
Kurtosis	1.431219	0.076184
Normality	2.591408	0.273705

A 6 CUSUM Graph



A 7 CUSUMSQ Graph

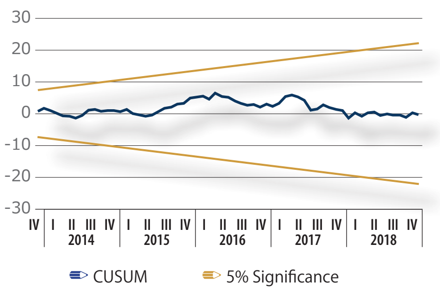


A 8	Breusch-Godfrey Serial Correlation LM Test for NARDL		
F-statistic	1.029031	Prob. F(2,59)	0.3637
Obs*R-squared	3.707731	Prob. Chi-Square(2)	0.1566

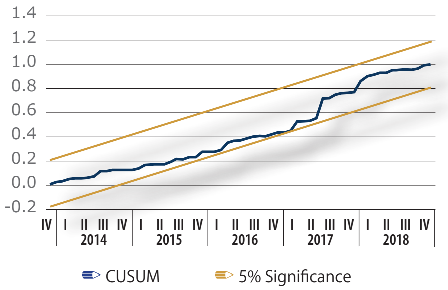
A 9	Heteroskedasticity Test for NARDL: Breusch-Pagan-Godfrey		
F-statistic	1.012279	Prob. F(48,61)	0.4779
Obs*R-squared	48.77145	Prob. Chi-Square(48)	0.4418
Scaled explained SS	31.41463	Prob. Chi-Square(48)	0.9692

A 10	Bai and Ng (2005) Long-Run Normality Test for NARDL	
	Statistic	Prob.
Skewness	-0.49317	0.689054
Skewness 3/5	2.25114	0.012188
Kurtosis	1.108916	0.133733
Normality	2.375209	0.304951

A 11 NARDL CUSUM Graph



A 12 NARDL CUSUMSQ Graph



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