DETERMINANTS OF INTEREST RATE SPREADS IN SUB-SAHARAN AFRICAN COUNTRIES: A DYNAMIC PANEL ANALYSIS

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Introduction

Efficient financial intermediation is an important factor in economic development process as it has implication for effective mobilisation of investible resources. Consequently, banking sector efficiency plays significant role in an economy. A major indicator of banking sector efficiency is interest rate spreads, which have been found to be higher in African, Latin American and the Caribbean countries than in OECD countries (Randall, 1998; Brock and Rojas-Suárez, 2000; Chirwa and Mlachila, 2004; Gelos, 2006; Crowley, 2007). A wide deposit-lending rate margin is not only indicative of banking sector inefficiency; it also reflects the level of development of the financial sector.

The prevailing margin between deposit-lending rates, the interest rate spreads (IRS) in an economy has important implications for the growth and development of such economy, as numerous authors suggest, a critical link between the efficiency of bank intermediation and economic growth. Quaden (2004), for example, argues that a more efficient banking system benefits the real economy by allowing 'higher expected returns for savers with a financial surplus, and lower borrowing costs for investing in new projects that need external finance.' Therefore, if the banking sector's interest rate spread is large it discourages potential savers due to low returns on deposits and thus limits financing for potential borrowers (Ndung'u and Ngugi, 2000).[i] Valverde et al (2004) elucidate by noting that because of the costs of intermediating between savers and borrowers, only a fraction of the savings mobilized by banks can be finally channelled into investments. An increase in the inefficiency of banks increases these intermediation costs, and thereby increases the fraction of savings that is 'lost' in the process of intermediation. This ultimately reduces lending, investment and economic growth.[ii]

These implications of banking sector inefficiency have spurred numerous debates in developing countries about the determinants of banking sector interest rate spreads. Studies have shown that there is a pervasive view amongst some stakeholders that high interest rate spreads are caused by the internal characteristics of the banks themselves, such as their tendency to maximize profits in an oligopolistic market, while many others argue that the spreads are imposed by the macroeconomic, regulatory and institutional environment in which banks operate.[iii] These debates can only be resolved through objective, quantitative analysis of the determinants of banking sector interest rate spreads in developing countries.

Many studies have attempted to conduct such analyses, but because of the dearth of actual loan and deposit interest data from individual commercial banks, most have resorted to using the banks' net interest margin (NIM) as a proxy for the interest rate spread.[iv] Demirguc-Kunt and Huizinga (1998) have justified the use of such proxies by noting that both *ex ante* and *ex post* spreads can be used in studies of bank efficiency. Whereas *ex ante* spreads are calculated from the contractual rates charged on loans and paid on deposits, *ex post* spreads measure the difference between banks' interest revenues and actual interest expenses. While noting that both proxies have advantages and disadvantages, Demirguc-Kunt and Huizinga (1998) chose to use an *ex post* proxy for which individual bank data are widely available, that is, the net interest margin (NIM). Brock and Franken (2003), however, caution against the isolated use of such *ex post* proxies in making conclusive statements about the determinants of interest rate spreads in commercial banks, as misinterpretation of interest rate spread regressions are likely. Demirguc-Kunt and Huizinga (1998) concur by noting that 'while net interest margin can be interpreted as a rough index of bank (in)efficiency, this does not mean that a reduction in net interest margins always signals improved bank efficiency.'[v] Brock and Fraken (2003) therefore suggest the

compilation and use of loan and deposit rate data from individual commercial banks in the study of interest rate spreads. However, because of data unavailability, the study of such spreads across a broad cross-section of developing countries is impossible. As an alternative, recent papers have examined interest rate spreads using data agglomerated by type of operation but not by individual commercial banks. This allowed for a more accurate calculation of spreads for the overall banking sector.[vi] These studies, however, only focused on a limited number of countries in Latin America and the Caribbean, the European Union and Africa.

This paper uses a similar principle of examining *ex-ante* spreads in the deposit-taking banking sector, using the actual loan and deposit interest rate data provided in the IMF's *International Financial Statistics*. It adds to the existing literature by using actual interest rate data to investigate the determinants of banking sector interest rate spreads across a wide range of countries in Sub-Sahara Africa (SSA). Therefore, the study represents a departure from specific country case study analyses that have been done for few African countries. For example, Ndung'u and Ngugi (2000) examine the causes of high interest rate spreads in Kenya, while Chirwa and Mlachila (2004) did a similar study for Malawi. In a recent study Crowley (2007), for example, compared both *ex-ante* and *ex-post* measures of interest rate spreads for the aggregate banking sector in English-speaking African countries. His findings suggest that analyses using *ex-ante* measures of interest rate spreads provide more useful results than those using *ex-post* measures.

This paper also adopts a macro approach to the investigation of interest rate spreads, as unlike Demirguc-Kunt and Huizinga (1998) we have used aggregated banking sector data rather than balance sheet data on individual banks. Although this was unavoidable due to data constraints, it allowed us to focus more intensively on the industry or market-specific and

macroeconomic determinants of interest rate spreads in the banking sector. In this respect, an important contribution made in this paper is the inclusion of macro-policy indicators not included in previous studies. So in addition to the traditional macroeconomic indicators highlighted by Demirguc-Kunt and Huizinga (1998), this paper investigates the effect of government policy measures, such as changes in the Treasury bill and discount rates, public-sector crowding out, government deficit financing, and money supply activities. This is an important addition to the literature, as it highlights the policy changes which will have the greatest and most direct impact in reducing spreads and increasing the efficiency of the banking sector.

The rest of the paper is divided into four subsequent sections. Section Two briefly surveys the literature on the determinants of commercial banks' interest rate spreads. Section Three describes the model, methodology and data used. Section Four highlights our results, and Section Five presents our conclusions.

2. Determinants of Interest Rate Spreads: A Brief Survey of the Literature

The literature is replete with empirical studies on the determinants of spreads or differentials between various types of interest rates. Rockerbie (1993), for example examines the determinants of interest rate spreads on sovereign Eurodollar loans, D'Amato and Pistoresi (2001) study the determinants of long-term yield spreads between Italian and German bonds, Marshall and Ho (2006) focus on the determinants of swap spreads in the United Kingdom, and Ito (2007) investigates the determinants of swap spreads in Japan.[vii] This paper, however, focuses specifically on commercial bank interest rate spreads. The approach used in much of the literature is to classify determinants of commercial banks' interest rate spreads according to

whether they are bank-specific, industry (market) specific or macroeconomic in nature. Demirguc-Kunt and Huizinga (1998), Moore and Craigwell (2000), Brock and Rojas-Suarez (2000), Gelos (2006), Sologoub (2006), and Crowley (2007) note that the specific characteristics of commercial banks that are usually theorized to have an impact on their spreads include the size of the bank, ownership pattern, the quality of the loan portfolio, capital adequacy, overhead costs, operating expenses, and shares of liquid and fixed assets. Robinson (2002) further notes that the incidence of fraud, the ease with which bad credit risks survive due diligence, and the state of corporate governance within banks all lead to higher operating costs, asset deterioration and ultimately wider interest rate spreads. These studies all show that such bank-specific factors impact significantly on commercial banks' net interest margins. Notwithstanding this, Brock and Franken (2002) note that the results of many other studies suggest that individual bank characteristics are often not tightly correlated with interest rate spreads.[viii] It is asserted that this may be because spreads are largely determined at the industry level, thus making individual bank characteristics more relevant to other variables, such as bank profitability.

A similar argument, made to explain the failure of spreads in developing countries to converge to international levels even after financial liberalization, suggests that high interest rate spreads in developing countries will persist if financial sector reforms 'do not significantly alter the structure within which banks operate' (Chirwa and Mlachila, 2004). This structure refers to the market/industry and macroeconomic environment in developing countries. The market-specific determinants of commercial bank interest rate spreads highlighted in the literature typically include lack of adequate competition in the banking sector and consequent market power of commercial banks, the degree of development of the banking sector, and explicit and implicit taxation - such as profit taxes and reserve requirements. Cross-country studies have also

established that banking spreads tend to fall as institutional factors improve.[ix] Such factors include the efficiency of the legal system, contract enforcement, and decreased levels of corruption, which are all critical elements of the basic infrastructure needed to support efficient banking. Several studies on small island developing states (SIDS) further note that interest rate spreads are widened by scale diseconomies due to the small size of markets (Demirguc-Kunt and Huizinga, 1998; Moore and Craigwell, 2000; Robinson, 2002; Jayaraman and Sharma, 2003; and Chirwa and Mlachila, 2004).[x] Of these factors, evidence has been found that interest rate spreads (as proxied by NIMs) are increased by:

- greater market power of commercial banks (Barajas et al, 2000);
- poorly-developed banking sectors (Demirguc-Kunt and Huizinga, 1998);
- high reserve requirements (Barajas et al, 2000); and
- inefficiency of the legal system and high corruption (Demirguc-Kunt and Huizinga, 1998).

Macroeconomic factors have also been shown to explain significant variation in commercial bank interest rate spreads.[xi] Brock and Franken (2003) quote from a Moody's report which argues that, 'macroeconomic factors are certainly among the most influential sources for variations in credit spreads.' Chirwa and Mlachila (2004) concur and assert that macroeconomic instability and the policy environment have important impacts on the pricing behaviour of commercial banks. They note that the macroeconomic variables typically thought to be determinants of interest rate spreads include inflation, growth of output, and money market real interest rates. Brock and Franken (2002) include interest rate uncertainty and exchange rate volatility, and Randall (1998)[xii] also includes the share of commercial bank public sector loans, in her list of determinants of spreads in the Caribbean. Randall's inclusion is similar to the additional variables suggested by stakeholders in Jamaica, as Tennant (2006) showed that macro-

policy variables, such as public sector domestic borrowing, discount rates and Treasury Bill rates, are commonly perceived to impact on commercial bank spreads. Additional macro-policy variables included by Crowley (2007) in his study of English-speaking African countries are broad money growth, and the fiscal balance. The macroeconomic variables which have been empirically shown to increase interest rate spreads include:

- high and variable inflation and real interest rates (Demirguc-Kunt and Huizinga, 1998);
- interest rate uncertainty - proxied by inter-bank interest rate volatility (Brock and Franken, 2002);
- broad money growth (Crowley, 2007);
- increased fiscal deficits (Crowley, 2007); and
- a high share of commercial bank public sector loans (Randall, 1998).

3. Model Specification, Data and Estimation Procedures

3.1 Model Specification

This paper examines the determinants of banking sector interest rate spreads in middle and low-income countries. We have used the determinants from previous studies to guide our choice of independent variables, but instead of focusing on the customary spreads or margins of individual banks, we have examined the spreads for the banking sector as a whole. This allows for the use of actual interest rate data in the calculation of spreads, and gives a better understanding of the broad state of efficiency of financial intermediation in the countries studied, thereby more effectively highlighting the macro-implications of such. Based on the availability of data, we have focused only on market (or industry-specific) and macroeconomic determinants of spreads. The variables used in this study are outlined in the paragraphs that follow.

Dependent Variable

Based on the data available in the IMF's *International Financial Statistics*, we use an *ex ante* approach in calculating the interest rate spread. This approach 'uses the rates quoted on loans and on deposits and draws inferences from the difference between them.'[xiii] Our dependent variable, bank interest rate spread, is therefore defined as the difference between bank lending and deposit rates. Ideally, it is measured as the difference between the average interest rate earned on loans and the average interest rate paid on deposits for individual commercial banks (Sologoub, 2006). However, due to the unavailability of such bank-level data on interest rates in many developing countries, and in order to better understand the broad state of efficiency of financial intermediation in an economy, banking sector spreads are instead examined. This is done by using the average commercial bank lending and deposit rates provided for low and middle-income countries.[xiv] The banking sector interest rate spreads (IRS) are therefore calculated as:

IRS = Average Commercial Bank Lending Rate – Average Commercial Bank Deposit Rate *(1)*

Market Determinants of Banking Sector Interest Rate Spreads

The market or industry-specific determinants of spreads included in this paper account for the impacts of the structure and development of the banking sectors in the respective countries, prescribed reserve requirements, and economies/diseconomies of scale, as determined by market size. The structure and development of the banking sector is captured using two proxies – the Bank/GDP ratio and Real Per Capita GDP. As in Demirguc-Kunt and Huizinga (1998) the

bank/GDP ratio *(BANKDEV)* is calculated as the total assets of commercial banks divided by current GDP. This ratio reflects the overall level of development of the banking sector, and the level of inter-bank competition in well-developed banking sectors. This ratio is expected to have a negative correlation with the dependent variable, as an improvement in the level of banking sector development and competition should force down banking sector interest rate spreads (IRS). Real per capita GDP *(RGDPpc)* should have a similar effect on IRS, as it is included as a general index of economic development, and should therefore reflect 'differences in banking technology and the mix of banking opportunities' (Demirguc-Kunt and Huizinga, 1998:16).

Prescribed reserve requirements are included as a market determinant of banking sector IRS, as such reserves reflect a burden associated with operating in the banking sector.[xv] A positive correlation between such reserves and IRS is expected, as high liquidity reserve requirements act as an implicit financial tax by keeping interest rates high. Chirwa and Mlachila (2004) explain by noting that, 'the opportunity cost of holding reserves at the central bank, where they earn no or little interest, increases the economic cost of funds above the recorded interest expenses that banks tend to shift to customers.' They further argue that the large pool of resources created by high reserve requirements allow for the financing of high fiscal deficits, and thereby creates an environment of high inflation and persistently high intermediation margins. Because data on required reserves are not widely available, actual reserves of commercial banks are used as a proxy. Demirguc-Kunt and Huizinga (1998) note that this is a reasonable proxy, as reserves are generally remunerated at less-than-market rates. The variable used *(RESREQ)* is the ratio of reserves to deposits, and is calculated as the banking sector's aggregate reserves divided by its total deposits.

This paper also measures the impact of market size on banking sector IRS, as studies on small island developing states suggest that diseconomies of scale may increase per unit costs in commercial banks, thus keeping spreads high.[xvi] In the absence of data on the actual sizes of banking markets in developing countries, we have used the population size as a broad proxy for market size. This variable *(SCALE)* is expected to be negatively correlated with IRS, as banking sectors in countries with larger populations are more likely to benefit from economies of scale, thereby enabling them to keep their costs and spreads down. It should be noted, though, that this is an imperfect proxy, as ideally the measure of economies of scale should reflect the market size of individual banks and not the entire economy. This is because even in countries with small populations, large banks may be able to achieve economies of scale by capturing relatively large segments of the market. In the absence of the requisite data to calculate a more accurate measure, this proxy, however, has to suffice.

Macroeconomic Determinants of Banking Sector Interest Rate Spreads

The macroeconomic determinants of spreads included in this paper account for the impacts of macroeconomic instability and the macro-policy environment on banking sector IRS. Similar to most studies in this area, the inflation rate for each country has been included, and has been calculated as the annual percentage change in the CPI. This variable *(INFL)* is an indicator of the cost of doing business in an economy, and it is expected to be positively correlated with IRS, particularly in developing countries where inflation is high and variable (Chirwa and Mlachila, 2004). Macroeconomic instability is proxied by the variable – exchange rate volatility *(XRATVOL)*. This variable reflects the changes in interest and inflation rates in countries with freely-floating exchange rates. Exchange rate volatility for each year is calculated as the

standard deviation of the percentage change in the real US$ exchange rate for the three preceding years.[xvii] Because increased macroeconomic instability heightens the risk faced by commercial banks, *XRATVOL* is expected to be positively correlated with IRS, as the banking sector increases its spreads to protect against the increased risk.

The macro-policy environment is captured in our model through the use of three variables not commonly used in similar studies. The first proxies the extent of government dependence on the domestic banking sector for the financing of its fiscal deficit. This variable *(CROWD)* measures for the entire banking sector, public sector borrowing as a percentage of total loans. Robinson (2002), notes that 'the level of government borrowing and its influence on money and credit markets is… an element of macroeconomic policy that imposes constraints on the flexibility on interest rates.' CROWD is therefore expected to be positively correlated with IRS, as governments' heavy reliance on domestic banking sectors for deficit financing increases competition for funds and causes interest rates to rise.[xviii] The second macro-policy indictor, the discount rate *(DISRATE)*, is defined as the cost faced by commercial banks when borrowing from central banks. Although declining in popularity, the discount rate is still used by some countries as a monetary policy instrument. Even more importantly, it is expected to be positively correlated with IRS, as it increases the commercial banks' cost of funds, which may be passed on to customers through higher spreads. Finally, the Treasury Bill rate *(TBILL)* is included. It is generally regarded as an indicator of the interest rate policy being pursued by the government, and a benchmark for the rates charged by commercial banks. This variable is therefore also expected to be positively correlated with IRS, because lower Treasury Bill rates would lead to lower interest rate spreads and vice versa. Further, the impact of government fiscal activities on IRS is captured by with the use ration of government deficits to GDP (*DEFGDP)*. This variable

is expected to have appositive relationship with IRS, as increases in government deficits would put pressure on banking sector credit. Finally, the ration of wider money supply to GDP (*M2GDP*) is also used a measure of the influence of the level of monetary aggregates on IRS.

The relationship between the banking sector IRS and its market and macroeconomic determinants is therefore specified as follows:

$$\begin{aligned} IRS_{it} = {} & \alpha_0 + \alpha_1 BNKDEV_{it} + \alpha_2 GDPpc_{it} + \alpha_3 RES_{it} + \alpha_4 SCALE_{it} \\ & + \alpha_5 INFL_{it} + \alpha_6 XRATVOL_{it} + \alpha_7 CROWD_{it} + \alpha_8 TBILL_{it} \\ & + \alpha_9 DISRATE_{it} + \alpha_{10} DEFGDP_{it} + \alpha_{11} M2GDP_{it} + e_{it} \end{aligned} \quad (2)$$

where *i* represents the respective countries and *t* the time periods.

3.2 Data and Descriptive Statistics

This study is conducted using annual data from the IMF's *International Financial Statistics* for the years 1988 – 2005. Attempts are made to include as many SSA countries as possible, however, based on the availability of data for numerous critical variables a maximum of 33 countries were included.[xix] By broadly grouping these countries into geographical regions, that is, Eastern, Central, Southern and Western regions, distinctions across categories of countries are highlighted.

Table 1 highlights the descriptive statistics (means and standard deviations) for all the variables for each grouping of countries. The statistics suggest that the average IRS for the SSA countries is about seven and a half percent; this figure however varies across regional grouping of countries with southern African region having the highest rate of 10.8 and the Western region having the lowest of about five percent. A look at the market determinants suggests that overall

the level of development of banking sector in the SSA countries is very low with an average of 23 percent. East African countries have the most developed banking sector with a mean value of 43 percent, the level of banking development in the Central Africa region is at par with the average of the SSA countries, whilst the Southern African countries have the least developed banking sector with average of 17 percent. Generally, the level of economic development across the SSA countries is relatively high given the mean per capita GDP of about US$987. The statistics show that Central Africa countries have the most developed economies with an average per capita income of about US$1651, the level of economic development in Eastern and the Southern regions is at par with a mean of about US$961, and the Southern region has the least developed economies with a mean per capita income of US$375. The average ratio of reserve requirement across the regional groupings of countries is 18 percent. The market size of the within which banks in the SSA operate is fairly large with an overall average of 15.6 million population. In this regards, the Central African countries have the smallest market size with a mean population of about four million, while Southern countries have the largest market size based on the average population of 24 million, follows by Eastern region with average of 19 million population, whilst the Central African countries have the market size given a mean population of four million.

In terms of macro determinants of IRS, the descriptive statistics indicate that SSA region experience a moderate crowding out as the average CROWD for all countries is 19 percent, the Eastern region having the highest level of 40 percent, while the Southern region has the least level of four percent. Fiscal discipline in the SSA countries poor as shown by the statistics, which indicate that average ratio of government deficits to spending to GDP, is about two hundred and fifty percent for all countries. However, this ratio differs significantly across

regional groupings of countries with one percent, three percent, and 46 percent for Southern, Eastern, and Western regions respectively; and Central region's ratio exceeding the average for all countries. The average Central Bank's discount rate in the SSA countries about seven percent, with the highest rate of about 22 being experienced in the Southern region. Cost of transactions is very much unstable and high within the SSA given the average inflation rate of 17.7 percent for all countries. The rate of inflation is much higher within the Southern region with 46.8 percent, while it is at the lowest in the Central region with about five percent. The ratio of money supply to GDP varies across sub-regional grouping s of countries within the SSA, while the average for all countries is 86 percent, that of Central region is 16 percent, and the ratio for Southern region is over two hundred percent. The average Treasury Bill rate for the SSA countries is 7.27 percent. Finally, the statistics show that exchange rate is highly volatile in the SSA countries with mean volatility rate of about 14 percent.

Generally, the descriptive statistics indicate a wide variation in both the market and macro determinants of IRS across the sub-regional groupings of countries within the SSA. This might have important implications for the analysis of IRS in the SSA countries, thus, in the empirical analysis cross-sectional fixed effect is used to track the possible of the variations.

4. Estimation and Discussion of Results

As a first step in the empirical analysis, we test for correlation among the variables of the model. Table 2 shows the correlation matrix, the correlation coefficients indicate that multicollinearity is not an issue in these estimations, as no two variables are highly correlated. Similarly, a number unit root tests of are performed, the results of which suggest that all the variables are stationary at their ordinary level (see Table 3), except for the Levin, Lin & Chu test which shows that DISRATE

and XRATVOL are not significant at ordinary level. However, all the tests show that all variables are stationary when first-differenced.

In the estimation of the IRS equations, the data is divided into three sets: 1980-2005; 1980-1992; and 1996-2005 based on data constraint. Table 4 shows results of the fixed effect redundant estimation of the IRS equation. The result of Model 1 shows that when the spreads between deposit and saving rates are regressed against the selected market and macroeconomic determinants, one year lagged IRS (IRS(-1)) has a negative and significant relationship on the current level of spreads, indicating that a rise in the variable would have a reducing effect on IRS. Similarly, inflation (INFL), ratio of M2 to GDP (M2GDP), real per capita GDP (RGDPpc), Treasury bill (TBILL), and population (SCALE) have negative relationships with IRS, however, only both M2GDP and RGDPpc are important in the determination of changes in IRS. Although the coefficient of ratio of government deficits to GDP (DEFGDP) appears negative, in actual terms, this indicates that there is a positive relationship between the variable and IRS. Measures of banking sector development (BANKDEV), crowding out by public sector borrowing (CROWD), Central Bank's discount rate (DISRATE), reserve requirement (RESREQ), and exchange rate volatility (XRATVOL) are positively related with IRS; implying that an increase in any of these variables would lead to a further widening of the gap between deposit and lending rates.

In model 2 shows that when all the variables are regressed at first-differenced a similar result to that of level regression is obtained. A major difference in the result obtained in model 2 from that of models 1 is that while most of the variables retained their signs, there is a great improvement in the coefficients of DEFGDP, DISRATE, M2GDP, RESREQ, and RGDPpc, so also is their level of significance. On the other hand, the one year lagged IRS became less

significant. In regression 3, using 1980-92 data set, all the variables retained their signs with the exception of INFL which now became positive and significant. Also, the significance levels of CROWD, DISRATE and TBILL improved tremendously. The result in model 4 obtained when the 1996-2005 data set is used does not differ from the results of previous regression, but for the fact that majority of the variables became less significant.

Overall, the analyses show that out of the touted market determinants of deposit-lending rate spread in the literature, only the scale variable is very important in the determination of variations in IRS in SSA countries, RESREQ and SCALE are of little importance, whilst BANKDEV is irrelevant. On the other hand, the macroeconomic policy variables are much more significant in the determination of the IRS, indicating that changes in IRS respond more to changes in policy variables than changes in market variables.

5. Conclusion

In this paper we have attempted to analyse the determinants of spreads between banks' deposit and lending rates in SSA countries from market and macroeconomic view points, using a dynamic panel data estimation technique. Using annual data covering 33 countries, the results obtained from the paper suggest that different market and macroeconomic policy variables play significant role in explaining variations in IRS in the region. Among others, the paper show that the extent of government crowding out in the banking sector, public sector deficits, discount rate, inflationary level, level money supply, reserve requirement, level economic development, and population size are important determinants of interest rate spreads in SSA countries. This result has an important implication in terms of policy design in the region.

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Appendix : Countries included in the study

All countries
Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Congo Republic
Cote D'Ivoire
Equatorial Guinea
Ethiopia
Gabon
Gambia
Kenya
Lesotho
Madagascar
Malawi
Mali
Mauritius
Niger
Nigeria
Rwanda
Senegal
Seychelles
South African Republic
Swaziland
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Central Africa
Burundi
Cameroon
Central African Republic
Chad
Congo Republic
Equatorial Guinea
Gabon
Rwanda

East Africa
Ethiopia
Kenya
Madagascar
Mauritius
Seychelles
Tanzania
Uganda

Southern Africa
Angola
Botswana
Lesotho
Malawi
South African Republic
Swaziland
Zambia
Zimbabwe

West Africa
Benin
Burkina Faso
Cape Verde
Cote D'Ivoire
Gambia
Mali
Niger
Nigeria
Senegal
Togo

Appendix 2: Table 1 - Descriptive Statistics [a]

Variable	Central Africa	East Africa	Southern Africa	West Africa	All Countries
IRS	8.65 (5.13)	6.82 (5.05)	10.83 (17.77)	5.16 (4.46)	7.52 (173.12)
Market Determinants					
BANKDEV	0.23 (0.33)	0.43 (0.36)	0.17 (0.72)	0.23 (37.77)	0.26(0.44)
RGDPpc (USD)	1650.63(25197.73)	961.95 (1134.11)	374.52 (1016.06)	960.45 (989.19)	987.44 (2746.88)
RESREQ	0.14(0.15)	0.15 (0.10)	0.20 (0.16)	0.20 (0.17)	0.18 (0.15)
SCALE (mn)	4.06(4.43)	18.57 (20.00)	24.08 (40.40)	16.24 (28.50)	15.66 (27.90)
Macro Determinants					
CROWD	0.22(0.20)	0.40(0.26)	0.04(4.96)	0.15(0.13)	0.19(2.44)
DEFGDP	-9.68 (31.35)	-0.03 (0.04)	-0.01 (0.06)	-0.46 (4.58)	-2.50 (16.14)
DISRATE	8.70(2.67)	10.88(10.98)	21.97(34.43)	8.68(4.78)	7.27(10.12)
INFL	4.92(8.62)	15.64(28.58)	46.75(350.81)	6.43(11.19)	17.72(173.12)
M2GDP	0.16(0.06)	0.37(0.24)	2.83(25.81)	0.22(0.17)	0.86(12.68)
TBILL	0.28(1.43)	10.06(8.90)	13.90(17.06)	6.13(4.95	7.27(10.12)
XRATVOL	18.96(24.44)	8.93 (9.77)	14.18(26.18)	13.75(23.02)	14.10(22.37)
N	206	181	204	258	849

a - Means are reported with their standard deviations in parentheses.

Table 2 – Correlation Matrix

	IRS	BANKDEV	CROWD	DEFGDP	DISRATE	INFL	M2GDP	RESREQ	RGDPpc	SCALE	TBILL	XRATVOL
IRS	1.000											
BANKDEV	0.076	1.000										
CROWD	0.034	0.032	1.000									
DEFGDP	-0.064	-0.093	-0.002	1.000								
DISRATE	0.548	-0.036	0.041	0.028	1.000							
INFL	0.312	0.008	0.007	0.009	0.054	1.000						
M2GDP	0.010	0.512	-0.002	0.009	-0.009	-0.001	1.000					
RESREQ	0.127	-0.055	-0.031	0.028	0.052	0.019	-0.057	1.000				
RGDPpc	-0.001	-0.001	0.003	-0.155	-0.056	-0.016	-0.019	0.002	1.000			
SCALE	-0.085	-0.318	-0.147	0.064	-0.005	0.005	-0.012	0.053	-0.114	1.000		
TBILL	0.137	0.112	0.044	0.106	0.386	0.025	0.007	0.113	0.056	0.003	1.000	
XRATVOL	0.042	-0.044	0.016	0.009	0.091	0.007	-0.032	-0.021	-0.027	0.035	0.027	1.000

Table 3: Unit Root Tests

Variable	Level							
	L, L & C	Prob.	I, P & S	Prob.	ADF-F Chi^2	Prob.	PP-F Ch^2	Prob.
IRS	-1.452	0.0732	-1.481	0.0693	91.976	0.0190	95.030	0.0111
BANKDEV	-4871.17	0.0000	-1524.43	0.0000	236.49	0.0000	218.00	0.0000
CROWD	52.505	0.0000	-10.391	0.0000	246.68	0.0000	220.45	0.0000
DEFGDP	NA	NA	NA	NA	138.05	0.0000	196.66	0.0000
DISRATE	-0.022	0.4916	-3.353	0.0004	120.04	0.0001	119.88	0.0001
INFL	-9.725	0.0000	-9.390	0.0000	214.95	0.0000	289.69	0.0000
M2GDP	-8820.38	0.0000	-2379.86	0.0000	299.71	0.0000	290.02	0.0000
RESREQ	-16.814	0.0000	-12.486	0.0000	224.46	0.0000	219.27	0.0000
RGDPpc	-348.86	0.0000	-285.25	0.0000	385.98	0.0000	415.98	0.0000
TBILL	NA	NA	NA	NA	107.08	0.0000	212.58	0.0000
XRATVOL	-0.022	0.4914	-5.733	0.0000	136.14	0.0000	171.74	0.0000
SCALE	-2369.44	0.0000	-15365.4	0.0000	356.69	0.0000	434.55	0.0000
	First Difference							
IRS	-15.813	0.0000	-16.6.5	0.0000	378.60	0.0000	514.74	0.0000
BANKDEV	-6051.51	0.0000	-1033.02	0.0000	1512.96	0.0000	528.61	0.0000
CROWD	97.829	0.0000	-21.816	0.0000	505.84	0.0000	544.45	0.0000
DEFGDP	NA	NA	NA	NA	375.28	0.0000	596.53	0.0000
DISRATE	-9.922	0.4916	-16.757	0.0000	383.98	0.0000	593.69	0.0000
INFL	-20.044	0.0000	-21.742	0.0000	502.98	0.0000	850.29	0.0000
M2GDP	-7319.34	0.0000	-1258.10	0.0000	1408.36	0.0000	570.03	0.0000
RESREQ	-32.012	0.0000	-22.628	0.0000	688.27	0.0000	617.67	0.0000
RGDPpc	-749.86	0.0000	-271.51	0.0000	2489.36	0.0000	519.22	0.0000
TBILL	NA	NA	NA	NA	291.91	0.0000	441.66	0.0000
XRATVOL	-7.794	0.0000	-14.327	0.0000	328.56	0.0000	541.55	0.0000
SCALE	-1291.35	0.0000	-4205.39.4	0.0000	7920.01	0.0000	503.17	0.0000

L, L & C = Levin, Lin & Chu; I, P & S = Im, Pesaran & Shin; ADF-F Chi^2 = ADF-Fisher Chi-square;
PP-F Chi^2 = PP-Fisher Chi-square

Table 4 - Panel Estimation of Changes in Interest Rate Spreads
(Dependent Variable: ΔIRS, Fixed Effects redundant)

Variable	**(1)[a]**	**(2)**	**(3)**	**(4)**
Constant	0.172	0.745	-1.029	0.042
	(0.581)	(1.343)	(-1.171)	(0.086)
ΔIRS(-1)	-1.730	-0.199	-0.025	-0.124
	(-2.296)**	(-1.868)*	(-0.115)	(-0.302)
ΔBANKDEV	0.676	0.549	-0.438	-0.072
	(0.933)	(0.510)	(-0.582)	(-0.232)
ΔCROWD	0.148	0.309	1.024	1.202
	(0.159)	(0.445)	(1.300)*	(1.717)*
ΔDEFGDP	-0.729	-1.901	-0.049	-0.845
	(-0.937)	(-2.314)**	(-0.091)	(1.416)*
ΔDISRATE	0.091	0.812	2.065	0.022
	(0.234)	(1.132)*	(2.146)**	(0.069)
ΔINFL	-0.009	-0.018	2.628	-0.009
	(-0.053)	(-0.693)	(3.015)***	(0.016)
ΔM2GDP	-0.929	-3.589	-2.228	-0.960
	(-1.416)*	(-4.101)**	(-2.818)***	(2.011)**
ΔRESREQ	0.387	0.885	1.476	0.213
	(0.144)	(1.787)**	(2.091)	(0.408)
ΔRGDPPC	-1.072.	-4.420	0.065	-2.250
	(2.076)**	(-4.895)***	(0.331)	(3.239)***
ΔTBILL	-0.103	-0.026	4.211	-0.024
	(-0.315)	(-0.557)	(5.231)***	(-0.039)
ΔXRATVOL	0.003	0.001	1.088	0.009
	(0.008)	(0.103)	(1.885)	(0.017)
ΔSCALE	-0.013	-0.652	-2.704	-0.569
	(-0.061)	(-0.791)	(-3.197)***	(-0.998)
Adjusted R^2	0.256	0.311	0.351	0.260
SER	2.414	2.646	1.152	1.113
SSR	1481.15	1483.96	136.72	206.6
DW. Stat	1.866	1.956	1.80	1.918
No. of Countries	10	10	12	11
No. of Observation	246	234	127	88

Notes: t-statistic in parentheses
*, ** and *** indicate 10%, 5% and 1% significance levels, respectively
a. Level regression.

[i] Quaden (2004) further notes that the increased efficiency of financial institutions should 'facilitate the re-allocation of capital towards new developing sectors and firms that have a high growth potential.' This is supported by Lucchetti et al (2000) who argue that efficient financial institutions tend to use technologically-driven cost reduction methods, the use of which is a 'necessary condition for the efficient allocation of resources.'

[ii] This model was tested using data from 17 administrative regions in Spain over the period 1986-2001. One of the conclusions made is that there is a significant and negative effect of the variable that proxies intermediation costs on gross fixed capital formations, 'showing the negative effect of augmenting transformation costs on investment' (Valverde et al, 2004).

[iii] Robinson (2002), Jayaraman and Sharma (2003) and Tennant (2006)

[iv] See for example, Demirguc-Kunt and Huizinga (1998)

[v] Demirguc-Kunt and Huizinga (1998) explain by noting that 'a reduction in net interest margins can, for example, reflect a reduction in bank taxation or, alternatively, a higher loan default rate. In the first instance, the reduction in net interest margins reflects an improved financial market function, while in the second case the opposite may be true. Also, note that variation in an accounting ratio such as *net interest margin* may reflect differences in net interest income (the numerator) or differences in (say) non-lending assets (in the denominator).'

[vi] Brock and Franken (2003) cite Catao (1998), Aizenman and Hoffmaister (1999), and Corvoisier and Gropp (2001) as examples. See also Moore and Craigwell (2000).

[vii] With a slightly different focus, Jacques (1995) examines the ability of the spreads between three-month and six-month Treasury bill rates to predict inflation, Adao and Luis (2000) investigate the probability of convergence of options spreads in Spain, Italy and Germany, and Poya and Matthews (2004) examine the link between the term spread and GDP growth in the Korean economy, and explores the usefulness of the spreads as an indicator of recessions.

[viii] Brock and Franken (2002) cite Ho and Saunders, McShane and Sharpe, and Brock and Rojas-Suarez as examples.

[ix] See, for example, Demirguc-Kunt, Laeven, and Levine (2003).

[x] In examining the relationship between bank efficiency and size in Latin America, Forster and Shaffer (2005) noted that, 'robust associations were found between absolute size and efficiency, whereas no such associations were found between relative size and efficiency. These findings together suggest that economic development may benefit from policies that are tolerant of large banks, and tend to rule out market power of dominant banks as a likely cause of the observed empirical associations.'

[xi] Yildirim (2002), while not specifically examining interest rate spreads, similarly notes that macroeconomic conditions had a profound influence on the efficiency of Turkish commercial banks.

[xii] As quoted in Jayaraman and Sharma (2003)

[xiii] Robinson (2002), however, notes that, 'discussions of banking behavior which rely only on *ex ante* measures downplay the importance of portfolio composition, capital adequacy and asset quality.' It must be noted though that whilst this limitation is acknowledged, it does not impact very heavily on this study, which focuses on the market and macroeconomic determinants of interest rate spreads, rather than the individual bank characteristics mentioned by Robinson (2002).

[xiv] It must be noted though, that for a number of countries, various specificities are included in the IFS' definition of the average commercial bank lending and deposit rates. The comparison of spreads across countries is therefore not perfect, but is the best that can be achieved using aggregated data in large cross-country studies.

[xv] Sologoub (2006)

[xvi] Randall (1998), Jayaraman and Sharma (2003) and Tennant (2006).

[xvii] This measure is similar to that used by Vergil (2002) to examine the effects of exchange rate volatility on trade.

[xviii] Tennant (2006)

[xix] See the appendix of list of countries included in the study.