MACROECONOMIC AND MARKET DETERMINANTS OF BANKING SECTOR INTEREST RATE SPREADS: EMPIRICAL EVIDENCE FROM LOW AND MIDDLE INCOME COUNTRIES

David Tennant* and Abiodun Folawewo
Department of Economics, The University of the West Indies, Mona Campus
Kingston, Jamaica

Abstract: This paper contributes to the literature on the determinants of interest rate spreads by using actual loan and deposit interest rate data to examine the macroeconomic and market-specific determinants of banking sector spreads in middle and low income countries. Numerous variables exogenous to the operations of commercial banks have been widely touted in academic literature and popular discourse to be important factors causing the typically high spreads in developing countries. This paper has tested such claims using panel data econometric techniques, allowing for more focused attention on the variables most likely to impact on spreads. Results are also examined to ascertain whether the determinants of spreads vary across regional groupings of countries.

Keywords: Interest rate spreads; commercial banks; intermediation efficiency; macroeconomic policy; developing countries

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*Corresponding author – David Tennant. Address: Department of Economics, University of the West Indies, Mona, Jamaica, West Indies. Telephone Number: 876 512 3010 or 876 977 1188. Fax Number: 876 977 1483. E-mail address: david.tennant@uwimona.edu.jm

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1. Introduction

Despite the widespread implementation of costly financial sector reform programmes in the developing world, banking sectors in many developing countries are still characterized by persistently high interest rate spreads. Studies by Randall (1998), Gelbard and Leite (1999), and Brock and Rojas-Suarez (2000) all show that interest rate spreads in Sub-Saharan Africa, Latin America and the Caribbean are wider than in OECD countries.[i] This is indicative of inefficiency in the banking sectors of developing countries, as it is now widely acknowledged that interest rate spreads are an adequate measure of bank intermediation efficiency (Sologoub 2006:2). Such spreads reflect the costs of intermediation that banks incur, inclusive of their normal profits (Robinson 2002:5).

This has important implications for the growth and development of these poorer economies, as numerous authors suggest a critical link between the efficiency of bank intermediation and economic growth. Quaden (2004:2), 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:iii).[ii] Valverde et al (2004:5-9) 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.[iii]

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.[iv] 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.[v] Brock and Franken (2003:22), however, caution against the use of such proxies in making conclusive statements about the determinants of interest rate spreads in commercial banks, as misinterpretation of interest rate spread regressions are likely. They 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 a second best option, 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 and the EU.

This paper uses a similar principle of examining spreads in the wider 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 cross-section of low and middle-income countries. Based on data availability, focus has been placed on the industry or market-specific and macroeconomic determinants of interest rate spreads in the banking sector. The results are important, as they will either aver or refute the claim made by many commercial bank managers that the typically high spreads in developing countries are caused by market and macro factors outside of their control. Our results also have important policy implications, as by including macro-policy indicators not typically included in previous studies, they highlight the policy changes which will have the greatest and most direct impact in reducing spreads and increasing the efficiency of the banking sector. Additionally, because we use a relatively large dataset of thirty-three (33) countries, we are able to investigate whether the determinants of spreads vary across regional groupings of countries.

The paper is divided into four subsequent sections. Section 2 briefly surveys the literature on the determinants of commercial banks' interest rate spreads. Section 3 describes the model, methodology and data used. Section 4 highlights our results, and Section 5 presents our conclusions.

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

An 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 (1998:3), Moore and Craigwell (2000:6) and Sologoub (2006:2) 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 (2002:18) 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 (2002:15) note that the results of many other studies suggest that individual bank characteristics are often not tightly correlated with interest rate spreads.[vii] 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 2004:98). 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. 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. 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 1998:3-4; Moore and Craigwell 2000:6; Robinson 2002:18; Jayaraman and Sharma 2003:1; and Chirwa and Mlachila 2004:98-100). 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. Brock and Franken (2003:9) 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 (2004:100) 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 (2002:17) include interest rate uncertainty and exchange rate volatility, and Randall (1998)[viii] 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. 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 2002:17); 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."[ix] 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 2006:8). 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.[x] The banking sector interest rate spreads (IRS) are therefore calculated as:

$$IRS = Average\ Commercial\ Bank\ Lending\ Rate - Average\ Commercial\ Bank\ Deposit\ Rate \quad (1)$$

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 (1998:12&22)

the bank/GDP ratio *(BNKDEV)* 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 *(GDPpc)* 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.[xi] 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 (2004:99) 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 (1998:12) note that this is a reasonable proxy, as reserves are generally remunerated at less-than-market rates. The variable used *(RES)* 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.[xii] 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 2004:100). 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.[xiii] 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 (2002:18) 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.[xiv] 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.

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

$$IRS_{it} = \alpha_0 + \alpha_1 BNKDEV_{it} + \alpha_2 GDPpc_{it} + \alpha_3 RES_{it} + \alpha_4 SCALE_{it} + \alpha_5 INFL_{it} + \alpha_6 XRATVOL_{it} + \alpha_7 CROWD_{it} + \alpha_8 TBILL_{it} + \alpha_9 DISRATE_{it} + e_{it} \quad (2)$$

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

3.2 Data and Descriptive Statistics

This study was conducted using annual data from the IMF's *International Financial Statistics* for the years 1988 – 2005. Because of our interest primarily in developing countries, the World Bank's classification of countries by income groups was used to guide the selection of only low and middle income countries. We attempted to include as many such countries as was possible, and based on the availability of data for numerous critical variables a maximum of 33 countries were included.[xv] By broadly grouping these countries into geographical regions and physical characteristics, distinctions across categories of countries are highlighted. The typical regional groupings among low and middle income countries are Asia, Europe, Latin America and the Caribbean, and Sub-Saharan Africa. Due to the unique characteristics of small island developing states (SIDS), highlighted by authors such as Briguglio (1995), Streeten (1993) and Ocampo (2002), these countries are also grouped and examined.

Table 1 highlights the descriptive statistics (means and standard deviations) for all the variables for each grouping of countries. When the figures for IRS are examined, it is noteworthy that SIDS have the smallest average interest rate spread of 7.23% and the lowest standard deviation of 1.69. At the other extreme, Latin American and Caribbean countries have the largest interest rate spread of 10.47%. The fact that all Caribbean states are SIDS, suggests that continental Latin American countries have relatively high interest rate spreads.[xvi] The wide variation between countries in this regional grouping is evidenced by the largest standard deviation of 8.16. Between these two extremes, Sub-Saharan African countries have the second largest interest rate spread (9.28%), followed by the middle and low income European and Asian countries (8.26% and 7.45%, respectively). It is therefore evident that amongst middle and low income countries for which data were available, SIDS and Asian countries were able to maintain the lowest average interest rate spreads, while Latin American and Sub-Saharan countries had the highest spreads.

The market characteristics for these groupings of countries suggest wide regional variations in the level of development and sophistication of the financial and banking sectors. Sub-Saharan African countries have the lowest average level of banking development with a bank assets to GDP ratio of 36.96%. With the second lowest standard deviation from this mean (23.74), there is a measure of relative uniformity amongst the Sub-Saharan African countries in this respect. The Asian countries have the highest degree of uniformity (with a standard deviation of 16.74), but have the second lowest level of banking development (46.10%). The average levels of banking development amongst the remaining groupings of countries are significantly higher, but the standard deviations are also greater, suggesting wider inter-group variations. The Latin

American and Caribbean countries have the highest average bank assets to GDP ratio (86.78%), but also the highest standard deviation (38.89). They are followed very closely by SIDS with an average ratio and standard deviation of 79.99% and 37.77, respectively. The middle and low income European countries have an average level of banking development (64.70%) that is in the mid-range relative to the other regional groupings. Very similar observations are made when the real per capita GDP figures are compared. Sub-Saharan African (US$1,462) and Asian (US$1,670) countries have the lowest levels of economic development, while SIDS (US$3,941) and Latin American and the Caribbean countries (US$3,844) have the highest levels of economic development. European countries (US$3,782) again fall in between these two extremes, but in this respect are much closer to the relatively higher levels development. This similar ranking of countries according to bank development and real per capita GDP is expected, as the latter is used in many studies as an indicator of the level of banking technology and opportunities available in a country.

The descriptive statistics for the reserves variable suggests that there is very little correlation between the levels of bank development and sophistication and the amounts of reserves banks are required to hold. This is evident because with only one notable exception, all groupings of countries have very similar reserves to deposits ratios. Sub-Saharan African countries have an average ratio of 17.82%, while SIDS, Asian, Latin American and the Caribbean and European countries all have average reserves to deposits ratios of just over 13%. The market size of the various groupings of countries is, however, the market characteristic for which there is the most variation across regions. As expected, SIDS, and by extension Latin American and Caribbean countries, have the smallest average population sizes (0.83 million and 1.37 million,

respectively) and the lowest standard deviations (1.40 and 2.45, respectively). This would suggest that diseconomies of scale should be important factors widening the interest rate spreads in these countries. Conversely, the regions with the largest average population sizes, Sub-Saharan Africa and Asia (26.12 million and 22.64 million, respectively), would be expected to experience less difficulties in this respect. This assertion is, however, tempered by the fact that the relatively large standard deviations for both these regions indicate significant variation in inter-regional sizes of populations. Also, as previously mentioned, Sub-Saharan Africa and Asia had the lowest levels of real per capita GDP and bank development, which may also affect effective demand for banking services in these regions. The interplay between all these market characteristics and interest rate spreads can, however, only be determined with the application of rigorous econometric testing.

The descriptive statistics for the variables representing macroeconomic instability also suggest clear distinctions amongst the groupings of countries. Middle and low income countries in Europe clearly have difficulties maintaining macroeconomic stability, with the highest average rate of inflation (36.75%) and level of exchange rate volatility (27.18). This is not surprising, as many of these countries are from the Eastern European block, some of which have faced fairly recent upheavals. It must also be noted though that the standard deviation from both means amongst this small grouping of countries is relatively large, indicating wide variations amongst these countries in terms of macroeconomic stability. Sub-Saharan African countries also have relatively weak indicators of macroeconomic stability, as they have the second highest average inflation rate (18.73%) and volatility of the exchange rate (23.18). The standard deviations for these variables are also relatively high for this region. There seems to be considerably greater

macroeconomic stability in SIDS and Latin American and Caribbean countries, as they have the lowest average inflation rates (7.24% and 10.78%, respectively) and levels of exchange rate volatility (4.54% and 3.43%, respectively). However, although the standard deviations for exchange rate volatility are relatively low for both groupings of countries, the same cannot be said of the inflation rate, as the Latin American and Caribbean countries have the third largest standard deviation for this variable.

The descriptive statistics for the macro-policy indicators reflect some interesting distinctions in the policy environment amongst groupings of countries. All the indicators suggest a similarity in the policies adopted in low and middle income countries in Sub-Saharan Africa and Europe, as these regions had the highest and very similar average discount rates (19.77% and 18.60%, respectively), average Treasury bill rates (17.60% and 19.04%, respectively), and average levels of public sector crowding-out (with ratios of public sector borrowing to total loans of 37.85% and 36.51%, respectively). The distinctions in the policy environment between these two regions and SIDS is particularly clear when the discount and Treasury Bill rates are compared across regions, as SIDS had the lowest figures for both of those indicators (9.75% and 7.68%, respectively). Asian countries also had a relatively low average discount rate (13.19%), but they along with SIDS, however, maintained fairly high levels of public sector crowding-out (30.13% and 29.00%, respectively). Latin American and Caribbean countries had the lowest average level of crowding-out (18.75%), and had the second lowest average Treasury bill rate (8.84%), but also had a relatively high discount rate (16.28%). These figures suggest that it is not as easy to surmise about the policy direction in SIDS, Asia and Latin America and the Caribbean, as it is for Sub-Saharan Africa and Europe, because of a lack of consistency across the indicators.

Furthermore, the relatively high standard deviations for all the policy variables amongst the latter two regions, makes it difficult to make conclusive statements about the policy environments even for these regions.

3.3 Estimation Procedure

The numerous differences across groupings of countries highlighted by the descriptive statistics suggest that cross-section specificity will affect the results of our panel estimation. To test whether this is so we include cross-section fixed effects and conduct the F and chi-square redundant fixed effects tests. Where the results suggest that fixed effects are not redundant we estimate the panel regressions with fixed effects, otherwise we omit the fixed effects and instead sequentially include dummy variables designed to reflect regional and other specificities in the model. The dummy variables included an Asian dummy (*ASIADUM*), European dummy (*EURODUM*), Latin American and Caribbean dummy (*LACDUM*), Sub-Saharan African dummy (*SSADUM*), and a small island developing states dummy (*SIDSDUM*). We estimate the equations using the panel corrected standard error methodology suggested by Beck and Katz (1995), wherein the covariance estimators are robust to heteroskedasticity across cross-sections.

The pairwise correlation coefficients highlighted in Table 2 suggest that multicollinearity is not an issue in these estimations, as no two variables are highly correlated. A number of panel unit root tests, however, uniformly indicate that two out of the ten variables being examined (BNKDEV and GDPpc) are non-stationary in levels (see Table 3). All variables are stationary when first-differenced. To eliminate the problem of non-stationarity and simultaneously

examine the macroeconomic and market factors that have an impact on the annual changes in interest rate spreads, the first-differenced model was estimated as follows:

$$\begin{aligned}\Delta IRS_{it} = {} & \alpha_0 + \alpha_1 \Delta BNKDEV_{it} + \alpha_2 \Delta GDPpc_{it} + \alpha_3 \Delta RES_{it} + \alpha_4 \Delta SCALE_{it} \\ & + \alpha_5 \Delta INFL_{it} + \alpha_6 \Delta XRATVOL_{it} + \alpha_7 \Delta CROWD_{it} + \alpha_8 \Delta TBILL_{it} \\ & + \alpha_9 \Delta DISRATE_{it} + e_{it} \end{aligned} \quad (3)$$

Equation 3 was estimated without fixed effects, as the cross-section F and chi-square redundant fixed effects tests both indicated that fixed effects were redundant.[xvii] Regional dummies were instead used. The results of this estimation are highlighted in Table 4 and are discussed in the subsequent section. It must be noted though that neither of the two I(1) variables (BNKDEV and GDPpc) are statistically significant, due to fundamental conceptual problems with these variables. They were therefore omitted from the model, which allowed us estimate the equation in levels using ordinary least squares, as follows:

$$\begin{aligned}IRS_{it} = {} & \alpha_0 + \alpha_1 RES_{it} + \alpha_2 SCALE_{it} + \alpha_3 INFL_{it} + \alpha_4 XRATVOL_{it} + \alpha_5 CROWD_{it} \\ & + \alpha_6 TBILL_{it} + \alpha_7 DISRATE_{it} + e_{it} \end{aligned} \quad (4)$$

Equation 4 was estimated using fixed effects, as the cross-section F and chi-square redundant fixed effects tests both indicated that fixed effects were not redundant. The results of this estimation are highlighted in the second column of Table 5, where the Durbin-Watson test gives a clear indication of the presence of positive autocorrelation. Numerous attempts were then made to correct for autocorrelation in the model.

In the first attempt (column 3) the model is estimated using a system of generalised least squares (GLS) with period seemingly unrelated regressions (period SUR), which is expected to simultaneously correct for both cross-section heteroscedasticity and autocorrelation. The resultant Durbin-Watson statistic, however, indicated that autocorrelation was not completely removed from the model. Attempts were then made to alter the functional form of the model, to include, respectively, double-log and quadratic specifications. However, as shown in columns 4 and 5 of Table 5, positive autocorrelation was still evident regardless of the functional form adopted. Because annual data were used and due to the relatively dynamic nature of interest rate spreads, only two variables (CROWD and SCALE) could be expected to have a lagged effect on IRS. However, as evident in column 6, the inclusion of these lagged variables also did not correct for autocorrelation in the model. The only procedure which corrected for autocorrelation is the estimation of a first-order autoregressive model (see column 7).[xviii] The results of this estimation are discussed below.[xix]

4. Empirical Results

The estimation results for equations 3 and 4 are highlighted in Tables 4 and 5. In equation 3, the first-differenced model highlights the market and macro-economic variables which have an impact on the changes in interest rate spreads in developing countries. The results indicate that in all the models estimated only three variables, ΔCROWD, ΔINFL and ΔDISRATE are consistently statistically significant at the 1% level, while ΔRES is consistently statistically significant at the 5% level. All the statistically significant variables have the signs predicted by theory. ΔRES and ΔDISRATE have the largest coefficients in all the models, with ΔRES having a marginally higher coefficient than ΔDISRATE. This suggests that these variables have the

largest impacts on the annual changes in the interest rate spreads in middle and low income countries. Five variables, ΔXRATVOL, ΔBNKDEV, ΔSCALE, ΔGDPpc, and ΔTBILL are not significant in any of the estimations using the traditional levels of significance, suggesting that none of these variables are important determinants of changes in interest rate spreads in developing countries. None of the regional dummies are significant at traditional levels of significance, and their inclusion do not meaningfully impact on the results derived. Finally, an adjusted R^2 of approximately 32% suggests that our model explains about a third of the variation in annual changes in the banking sector interest rate spreads of middle and low income countries.

In equation 4, where the I(1) variables are omitted, the impact of market and macroeconomic variables on the level of banking sector interest rate spreads are examined. The results of the first-order autoregressive model (column 7 of Table 5) are very similar to those highlighted above, as CROWD, DISRATE, INFL and RES are the only variables with statistically significant impacts on IRS, with the former three being significant at the 1% level and RES at the 10% level. All these variables have the expected signs, with DISRATE having the largest coefficient. It should be noted that both the level of significance and the size of the coefficient for RES have declined when the model is estimated in levels instead of being first-differenced. For the estimation in levels the adjusted R^2 is approximately 86%.

The implications of these results on the academic and popular discourse on the determinants of interest rate spreads in developing countries are critical, as various stakeholders seek to ascertain the causes of high spreads in many countries. This, however, is not simply an exercise in apportioning blame, because as Randall (1998:7) suggests, "to the extent that the determinants of

the spreads are distortionary, these problems can be redressed so as to permit interest rate spreads… to narrow, with positive effects on economic growth and the efficiency of resource allocation."

With this in mind, the first clear implication of our results is the fact that many of the factors commonly believed to be critical determinants of interest rate spreads may not be as relevant as perceived. For example, whilst macroeconomic stability has been long held to be a critical cause of high interest rate spreads, our results have shown that one of the most common indicators of such instability, the volatility of the exchange rate, does not have a significant impact on the banking sector interest rate spreads in middle and low income countries. This suggests that much of the debate on exchange rate policies and management may not be highly relevant to banking spreads, as whilst exchange rate volatility may impact on a country's exports and balance of payments, there is no evidence of a transmission mechanism by which this effect is translated into a widening of banking sector spreads.

A caveat must, however, be noted, as the above argument does not hold true if exchange rate volatility leads to high and volatile inflation rates. This is because the results clearly indicate that inflation has a consistently positive and significant impact on both changes in and levels of banking sector spreads. This suggests that low inflation is a critical element in the minimization of banking spreads. This is not surprising, as low inflation rates reduce banks' operating and transaction costs, particularly in middle and low income countries wherein the bulk of these costs are labour-related, and pay scales are linked to inflation rates. Robinson (2002:18) further notes that, "low and stable inflation puts a floor on deposit rates, and limits the mark-up factor on the

real return on assets that banks target…" It must, however, be noted that the coefficients for the inflation rate are low in both the first-differenced and levels estimations (approximately 0.02). This suggests that anti-inflationary measures will have to be stringent if they are to cause an appreciable reduction in interest rate spreads.

Also of interest is the fact that of the three macroeconomic-policy variables widely touted to have important impacts on banking sector spreads, two are statistically significant, while one is insignificant. The only insignificant macroeconomic policy variable, the Treasury bill rate, is generally viewed as the benchmark interest rate in the economy, and a lowering of this rate is expected to have a signalling effect, precipitating a lowering of interest rates by other stakeholders. The insignificance of this variable suggests that this signalling effect has less of an impact on interest rate spreads than that perceived in much of the literature. This is especially so if there are other contradictory signals, such as high and/or volatile inflation rates. The clear implication is that 'soft' measures by governments, such as signalling and moral suasion, will have little, if any, impact on interest rate spreads in environments where there are persistent factors causing spreads to be high.

One such policy factor leading to the widening of banking sector spreads is crowding-out by the government, which is statistically significant in all of our models. This suggests that government competition for local funds has a significant impact on banking sector spreads. The fact that public sector crowding-out is significant, while the Treasury bill rate is not, is however, surprising, as it would normally be expected that competition for domestic funds would force the government to raise its Treasury bill rate. This seems to suggest that governments in developing

countries may be using other non-traditional ways of raising funds domestically. Further research on other types of government-issued financial instruments is therefore necessary.

Also surprising is the fact that the discount rate is not only consistently statistically significant, but has the largest coefficient of the macroeconomic policy variables. The discount rate is the rate charged by central banks when commercial banks borrow from them. Much of the recent economic literature suggests that the discount rate is no longer an important monetary policy tool for many countries. However, our results suggest that whether or not the discount rate is being used by the government as a means of controlling the money supply, it is undoubtedly an important factor in determining the size of the banking sector interest rate spreads. Governments and central banks should therefore carefully consider the level at which they set their discount rates, as it can have significant feedback impacts on economic variables through the interest rate spreads. If it is indeed a fact that these rates are not being used as a means of controlling the money supply, then they represent a fairly straightforward means by which governments can assist in the reduction of banking sector spreads. In fact, our results suggest that governments could be more successful in reducing spreads through this means than through anti-inflationary measures, as the coefficients for the discount rate in both the first-difference and levels estimations (approximately 0.10 and 0.14, respectively) are larger than those of the inflation variable (0.016 and 0.018, respectively).

The reserve requirement ratio is similar to the discount rate, as it is another variable which has in the past been popular as a monetary policy tool. The literature, however, suggests that its importance in this respect is now superseded in most countries by its use as a regulatory

standard. The proxy for reserves is therefore included in our models as a market characteristic rather than a policy variable. In this respect, it is the only market characteristic that is statistically significant in both models. Its significance level is, however, smaller than those of the significant macroeconomic and policy variables. This is particularly so when the model was estimated in levels, as its significance was weak (10%), as compared with a stronger (5%) significance level (and larger coefficient) in the first-difference model. This indicates that changes in the required reserve ratio are more important in the determination of changes in interest rate spreads, than are the levels of the ratio to the levels of the spread in developing countries. These results suggest that reserve requirements may have been ascribed too large a role in explaining the high levels of interest rate spreads in many countries, as the much criticized implicit financial tax has not been shown to have a large or highly significant impact on the level of banking sector spreads in middle and low income countries. This is possibly explained by a movement away from using reserve requirements to finance budget deficits or to control money supply, and towards setting such requirements based on international prudential benchmarks. This tendency would reduce the importance of this variable to the level of banking sector spreads. Changes in reserve requirement ratios would, however, suggest a movement away from international benchmarks (which do not change very frequently or erratically), and may imply a reversion (albeit temporary) to the use of such requirements as distortionary implicit financial taxes. Such changes in this ratio have been shown to have larger and more significant impacts on the annual changes in interest rate spreads in developing countries.

The other market characteristics – changes in bank development and real per capita GDP – were statistically insignificant. This is a surprising result, as it contradicts the findings of some

important studies in the area. As mentioned in Section 3, bank development, as measured by the bank assets to GDP ratio has been used in previous studies as a proxy for the overall level of development of the banking sector, and, more importantly, the level of competition in well-developed banking sectors. It must, however, be noted that when conducting a study focusing on only middle and low income countries, where the average Bank to GDP ratio is only 58.18%, it cannot be assumed that we are dealing with 'well-developed' banking sectors, and it therefore also cannot be assumed that this ratio is an accurate indicator of competition within such banking sectors. Furthermore, this ratio does not give an indication of the degree to which there is a concentration of bank assets in a few large banks, which is the case in the oligopolistic banking sectors of some countries. The statistical insignificance of the relationship between changes in the Bank to GDP ratio and changes in banking sector spreads is thus understandable, because of this ratio's inability to accurately reflect the level of competition in banking sectors. This is also a fundamental problem with the broader, supplementary indicator of banking sector sophistication and development – real per capita GDP – leading to its statistical insignificance. Within a narrow grouping of developing countries in the middle and low income categories, an increase in per capita GDP may not necessarily reflect increased levels of competition in the banking sector, particularly as a number of the countries being studied have only recently undergone financial liberalization, and are still often dominated by large multinational or government-controlled banks.

Our results also indicate that the final market characteristic investigated – the existence of diseconomies of scale – is not significant. Contrary to theory, this suggests that the existence of diseconomies of scale is not an important determinant of high interest rate spreads in countries

with a relatively small population, and by extension, a small market size. This result may, however, be due to problems with the proxy for market size, as using the size of the population is a very broad and possibly inaccurate approximation of the size of the financial sector market in developing countries. This is because in many developing countries the size of the labour force may be considerably smaller than the size of the population, and even within the labour force, there may be numerous people who do not have effective demand for financial sector products, depending on the level of financial sophistication in each country. As more data become available, future studies in this area should attempt to develop more accurate proxies to examine the impact of diseconomies of scale on interest rate spreads.

Finally, an adjusted R^2 of approximately 0.32 in the first model estimated suggests that there are other determinants of changes in banking sector spreads which are not accounted for. This conclusion seems to be supported in the levels estimation by the difficulty experienced in correcting for autocorrelation, which may be due to the omission of relevant variables. This is not surprising, as while we have focused on investigating the macroeconomic and market determinants of banking sector interest rate spreads, we readily acknowledge the impact of individual bank characteristics that have been omitted from our models. As outlined in Section 2, such characteristics include a wide range of intrinsic factors that impact on the operational efficiency of individual banks, and which by extension impact on the intermediation costs associated with the banking sector in general. Our results therefore suggest that while certain macroeconomic variables, policy tools and market characteristics are important determinants of banking sector interest rate spreads, other factors related to the operational efficiency and profitability of individual banks should be considered.

5. Conclusions

This paper contributes to the literature on the determinants of interest rate spreads by using actual loan and deposit interest rate data to examine the macroeconomic and market-specific determinants of banking sector spreads in 33 middle and low income countries. Numerous variables, exogenous to the operations of commercial banks, have been widely touted in academic literature and popular discourse to be important factors causing the typically high spreads in developing countries. This paper has tested such claims using panel data econometric techniques. In addition to the market characteristics of banking sectors and the indicators of macroeconomic instability typically included in studies of this nature, this paper also examines the impact on banking sector spreads of macroeconomic policy variables widely referred to by stakeholders, but not usually included in econometric tests.

Our results clearly indicate that many of the factors commonly believed to be critical determinants of interest rate spreads may not be in fact relevant to the size of the banking sector spreads in developing countries. Possibly most surprising was the statistical insignificance of the economies of scale, bank development, and real per capita GDP variables. Although these market characteristics have been highlighted in the literature as determinants of interest rate spreads in numerous countries, they were unable to explain the variation in banking sector spreads of the middle and low income countries studied. This may be due to the inadequacy of the proxies used to represent these variables to accurately reflect the market size and level of competition in relatively under-developed banking sectors. Our results therefore do not suggest that economies of scale and the level of bank development and sophistication are not

determinants of the size of spreads, but rather indicate the need for the formulation of new proxies that are better able to measure the market size and degree of competition in banking sectors in developing countries.

This problem was not experienced with the final market characteristic examined, as the proxy used for the required reserve ratio was fairly accurate. The results for the reserves variable were unique, as this was the only variable for which significantly different results were derived in the levels and first difference estimations. While consistently positive, the coefficient and significance level of this variable in the levels estimation was smaller than in the first-difference model. This suggests that reserve requirements may have been ascribed too large a role in explaining the high levels of interest rate spreads in many countries, as it was not shown to have a large or highly significant impact on the level of banking sector spreads in middle and low income countries. Changes in this ratio were, however, shown to have larger and more significant impacts on the annual changes in interest rate spreads in developing countries. This is possibly explained by a movement away from using reserve requirements to finance budget deficits or to control money supply, and towards setting such requirements based on international prudential benchmarks. This tendency would reduce the importance of this variable to the level of banking sector spreads, while changes in reserve requirement ratios (which would suggest a movement away from international benchmarks towards a temporary reversion to the use of such requirements as implicit financial taxes) would be more important to determining the annual changes in the spreads. This has important policy implications, as it supports that view that regulatory tools, such as the reserve requirement ratio, should not be used in a distortionary manner as financial taxes, but rather should be based solely on prudential criteria.

Our results also indicate that only one of the highly touted macroeconomic policy variables – the Treasury bill rate – was statistically insignificant. The insignificance of the Treasury bill rate suggests that any attempts by governments to signal changes in policy direction will not precipitate adjustments to banking sector interest rate spreads, particularly if there are contradictory signals and other factors constraining reductions in the spreads. One such policy factor leading to the widening of banking sector spreads is crowding-out by the government. This indicates that government competition for local funds has a significant impact on banking sector spreads. The fact that public sector crowding-out is significant, while the Treasury bill rate is not suggests that governments in developing countries may be using other non-traditional ways of raising funds domestically. Further research on other types of government-issued financial instruments is therefore necessary. The other macroeconomic policy variable – the discount rate – was highly significant in both of our models, positively correlated with banking sector spreads, and had one of the largest coefficients. Central banks should therefore avoid the use of discount rates as a means of controlling the money supply, as, if not otherwise directed, this is a potentially straightforward mechanism through which governments can precipitate reductions in banking sector spreads.

Exchange rate volatility, a commonly used indicator of macroeconomic instability, was statistically insignificant, suggesting the absence of a transmission mechanism through which the negative impacts on a country's balance of payments is translated into a widening of banking sector spreads. If exchange rate volatility leads to high inflation rates, there is however, a clear indication that this will lead to increased banking sector spreads. The inflation rate is

consistently and highly significant in all of our models. As expected, there is a positive relationship between inflation and banking sector spreads, but the coefficient for the inflation rate is low, suggesting that anti-inflationary measures will have to be stringent if they are to cause appreciable reductions in interest rate spreads.

Finding a resolution to the debate as to the causes of the relatively high interest rate spreads in developing countries is not an academic exercise, as if the underlying causes are unearthed and addressed, narrower spreads can have tangible economic benefits. Such efforts, however, have to distinguish between the rhetoric of rival stakeholder groups and the actual determinants of banking sector spreads. This paper has attempted to do this with respect to the theorized and/or touted macroeconomic and market determinants of interest rate spreads. The fact that five of the nine variables in our models are consistently insignificant should not be viewed negatively, as this allows for more focused attention on the variables most likely to impact on spreads. Finally, we readily acknowledge the likely impact of individual bank characteristics that have been omitted from our models. Whilst banking sector interest rate spreads are clearly impacted by factors both exogenous and endogenous to the operation of commercial banks, this paper has focused on highlighting the exogenous factors which, if controlled, are most likely to have the largest effects in reducing such spreads.

Appendix 1: Countries included in the study

All countries
Albania
Belize
Bolivia
Bulgaria
Czech Republic
Dominica
Egypt
Ethiopia
Fiji
Guyana
Hungary
Kenya
Lao People's Dem. Rep.
Latvia
Lesotho
Malawi
Nigeria
Philippines
Papua New Guinea
Poland
Republic of South Africa
Sri Lanka
St. Kitts and Nevis
St. Lucia
St. Vincent & the Grenadines
Swaziland
Seychelles
Tanzania
Trinidad and Tobago
Uganda
Uruguay
Zambia
Zimbabwe

Asia
Fiji
Lao People's Dem. Rep.
Philippines
Papua New Guinea
Sri Lanka

Latin America & Caribbean
Belize
Bolivia
Dominica
Guyana
St. Kitts and Nevis
St. Lucia
St. Vincent & the Grenadines
Trinidad and Tobago
Uruguay

Sub-Saharan Africa
Ethiopia
Kenya
Lesotho
Malawi
Nigeria
Republic of South Africa
Swaziland
Seychelles
Tanzania
Uganda
Zambia
Zimbabwe

Small Island Developing States
Belize
Dominica
Fiji
Guyana
Papua New Guinea
Seychelles
St. Lucia
St. Kitts and Nevis
St. Vincent and Grenadines
Trinidad and Tobago

Europe
Albania
Bulgaria
Czech Republic
Hungary
Latvia
Poland

Appendix 2: Table 1 - Descriptive Statistics [a]

Variable	Latin America and Caribbean	Sub-Saharan Africa	Asia	Europe	SIDS	All Countries
IRS (%)	10.47 (8.16)	9.28 (5.63)	7.45 (5.26)	8.26 (8.03)	7.23 (1.69)	8.93 (6.72)
Market Determinants						
BNKDEV (%)	86.78 (38.89)	36.96 (23.74)	46.10 (16.74)	64.70 (27.53)	79.99 (37.77)	58.18 (34.45)
GDPpc (USD)	3844 (2101.23)	1462 (2121.51)	1670 (1807.60)	3782 (2304.15)	3941 (2145.86)	2439 (2350.19)
RES (%)	13.11 (4.79)	17.82 (9.69)	13.05 (1.56)	13.17 (6.17)	13.04 (6.92)	15.10 (8.02)
SCALE (mn)	1.37 (2.45)	26.12 (30.17)	22.64 (27.66)	12.60 (11.59)	0.83 (1.40)	18.19 (25.96)
Macro Determinants						
INFL (%)	10.78 (19.53)	18.73 (24.39)	11.48 (17.85)	36.75 (138.73)	7.24 (14.34)	17.91 (55.96)
XRATVOL	3.43 (4.75)	23.18 (33.31)	11.91 (15.03)	27.18 (43.02)	4.54 (4.13)	15.40 (27.93)
CROWD (%)	18.75 (9.14)	37.85 (25.25)	29.00 (10.46)	36.51 (20.14)	30.13 (20.79)	30.51 (19.74)
DISRATE (%)	16.28 (30.79)	19.77 (13.02)	13.19 (7.65)	18.60 (25.40)	9.75 (4.87)	17.25 (20.31)
TBILL (%)	8.84 (6.81)	17.60 (12.46)	12.34 (6.97)	19.04 (20.20)	7.68 (4.64)	14.48 (12.62)
N	92	146	71	58	177	375

a Means are reported with their standard deviations in parentheses.

Table 2 – Correlation Matrix

	IRS	XRATVOL	BNKDEV	CROWD	DISRATE	SCALE	INFL	GDPpc	RES	TBILL
IRS	1.0000									
XRATVOL	0.1553	1.0000								
BNKDEV	-0.0960	-0.1675	1.0000							
CROWD	0.0396	0.1493	-0.1129	1.0000						
DISRATE	0.6203	0.1513	-0.0970	0.0269	1.0000					
SCALE	-0.1603	0.2686	-0.1413	0.0200	-0.0325	1.0000				
INFL	0.3117	0.3164	-0.0860	0.0738	0.1613	-0.0105	1.0000			
GDPpc	-0.1597	-0.2460	0.5280	0.0112	-0.1091	-0.3120	-0.1065	1.0000		
RES	0.2116	0.2435	-0.2570	0.1508	0.1754	0.1785	0.0922	-0.2812	1.0000	
TBILL	0.5354	0.3757	-0.1780	0.1636	0.7023	0.0355	0.4609	-0.2710	0.2216	1.0000

Table 3 – Unit Root Tests

Variables	**Levels**							
	L, L & C	Prob.	I, P & S	Prob.	ADF-F Chi^2	Prob.	PP-F Chi^2	Prob.
IRS	-2.831	0.0023	-3.049	0.0011	130.122	0.0000	123.933	0.0000
XRATVOL	-9.945	0.0000	-6.164	0.0000	299.591	0.0000	208.537	0.0000
BNKDEV	2.471	0.9933	3.465	0.9997	58.432	0.7347	48.579	0.9469
CROWD	-2.070	0.0192	-2.487	0.0064	127.794	0.0000	100.535	0.0040
DISRATE	-4.362	0.0000	-1.290	0.0985	101.780	0.0011	92.692	0.0110
SCALE	-2.575	0.0050	-1.652	0.0493	210.045	0.0000	169.862	0.0000
INFL	-25.205	0.0000	-7.199	0.0000	128.761	0.0000	139.416	0.0000
GDPpc	-0.585	0.2794	0.161	0.5640	81.858	0.0901	71.110	0.3115
RES	-4.485	0.0000	-2.693	0.0035	107.149	0.0010	141.116	0.0000
TBILL	-3.972	0.0000	-1.363	0.0864	119.312	0.0001	105.523	0.0014
	First Difference							
IRS	51.762	1.0000	-8.680	0.0000	224.780	0.0000	495.222	0.0000
XRATVOL	-16.637	0.0000	-11.960	0.0000	444.585	0.0000	773.578	0.0000
BNKDEV	-11.566	0.0000	-10.318	0.0000	233.594	0.0000	250.719	0.0000
CROWD	-6.000	0.0000	-6.976	0.0000	216.970	0.0000	283.913	0.0000
DISRATE	-16.539	0.0000	-11.764	0.0000	274.897	0.0000	459.916	0.0000
SCALE	0.966	0.8331	0.491	0.6885	99.957	0.0044	149.219	0.0000
INFL	-7.617	0.0000	-13.021	0.0000	311.826	0.0000	533.961	0.0000
GDPpc	-11.721	0.0000	-8.131	0.0000	204.610	0.0000	229.915	0.0000
RES	-9.876	0.0000	-10.832	0.0000	251.515	0.0000	304.774	0.0000
TBILL	-10.239	0.0000	-10.332	0.0000	237.369	0.0000	225.281	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)	(2)	(3)	(4)	(5)	(6)[a]
Constant	0.056 (0.269)	-0.020 (-0.087)	0.072 (0.332)	0.204 (0.791)	0.022 (0.102)	0.125 (0.380)
ΔXRATVOL	-0.004 (-0.521)	-0.004 (-0.508)	-0.004 (-0.532)	-0.004 (-0.482)	-0.004 (-0.530)	-0.004 (-0.503)
ΔBNKDEV	0.048 (1.456)	0.049 (1.492)	0.047 (1.442)	0.051 (1.537)	0.048 (1.454)	0.049 (1.486)
ΔCROWD	0.071 (2.628)***	0.069 (2.554)***	0.071 (2.626)***	0.071 (2.625)***	0.071 (2.631)***	0.071 (2.643)***
ΔDISRATE	0.104 (2.823)***	0.104 (2.807)***	0.104 (2.820)***	0.102 (2.734)***	0.104 (2.813)***	0.104 (2.810)***
ΔSCALE	-0.036 (-0.187)	-0.055 (-0.281)	-0.047 (-0.241)	-0.134 (-0.611)	-0.062 (-0.299)	-0.081 (-0.325)
ΔINFL	0.016 (3.291)***	0.016 (3.299)***	0.016 (3.283)***	0.016 (3.266)***	0.016 (3.279)***	0.016 (3.295)***
ΔGDP_{PC}	0.000 (0.572)	0.000 (0.566)	0.000 (0.606)	0.000 (0.489)	0.000 (0.618)	0.000 (0.587)
ΔRES	0.107 (2.138)**	0.105 (2.089)**	0.107 (2.116)**	0.107 (2.141)**	0.108 (2.136)**	0.109 (2.155)**
ΔTBILL	0.017 (0.292)	0.016 (0.274)	0.017 (0.285)	0.018 (0.318)	0.017 (0.296)	0.017 (0.296)
ASIADUM		0.423 (1.239)				
EUDUM			-0.090 (-0.175)			
LACDUM				-0.456 (-1.223)		
SSADUM					0.107 (0.291)	
SIDSDUM						-0.162 (-0.483)
Adjusted R^2	0.320	0.320	0.318	0.321	0.318	0.318
SER	2.778	2.778	2.782	2.776	2.782	2.781
SSR	2368.36	2359.92	2368.06	2357.461	2367.62	2366.85
DW-Stat	2.044	2.051	2.044	2.054	2.045	2.045
No. countries	33	33	33	33	33	33
No. observations	317	317	317	317	317	317

Notes: . t-statistic in parentheses
. ** and *** indicate 5% and 1% significance levels, respectively
a. In addition to sequentially including the dummies as above, we also removed the constant and simultaneously included all the dummies. We then removed them one at a time to determine whether the removal of any of the dummies would impact the results. No statistically significant changes were recorded, and as such we did not report the results.

Table 5 – Panel Estimation of Interest Rate Spreads
(Dependent Variable: IRS, Fixed Effects included)[1]

Variable	Initial Model	Attempts at Correcting for Autocorrelation				
		Period SUR[2]	Double Log	Quadratic	Lagged Indp.	AR(1)
Constant	3.891	4.5843	-1.9229	-0.4551	-1.3089	-0.0423
	(3.7959)***	(6.2373)***	(-4.6949)***	(-0.1204)	(-0.8892)	(-0.0151)
XRATVOL	-0.0109	-0.0006	-0.0136	-0.0470	-0.0159	-0.0001
	(-1.3170)	(-0.0980)	(-0.5954)	(-2.1324)**	(-1.9517)**	(-0.0136)
CROWD	0.0506	0.0087	0.1342	0.0883		0.0865
	(2.6671)***	(0.6054)	(2.4298)**	(1.4020)		(2.8319)***
DISRATE	0.1274	0.1447	0.1441	0.0143	0.1174	0.1447
	(3.2981)***	(7.6539)***	(2.2421)**	(0.1723)	(3.5654)***	(4.0354)***
SCALE	0.0031	-0.0381	1.8592	0.0320		0.1424
	(0.1323)	(-3.1025)***	(7.9318)***	(0.5865)		(1.1186)
INFL	0.0184	0.0171	0.0359	0.0477	0.0202	0.0180
	(3.5607)***	(5.3958)***	(1.8697)*	(5.3564)***	(4.2716)***	(3.6413)***
RES	0.0166	0.0484	0.1168	-0.4755	0.0739	0.0796
	(0.4632)	(1.7873)*	(2.4633)***	(-2.7636)***	(1.7790)*	(1.6724)*
TBILL	0.0635	0.0774	0.1085	0.3987	0.0741	0.0002
	(1.1154)	(2.5273)***	(1.5494)	(2.7933)***	(1.4762)	(0.0029)
XRATVOL^2				0.5627		
				(1.7646)*		
CROWD^2				-0.2865		
				(-0.4063)		
DISRATE^2				2.0891		
				(1.7945)*		
SCALE^2				-0.5363		
				(-0.8737)		
INFL^2				-0.9534		
				(-3.6773)***		
RES^2				4.6060		
				(3.4374)***		
TBILL^2				-3.7813		
				(-2.5634)***		
CROWD(-1)					0.1108	
					(5.6819)***	
SCALE(-1)					0.1608	
					(3.1160)***	
AR(1)						0.6594
						(8.9089)***
Adj R2	0.6784	0.6033	0.6749	0.7051	0.7290	0.8562
SER	3.7947	0.7645	0.3231	3.6531	3.5249	2.4922
SSR	5140.690	227.3797	35.8113	4604.066	4311.514	1844.619
DW Stat	0.6518	1.6296	0.6067	0.7647	0.7251	1.8936
Inv. AR Roots						0.66

Notes: t-statistic in parentheses
*, ** and *** indicate 10%, 5% and 1% significance levels, respectively
1. Fixed effects coefficients can be obtained on request from the authors.
2. Fixed Effects precluded by methodology used

Endnotes

[i] Chirwa and Mlachila (2004:98)

[ii] Quaden (2004:2) 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 (2000:7) 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.'

[iii] 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 2004:18).

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

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

[vi] Brock and Franken (2003:2) cite Catao (1998), Aizenman and Hoffmaister (1999), and Corvoisier and Gropp (2001) as examples. See also Moore and Craigwell (2000).

[vii] Brock and Franken (2002:15) cite Ho and Saunders, McShane and Sharpe, and Brock and Rojas-Suarez as examples.

[viii] As quoted in Jayaraman and Sharma (2003:4)

[ix] Robinson (2002:9), 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).

[x] 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.

[xi] Sologoub (2006:8)

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

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

[xiv] Tennant (2006)

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

[xvi] Generalizations about Latin American countries have to however be viewed with caution, as our dataset only includes two such countries.

[xvii] Cross-section F statistic: 0.9931 (prob: 0.4825), Cross-section chi-square statistic: 34.667 (prob: 0.3419)

[xviii] The Durbin-Watson statistic of 1.8936 is greater than Du (1.86923).

[xix] Numerous other attempts were made to correct for autocorrelation, but none were successful. It should be noted though that when lagged values of CROWD and SCALE were included along with the AR(1) term the Durbin-Watson statistic falls within the zone of indecision, and results were generally weaker than when contemporaneous values were used.

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