Credit Booms and Busts in the Caribbean

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Abstract

Since 1970, private sector credit has grown quite rapidly in the Caribbean. More recently, between 2004 and 2006, total real credit in the Caribbean has risen by a cumulative 55.7 percent, or approximately 19 percent per annum. In some countries, the rate of expansion has even been stronger, which is of concern given the likely negative macroeconomic consequences of credit booms. This paper attempts to identify the factors that have led to credit booms and conversely busts in the Caribbean, employing annual data for 13 Caribbean countries covering the period 1970 to 2006 in the analysis. This study employs a panel count data regression approach. Three key groups of variables are considered: (1) macroeconomic developments; (2) macroeconomic policy, and (3) external shocks. The reported results suggest that macroeconomic developments were the main determinants of credit booms in the Caribbean, with low inflation, high growth in GDP per capita, investment booms as well as less developed financial systems leading to the emergence of credit booms and conversely for busts.

Keywords: Credit Booms, Credit Busts, Caribbean, Count Data Model

JEL Classification: E31; E58

1. Introduction

The financial system fulfils five key roles in any economy: (1) reduces risk; (2) allocates resources; (3) monitors and exerts control over managers; (4) mobilise savings, and; (5) facilitates the exchange of goods and services (Levine, 1997). Indeed, King and Levine (1993), using the ratio of commercial bank paper to central bank credit to measure the degree of financial development found that financial development was positively correlated with economic growth.

An inadequate supply of credit to the private sector can therefore constrain the long-run growth prospects for any economy. At the same, however, too much credit can be equally damaging. A credit boom, described as an episode of sharp and above trend expansion in real credit, is usually associated with greater investment in risky assets and above trend private consumption expenditure growth. These two factors often contribute to inflationary pressures, increased financial sector fragility and at the limit a balance of payments and/or financial crisis.

There is considerable evidence identifying lending booms as a frequent cause of banking and currency crises (Caprio and Klingebiel, 1996; Borio and Lowe, 2002). Kaminsky, Lizondo, and Reinhart (1997), in a survey of the literature, reported that five out of seven studies identified credit growth to be an important determinant of banking and/or currency crises. According to Borio and Lowe (2002), one of the relatively few robust findings to emerge from the literature on leading indicators of banking crisis is that rapid domestic credit growth increases the likelihood of a problem. Similarly, IMF (2004) concluded that credit booms posed significant risks for emerging market countries, as they are generally followed by sharp economic downturns and financial crises. In a broad sample of boom episodes over forty years, lending booms were found to be associated with a domestic investment boom, an increase in domestic interest rates, a worsening of the current account, a decline in international reserves, a real appreciation of the exchange rate, and a fall in growth of potential output. About three-fourths of credit booms were found to be associated with a banking crisis and almost seven-eighths with a currency crisis (IMF, 2004).

Hilber *et al* (2005) also reported that lending booms are accompanied by a sharp deterioration in the trade balance and current account balance in the crisis countries. Similar trends were observed in Central and Eastern European countries as well as countries to the East and South of the European Union (referred to as CEE) where the current account deficit also widened sharply (Hilber *et al*, 2005). Hilber *et al* (2005) deduced that the rapid expansion in bank credit seemed to be associated with high current account deficits in most of the CEE countries.

Although a prolonged period of above trend growth in credit can be linked to the increased risk of banking and currency crisis, at the same time the importance of credit in the growth dynamic cannot be ignored. This trade-off often poses a dilemma for policymakers (Kraft and Jankov, 2004). Policymakers in the Caribbean are especially challenged as they seek to stimulate economic activity and engender growth and sustainable development with limited resources and heighten vulnerability to external shocks. Balancing the potential risks associated with credit booms against the gains requires an understanding of the main determinants of credit.

This study outlines the main drivers of credit boom episodes over the last thirty years in the Caribbean. A credit bust is the converse of a credit boom and is expected to arise from opposite forces and so the investigation focuses on the boom episode. The findings presented in this paper should help policymakers understand the conditions under which credit booms are likely to emerge as well as the policies that could be employed to address the problem. The paper also contributes to the existing literature by: (1) providing a review of credit trends in the Caribbean over the last 30 years; (2) providing a framework for identifying booms, and; (3) examining the role of policy as well as external shocks to the emergence of credit booms.

The remainder of the paper is organised as follows. Section 2 provides a brief review of the literature on credit booms, while section 3 provides a review and analysis of credit trends in the Caribbean between 1970 and 2007. Section 4 presents the methodology for identifying credit boom episodes and outlines the empirical approach employed to evaluate the determinants of credit booms. Section 5 provides the empirical results, while section 6 gives a summary of the results as well as policy recommendations.

2. Why do Credit Booms or Busts Occur?

During the development phase of an economy, credit grows more quickly than output (Favara, 2003; King and Levine, 1993; and Levine, 1997). This "financial deepening" argument is supported by empirical work suggesting that a more developed financial sector helps promote economic growth. Another observation is that credit expands more rapidly than output at the beginning of a cyclical upturn due to firms' investment and working capital needs, according to the conventional accelerator models (see, e.g., Fuerst, 1995; and International Monetary Fund, 2004a). In addition, excessive credit expansions may result from inappropriate responses by financial market participant to changes in risks over time. In practice, it has proven difficult to distinguish among these three factors driving credit growth and to determine a "neutral" level or rate of growth for credit.

The risks associated with excessive credit expansions are generally underestimated due to measurement difficulties both in forecasting overall economic activity and its link with credit losses, and in assessing how correlations of credit losses across borrowers and lenders change over time (Hilber *et al*, 2005). This under-estimation of risk may result in over optimism about the degree of structural change that may be fueling the credit growth and a socially suboptimal reaction to risk by market participants. Incentives structures that reward short-term performance further contribute to credit growth even if risks are measured properly. Certain accounting and regulatory frameworks may create incentives for banks to take on excessive risk, including moral hazard arising from implicit or explicit government guarantees or inappropriate governance structures.

Credit expansion can be viewed as a symptom of financial development, in particular financial deepening, as noted in the literature on the finance-growth nexus. Financial development, fostered by technical change that has reduced the cost of acquiring, processing and storing information is also a factor. According to the literature, financial liberalisation and capital flows triggered by external factors or wealth shocks originating from comprehensive structural reforms can also contribute to excessive credit expansion. Equally important in stimulating the growth of

credit is the continuous opening-up of these economies to international financial flows. This facilitates access to foreign funds as an additional source of refinancing banks credit action. Less than fully credible policies, in particular exchange rate-based stabilisations can play a role in stimulating credit booms by setting off a consumption boom. Backe and Wojcik (2008) found a link between the expansion in credit and macroeconomic stabilisation and a build up of confidence in policy frameworks that provide lower inflation and, thus, declining interest rates drawing on the experience of the new Central and Eastern European EU member states. Privatisation and restructuring of the banking sector together with regulatory reforms of the financial markets that have promoted private savings as a source of banks' financing can therefore facilitate credit expansion. Improvements of legal frameworks, by reducing risk of banks' activities, were found to positively influence the supply of credit (Backe and Wojcik, 2008). Increased competition stimulated the development of new products.

Backe and Wojcik (2008) study also found that supply and demand factors were closely interrelated. They focused on the demand-side phenomenon, albeit one which is set off by a supply side shock. In particular, they emphasized the role of consumption smoothing in response to a productivity shock as an important channel of the observed credit expansion. Hilbers *et al* (2005) in reviewing the credit boom episodes of CEE argued that low initial credit-to-GDP ratios reflected the underdeveloped nature of domestic financial sector at the beginning of the transition.

The literature on credit in the Caribbean is relatively sparse. Bourne (1984), Worrell (1983) and Ramkissoon (1988) analysed various aspects of the loans market. These efforts include a number of alternative specifications and variables. Ramkissoon (1988) specified both a loan demand and supply schedule for business which incorporated variables such as the supply of business loans, the weighted average loan rate, the weighted average rate on treasury bills and other special deposits and the average bank deposits on the supply side. On the demand side he considered operating surplus, the weighted average loan rate and gross domestic product at current prices. The results were consistent with other studies that the weighted average loan rate was statistically insignificant. Other studies of the demand for credit have included the following variables: expected price level, current dollar permanent income, current dollar transitory income, expected

rate of inflation, nominal interest rate. On the supply side the following variables have been considered: scale constraint, interest rate on commercial bank loans, opportunity cost of lending for commercial banks and cost per dollar of bank deposits.

Downes *et al* (1997) examined the demand function for private individual credit in Barbados, in which they argued that demand was the key determinant with supply adjusting to meet households' requirements and the interest rate on consumer credit set exogenously according to the base rate of the commercial banks rather than the interaction of supply and demand for credit. Demand was postulated to depend on disposable income, liquid assets, nominal base interest rate, inflation and government policy on credit. The findings were similar with nominal interest rate being found not to influence private consumer credit, at least not in the short run.

3. The Development of Credit Markets in the Sample Countries

Prior to the start of our sample, there existed a British Caribbean Currency Board, which governed monetary and exchange rate policy in the Anglophone Caribbean, a grouping of which included all of our sample countries. Concurrently, many of the same banks operated in most territories, leading to a fairly integrated banking sector. The 1960s signalled the end of colonisation within the larger economies so that by the 1970s (when the smaller economies gained their independence) there were five central banks in operation and, by the 1980s, there were eight central banks[2]. These fledging institutions were patterned for the most part after their British and European counterparts, a consequence of their colonial heritage, but evolved to suit their various economies over time.

Despite their somewhat similar beginnings, however, monetary and exchange rate policy in these territories started to diverge. By the end of 2007, the fixed exchange rate system that had dominated the region during British rule was systematically moving towards a floating rate system, though some countries still opted to peg their currency to that of a larger economy[3]. In

[2] The OECS countries are a special case, as they have one central bank – the Eastern Caribbean Central Bank – though most were independent nations.
[3] Those countries with fixed exchange rate regimes within our sample are pegged to the US dollar.

addition, some islands had significantly fewer controls over financial flows than others, leading to different rates of development of their banking and overall financial sectors.

Table 1: Descriptive Statistics of the Financial Systems
(As at December 2007)

Countries	MONETARY AND EXCHANGE RATE POLICY FRAMEWORKS			
	Pegged Exchange Rate	Currency Board	Tightly Managed Float	Fully Floating
Bahamas	✓			
Barbados	✓			
Belize				
ECCU	✓			
Antigua & Barbuda		✓		
Dominica		✓		
Grenada		✓		
St. Kitts & Nevis		✓		
St. Lucia		✓		
St. Vincent & the Grenadines		✓		
Guyana				✓
Jamaica				✓
Suriname				
Trinidad & Tobago			✓	
Total				

Sources: Various IMF Country Reports, Various Central Banks

In line with the move towards increased sovereignty, the regional financial sector that had developed pre-independence came under threat with the concomitant surge in nationalist sentiment. Some of the foreign commercial banks were being phased out, either through voluntary exit or nationalisation by governments, one of the repercussions of which was that the financial sector primarily served political interests and was hampered in terms of determining its own direction. These newly developed national financial sectors, however, proved attractive for foreign investors and some countries, such as Barbados, the Bahamas and a few of the OECS countries, started to host a growing offshore banking sector.

From the late 1970s to the early 1990s, these fragile economies buckled under the strain, experiencing extreme economic hardships that forced the implementation of structural adjustment and stabilisation programmes. Guyana, Jamaica, Barbados, Suriname and Trinidad and Tobago all endured these efforts to re-orient their economies towards a free market with minimal government intervention. The concurrent liberalisation of the financial system boded well for the banking sector, which benefited from a relaxation in exchange controls and a general easing of tight financial regulations. In general, therefore, over the period 1970-2007, there was a significant deepening of the financial sector, as the banks expanded and increased the efficiency of their operations. In addition, this period saw regional integration creep to the forefront of policy once again, which helped to encourage many of the banks to widen their operations across territories. This concentration across countries suggests that there would be similar lending practices, even though institutions would obviously adapt their strategies to suit each individual territory. In addition, their operations could lead to similar responses across countries to monetary policy and economic developments.

The blossoming of the banking sector fostered an environment that encouraged the development of competition in the form of non-bank financial institutions. At the start of our sample period, the ratio of bank assets to total financial system assets was roughly 80%, however, by 2007, this ratio had fallen to 63.5%, reflecting the deepening and broadening of the financial systems across the region. Although banks are still the major players in consumer and commercial lending, as well as being an important supplier of credit to government, these non-bank institutions are playing a greater role in financing the economic development of their respective territories. Stock markets are becoming increasingly acknowledged as a source of commercial credit since their birth in the region in the 1980s, while, with respect to consumer lending, there is a wider range of options, including credit unions, mortgage finance institutions, building societies and insurance companies, to a lesser extent. Credit unions in particular have been steadily increasing their market presence though, in general, they have yet to present any meaningful competition to commercial banks. Given the sustained, though weakened, dominance of the banking sector, our study focuses on the credit extended by commercial banks.

4. Identifying Credit Booms

This section of the study outlines the approaches that will be employed to identify credit booms in thirteen English-speaking Caribbean countries. A credit boom is defined as a period of above average growth in credit and is identified through the deviation of credit growth from its historical trend. The first step in the process of identifying credit booms is therefore to estimate trend credit growth for each country in the sample. The moving-average approach calculates trend credit growth as the nine-month moving average of credit growth. In the second step of the process, trough dates are identified as points in time when trend credit growth is lower than in the preceding and succeeding six months, while peak dates are those periods when trend credit growth is higher than in the preceding and succeeding six months. An episode is then defined as a period over which trend credit growth rises by at least 5 percent from trough to peak.

One of the drawbacks of the approach discussed above is that booms and busts are identified through a somewhat ad hoc process. To overcome this shortcoming, the boom and bust cycle of Caribbean credit growth is modelled using a Markov switching vector autoregressive model. The stochastic process of the growth in credit is assumed to follow an autoregressive specification of order *k*:

$$\Delta_k y_t = v(s_t) + \sum_{i=1}^{k} \phi \Delta_k y_{t-i} + \varepsilon_t \qquad (1)$$

Where v is the regime-dependent intercept, s_t is the regime index, ϕ are the coefficients on the autoregressive terms, and ε_t is a sequence of $i.i.d\ N(0,1)$ random variables. By allowing the intercept to depend on the cycle, the model implicitly assumes a smooth transition from one state to the next.

Following Hamilton (1989), the state variable, s_t, is represented as an unobserved discrete-time, discrete-state Markov process. The transition probability matrix is such that:

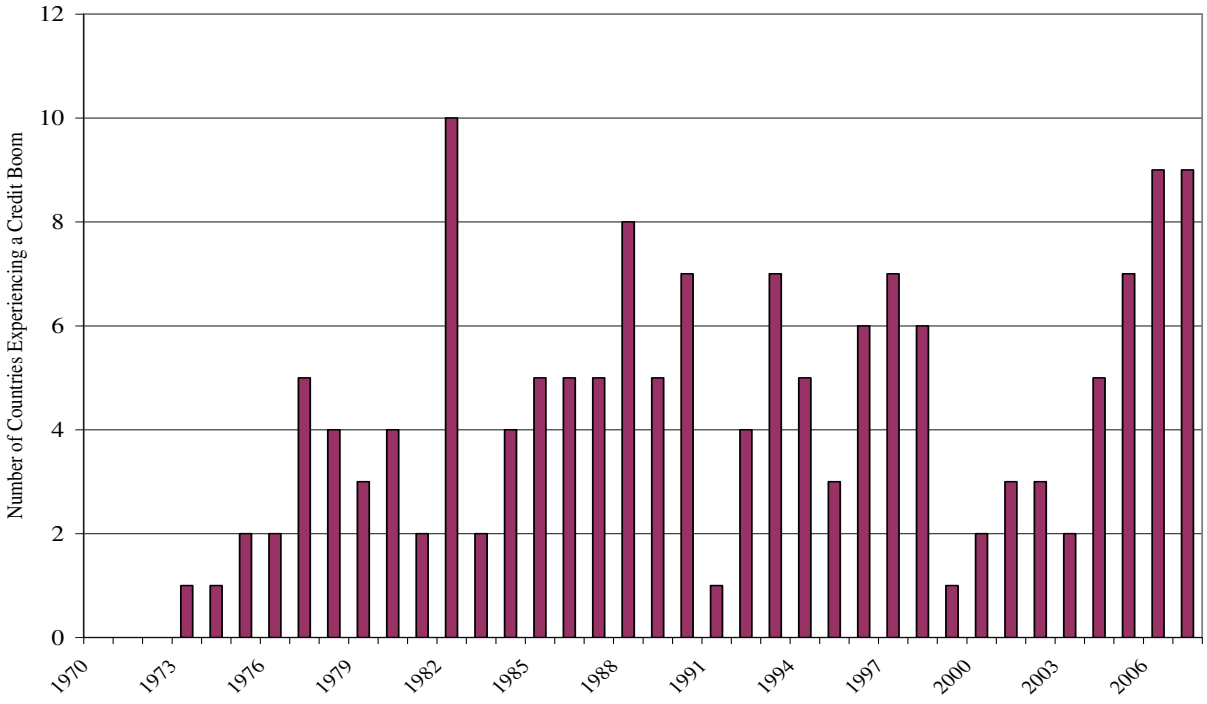
$$P_{ij} = \Pr[s_t = j \mid s_{t-1} = i] \quad with \sum_{j=0}^{N} P_{ij} = 1 \ for\ all\ i\,. \qquad (2)$$

Maximum likelihood estimation of the framework given in Equation (1) is undertaken using the Expectation Maximization algorithm discussed in Hamilton (1990). In addition, the smoothing algorithm of Kim (1994) is employed to assign probabilities to the unobserved state conditional

on the information set. The three-regime version of Equation (1) is applied to monthly credit growth for each Caribbean country. The three-regime framework assumes that credit growth evolves through a stochastic process of busts, moderate growth and booms.

Figure 1 plots the number countries experiencing a credit boom during a particular year. The figure suggests that there was a concentration of credit booms in the late 1980s and mid-1990s. It also indicates that since 2005, a larger number of countries have been experiencing credit booms.

Figure 1: Credit Booms in the Caribbean



Source: Author's calculations

To remove the effects of business cycle fluctuations, the database was averaged over five-year intervals. As a result, the study employs a panel count data specification to empirically model credit booms. It is common to assume a Poisson distribution for the number of occurrences of an event:

$$\Pr[Y = y] = \frac{e^{-\mu_i}\mu^{y_i}}{y_i!}, \quad y = 0,1,2,... \tag{1}$$

Where μ is the intensity parameter and y are the number of events occurring during a particular period. The intensity is then explained by K linearly independent covariates:

$$\mu_i = \exp(x_i^{'}\beta), \quad i = 1,...,N \tag{2}$$

The Poisson regression is derived under the assumption of mean and variance equality. If this is not the case, i.e. over dispersion, then one can utilise the negative Binomial model (see Cameron and Trivedi, 2005). The model is estimated by the method of maximum likelihood using the Bendt-Hall-Hausman algorithm (other algorithms, such as Quadratic-Hill Climbing and Newton-Raphson, were employed, but these yielded similar estimation results).

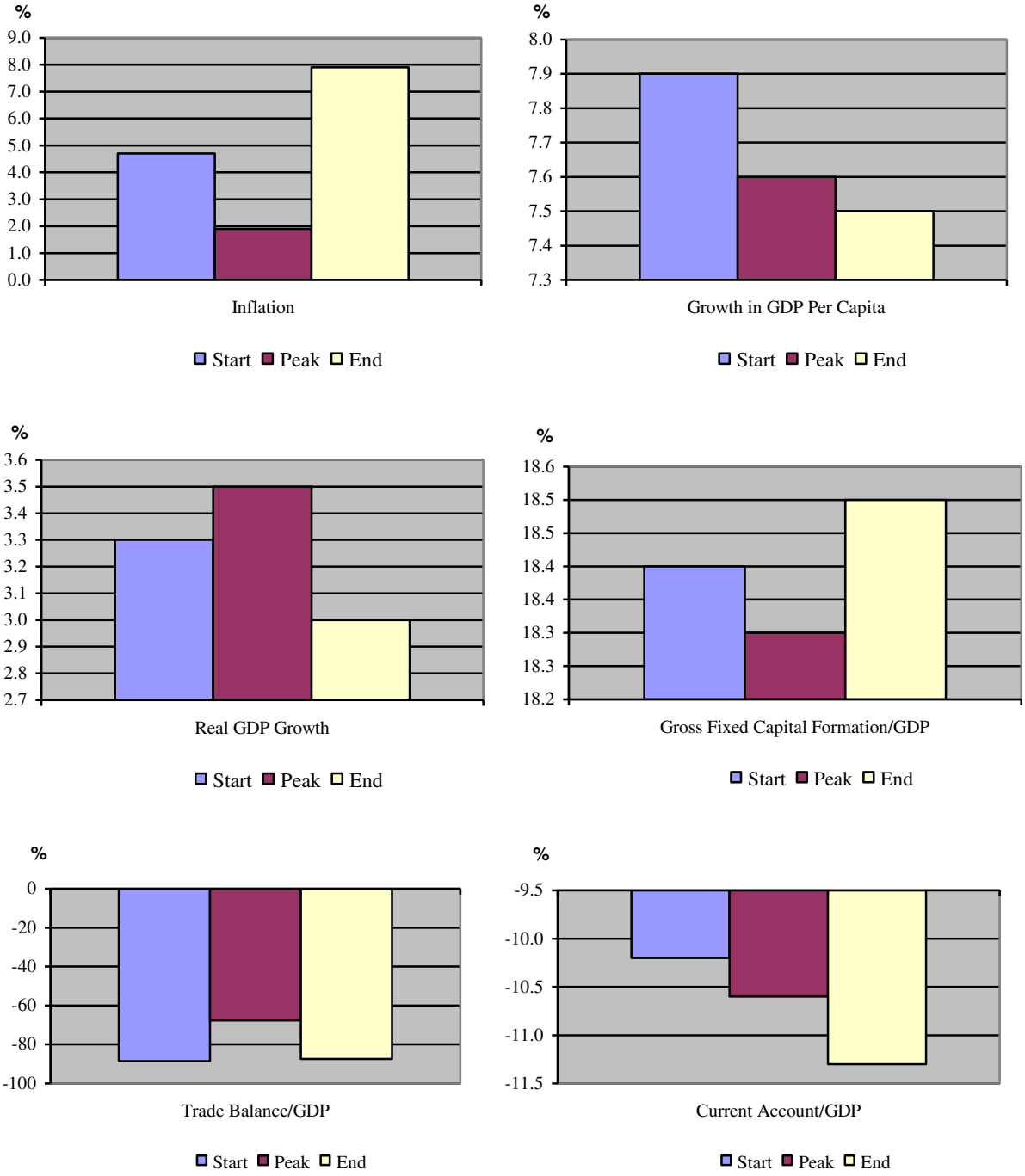
5. Factors Influencing the Emergence of Credit Booms or Busts

During the episodes of rapid credit growth, patterns have emerged in key macroeconomic and financial variables and, drawing on the previous empirical work summarised in Section 2, the following influences on the emergence of credit booms in developing countries have been identified for consideration in this study: (1) macroeconomic developments (inflation, GDP per capita growth, gross fixed capital formation as a percentage of GDP and financial development); (2) macroeconomic policy (government consumption as a percentage of GDP, reserve requirements, interest rate changes, sterilisation operations/exchange rate interventions); (3) external shocks (world growth, capital inflows, changes in the terms of trade and elections); and, (4) financial indicators (capital adequacy ratio, non-performing loans to total loans, loans/deposits, deposits as a percentage of GDP, funding of credit booms)

5.1 Macroeconomic Developments

Macroeconomic developments should be expected to be one of the key determinants of the emergence of credit booms in the developing economies of the Caribbean, since they impact on both the demand for credit on the part of the private sector, as well as the willingness to lend on the part of the banking industry. Figure 2 illustrates the pattern of key macroeconomic indicators at the start, peak and end of the credit boom episodes identified in the previous section.

Figure 2: Macroeconomic Developments during Credit Booms



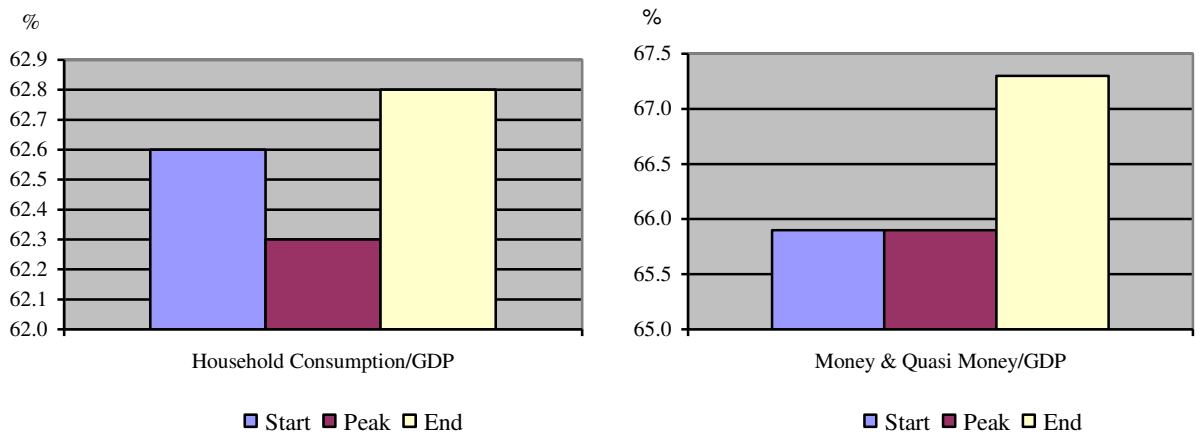


Figure 2 clearly shows that, on average, inflationary pressures eased during the credit booms but shoots up thereafter. As inflation reduces the real value of amounts repaid by borrowers as well as increases uncertainty, it should be expected to be inversely correlated with the emergence of credit booms. The charts of real GDP growth and growth in GDP per capita, on the other hand, show the reverse, where during credit booms, economic activity expands at a faster rate than pre- or post-boom. According to the financial accelerator model, credit should be expected to rise faster at the beginning of a cyclical upturn due to firms' investment and working capital needs (see, e.g., Fuerst, 1995; and International Monetary Fund, 2004a). To capture this effect, the regression equation includes the difference between growth in GDP per capita and trend growth.

The ratio of gross fixed capital formation to GDP, taken as a measure of investment activity, attempts to capture the effects of investment booms. A credit boom, therefore, may be a sign of an investment boom and this appears to be the case when considering the gross fixed capital formation to GDP chart. Moreover, the decline in the ratios of household consumption-to-GDP and government consumption-to-GDP, as shown in Figure 2, provide further evidence that this may be the case given that if there is no investment boom lending may be aimed more at households or government. Since most finance for investment in the Caribbean either comes from internal sources or commercial banks (Craigwell, Maxwell and Moore, 2005), investment booms are expected to be positively correlated with the emergence of credit booms.

Financial development, fostered by technical change that has reduced the cost of acquiring, processing and storing information can facilitate more arms' length transactions as well as allow

broader participation. This encourages an expansion in both the variety of intermediaries as well as the number of financial transactions (Love, 2003; Blackburn and Hung, 1998). The wider variety of financial intermediaries should result in a reduction in the dependence of the private sector on bank finance; however, the history of these markets shows that the ratio of bank real credit to the private sector (BRCPS)-to-GDP rose from an average – excluding Suriname and Jamaica[4] – of 57.9% in 1971 to 95.5% in 2007. Furthermore, when considering total deposits-to-GDP, there has been a significant increase over the sample period, from an average[5] of 24.3% in 1979 to 128.9% in 2007, and this suggests development within the financial sector as market participants increasingly utilise financial instruments for savings. Although there is a clear indication of the continued dominance of the banking industry, there is no doubt that there has been substantial development within the financial sectors of the sample countries. As a result, the relationship between financial development, proxied by the ratio of M2 to GDP, and credit booms is expected to be inversely related to the emergence of credit booms.

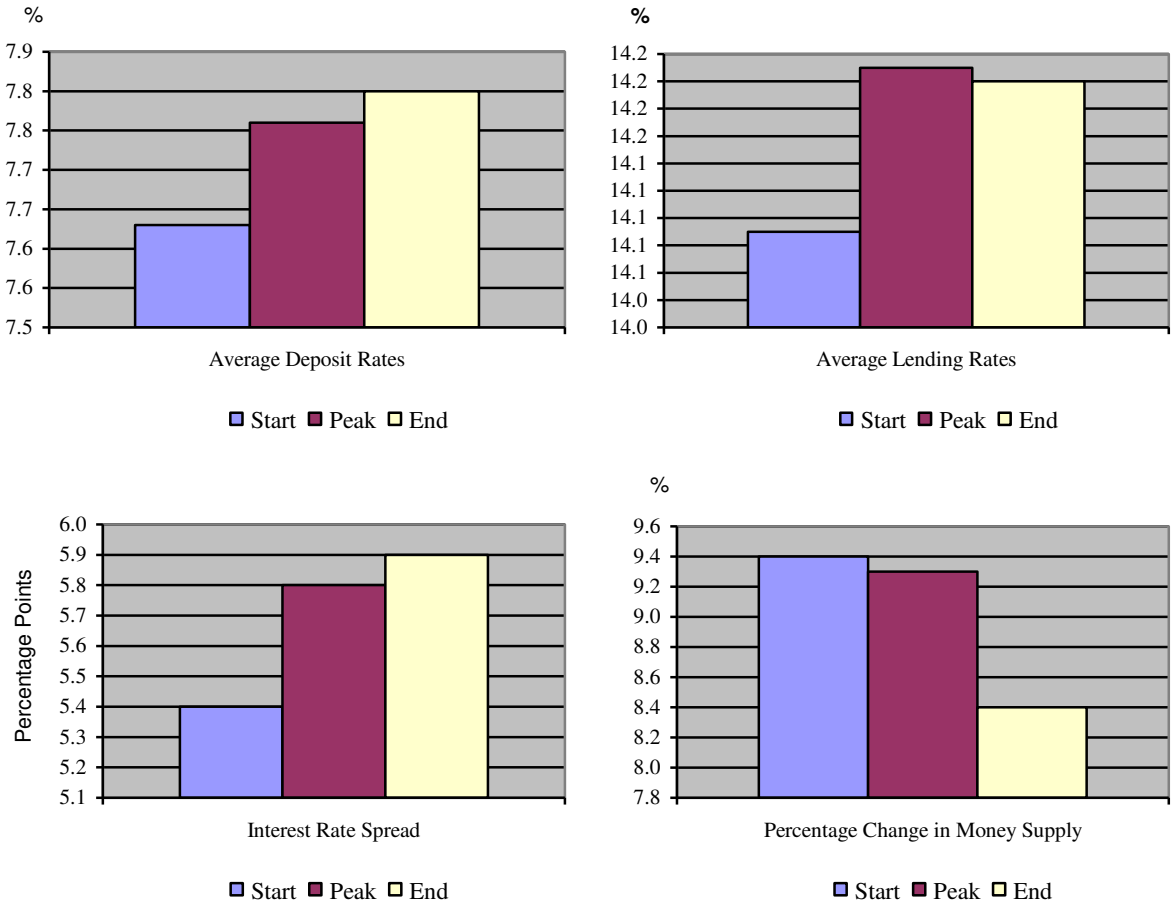
One feature of the economies of the sample countries is that most of them are net importers, some to the extent that more than 75% of their consumption is imported. This leads to a situation where credit booms inevitably lead to worsening external current account positions, as shown in the current account to GDP chart in Figure 2. In fact, it is this relationship that often forces central bank intervention in the fixed exchange rate regimes of our sample in order to protect the net international reserves of the country in question.

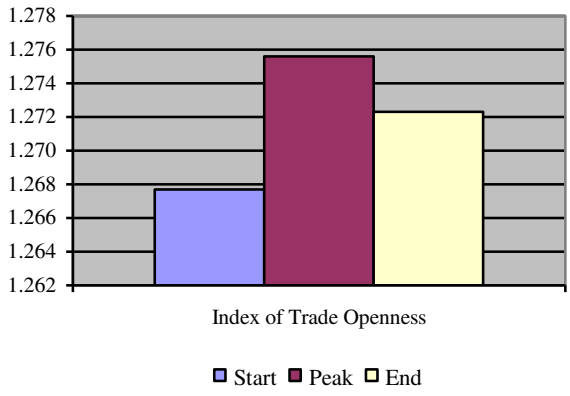
5.2. Macroeconomic Policy

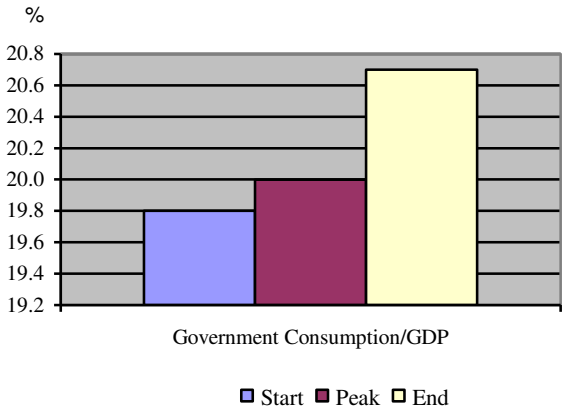
Rather than macroeconomic developments, it is also possible that the activities of policymakers may directly or indirectly influence the emergence of credit booms. As such, we shall consider the behaviour of monetary, fiscal and trade policy indicators (see Figure 3).

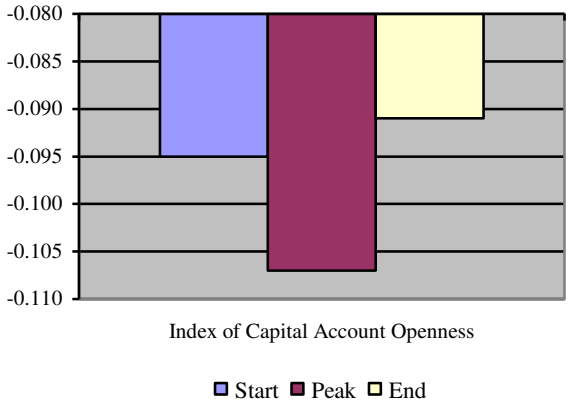
[4] This average excludes Suriname and Jamaica. Due to exchange rate challenges, the ratio of bank credit-to-GDP when expressed in real terms for Suriname and Jamaica are exceptionally high, though they had fallen over the sample period, and including these ratios significantly distorts the average across the region.
[5] This average excludes Suriname.

Figure 3: Macroeconomic Policy during Credit Booms









With respect to monetary policy, in most Caribbean countries, policy makers either directly or indirectly attempt to influence interest rates. Relative high interest rates can increase the cost of borrowing and suffocate private sector investment. However, relatively low interest rates can make projects with relatively low returns seem more attractive and encourage speculation to earn higher returns. Three indicators of interest rate rates are therefore examined in this study: (1) deposit rates; (2) lending rates, and; (3) interest rate spreads. Figure 3 shows the behaviour of interest rates prior to, during and immediately following credit booms. The graph indicates that prior to credit booms, a low interest rate regime prevailed and it is possible that this favourable borrowing environment encouraged the development of episodes of rapid credit growth. As the boom takes hold, rates start to rise, probably due to central bank intervention so that by the end of the boom period, rates are noticeably higher than pre-boom. Another interesting pattern is the widening of the spread between deposit and lending rates during credit booms. At the beginning of the boom, interest rate spreads are smaller but gradually rise throughout the episode. This

could once again be due to central bank intervention, which tends to translate into faster lending rate adjustment relative to that of deposit rates.

As an alternative indicator of monetary policy, changes in liquid money (M1) was considered, as the central banks may attempt to influence money supply through changes in base money. An increase in the money supply may suggest that the central bank is maintaining an expansionary policy stance and could therefore encourage banks to expand their loan portfolios.

In terms of fiscal policy, government consumption is employed as a measure of government's fiscal policy stance and, as shown in Figure 3, government consumption-to-GDP tends to rise during credit booms. However, a priori, it has an ambiguous impact on the emergence of credit booms. If government finances its spending through money creation this could increase bank liquidity and create the conditions for a credit boom. On the other hand, if spending is financed via government paper, this can reduce the supply of funds for private investment.

The removal (or weakening) of controls on trade as well as financial flows are also ambiguously associated with the emergence of a boom. Figure 3 suggests that trade openness is at its highest during credit booms but is relatively restricted pre- and post-boom. Greater trade openness could provide larger markets for exporters (Santos-Paulino and Thirlwall, 2004) and therefore greater demand for credit. However, if trade liberalisation leads to increased uncertainty, financial institutions could be less willing to lend (particularly to those companies that could be severely affected due to the removal of protection).

Similarly, opening the capital account should provide domestic firms greater options, in terms of financing their activities and should thus reduce the dependence on domestic finance. On the other hand, if the removal of controls on capital flows leads to greater capital inflows, this could drive up liquidity and result in a domestic credit boom (Mendoza and Terrones, 2008). With respect to capital account liberalisation, Figure 3 suggests that capital account restrictions are at their most stringent during credit booms. It is possible, therefore, that the more relaxed stance prior to the boom could have encouraged inflows that helped spur high credit growth. Following the onset of the boom, policy makers may have tightened restrictions to mitigate any unwanted

impact on exchange rates and/or reserves. In fact, the financial account-to-GDP chart in Figure 4 suggests that financial inflows grew despite relatively tighter controls, implying that the favourable conditions that prevailed pre-boom were sufficient incentive for sustained capital flows, even after the actions of policy makers.

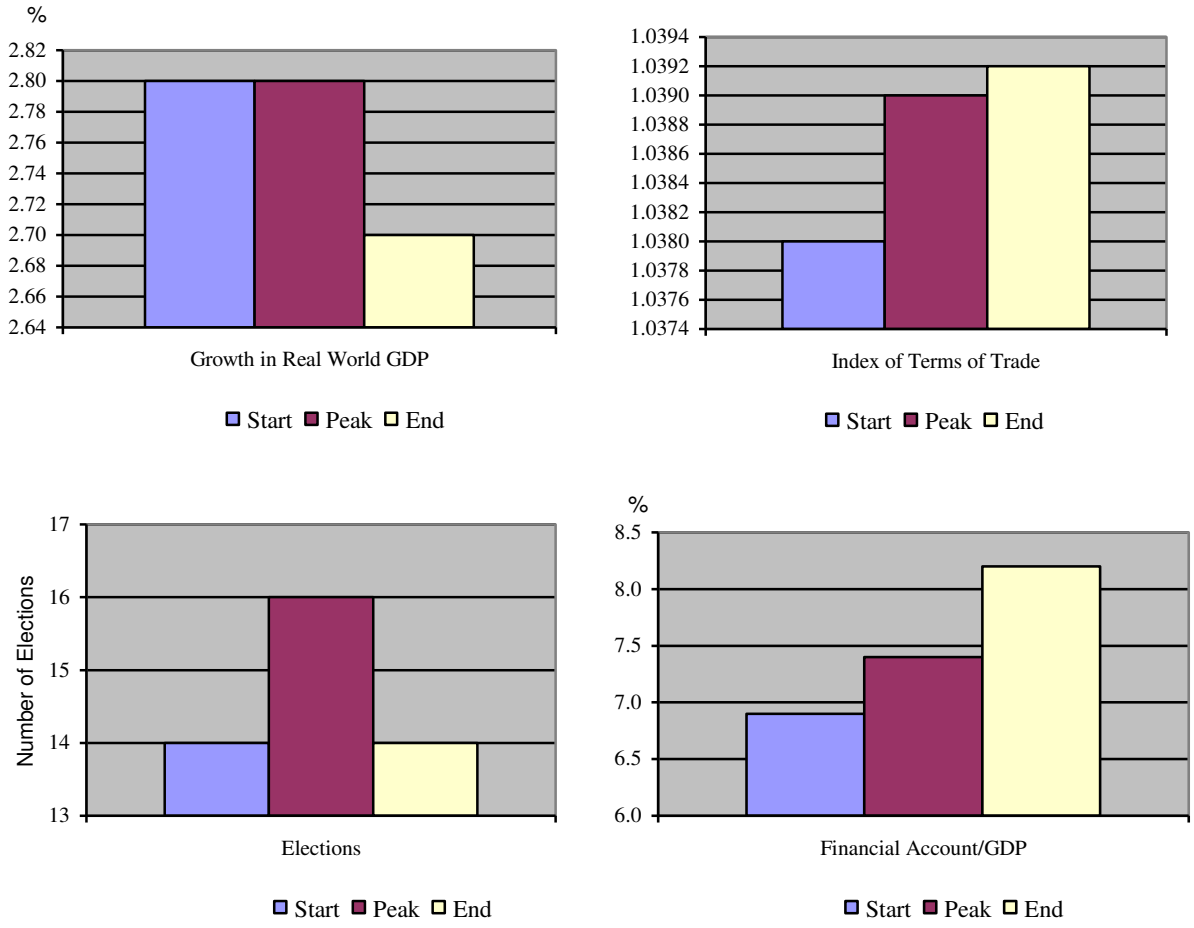
5.3 Political Cycles and External Shocks

Due to the vulnerability of Caribbean economies to external shocks (see Easterly and Kraay, 2000), the third group of variables considered attempt to capture the effects of external shocks on the likely emergence of credit booms. Four potential external factors are considered: (1) world growth; (2) capital inflows; (3) changes in the terms of trade; and, (4) elections.

Most Caribbean economies depend on the export of primary commodities or tourism services to propel growth. These activities are largely driven by income fluctuations (world growth) in key source markets and prices (terms of trade). Positive shocks to world income and the terms of trade are therefore expected to be positively associated with the emergence of credit booms. Figure 4 supports this expectation, clearly showing that prior to and during credit booms, growth in real world GDP is noticeably higher than immediately following the boom and that there are improvements in the terms of trade over the duration of the boom. Capital inflows eventually filter into the financial system, as noted in the financial account/GDP chart in Figure 4, and could therefore finance a significant expansion in credit.

With respect to elections, in an attempt to obtain a favourable outcome, incumbent governments may engage in some degree of pre-election spending. This could, depending on the source of finance, provide the conditions for the emergence of credit booms (Nordhaus, 1975). The elections chart in Figure 4 shows the total number of elections that took place before, during and after elections for all sample countries over the period 1970-2007, and shows a slight rise in the number of elections during booms.

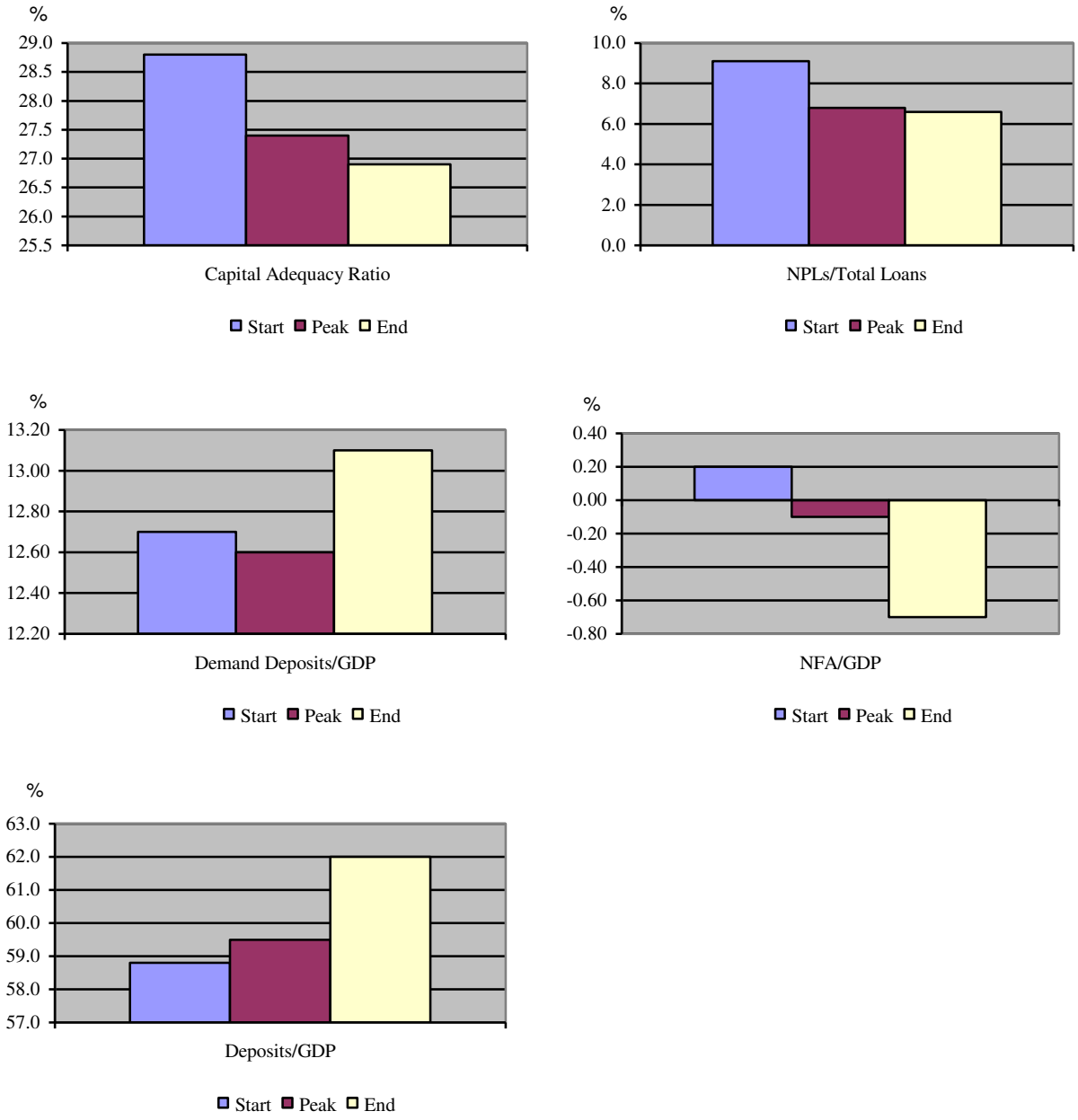
Figure 4: Political Cycles and External Shocks during Credit Booms



5.4 Financial Sector Indicators

The final set of indicators are not included in the regression to determine the causes of credit booms because of insufficient time series, but they warrant discussion because they provide of good description of developments within the financial sector during credit booms and some of the indicators, such as the prudential measures, could influence the emergence of credit booms. These are summarised in Table 2 and Figure 5.

Figure 5: Financial Sector Indicators during Credit Booms



One of the key indicators of the health of the banking sector is the capital adequacy ratio, which is a measure of the capital buffer of the banks should there be a significant negative event. Figure 5 shows that during booms, the capital adequacy ratio falls and continues to decline following the boom. This implies that the capital buffer of banks is eroded somewhat after a credit boom and the recovery is not immediate. A similar pattern is also observed for non-performing loans to total

loans and this implies that the loan quality improves during a credit boom, probably due to an increased ability to repay on the part of borrowers.

Commercial bank credit in most countries was generally funded through the deposit base; however, as illustrated in Figure 5, prior to the onset of a credit boom, there appears to be a trend where there are noticeable inflows reflected in the commercial banks' net foreign assets (NFA). This is in line with the assumption that capital inflows could lead to rapid credit growth.

Table 2: Descriptive Statistics of the Banking Systems of Selected Countries
(As at December 2007, unless stated otherwise)

Countries	Banking Assets/ Total Financial System Assets (%)	Capital Adequacy Ratio (CAR) (%)	NPL/ Total Loans (%)	Share of Loans to Businesses (%)	Share of Loans to Households (%)	Share of FX Loans (%)	Maturity of Loans[1] (%)	Loans to Deposits (%)
Bahamas	--	33.9[a]	4.2[a]	--	70.5	11.2	83.0	115.3
Barbados	65.8[a]	44.3	3.3	39.2	47.7	9.5	73.9	63.7
Belize	--	10.5	8.7	61.7	23.5	49.6	--	98.0
ECCU	--	24.3	7.2	36.8	41.8	--	81.0	81.2
Antigua & Barbuda	--	--	--	38.0	42.7	--	79.9	73.7
Dominica	--	16.4	8.4	29.7	57.0	--	84.0	63.9
Grenada	--	--	--	30.8	54.7	--	82.9	81.0
St. Kitts & Nevis	--	38.9[a]	4.8[a]	22.9	31.4	--	72.7	49.3
St. Lucia	--	17.6[a]	8.5[a]	53.6	33.9	--	82.2	122.0
St. Vincent & the Grenadines	--	--	--	29.5	45.7	--	84.2	82.0
Guyana	61.6	15.3	11.5	63.4	32.7	--	46.3	50.4
Jamaica	65.3	16.1	2.2	60.2	37.8	40.8	--	64.8
Suriname	--	--	11.5	--	--	--	--	54.3
Trinidad & Tobago	72.9[c]	21.4[b]	2.3[b]	48.1	41.0	--	46.7	84.2
Average	63.5	20.5	7.6	43.4	43.2	27.8	73.6	77.1

Sources: International Financial Statistics, Various IMF Country Reports, Various Central Banks, Authors' calculations
Explanation: NPL=Non-performing loans; FX=Foreign exchange
[1] Long terms loans divided by total loans
[a] End of 2006
[b] End of 2005
[c] Total Banking Assets as a percentage of Total Assets of Deposit-Taking Financial Institutions

6. Empirical Approach and Results

6.1 Macroeconomic Developments

Table 3 provides the coefficient estimates for the basic econometric model that only includes variables that capture macroeconomic developments. Before analysing the coefficient estimates, an analysis of the test statistics is provided. The model was first estimated using Poisson estimation, however, a test for over dispersion (see Cameron and Trivedi, 2005) rejected the Poisson restriction. As a result, the model was estimated using the negative Binomial count model. A test for the significance of the fixed-effects had a chi-square value of 21.088[0.049], suggests that the null hypothesis that the fixed-effects can be restricted to zero could not be accepted at normal levels of testing. The Jarque-Bera statistic, which tests the null hypothesis that the residuals are normally distributed, is 0.377 (p-value = 0.828) for the model with fixed effects and 4.835 (p-value = 0.089), for the model without fixed effects, suggesting that the null hypothesis can not be rejected at normal levels of testing for the model with fixed effects.

Turning now to the coefficient estimates, Table 3 provides the coefficient estimates from two model specifications: one with fixed effects and the other without fixed effects (i.e. assuming that the intercept does not vary across countries). In addition, the dependent variable, credit booms is generated using the trend approach as well as the Markov switching technique. Given the joint significance of the fixed effects alluded to above, the model without fixed effects is only provided for comparison purposes. In addition, the main findings from employing the trend and Markov switching techniques were quite similar. Consequently, the coefficient estimates obtained from using the trend approach to identifying booms is employed in the rest of the study. The four main indicators or macroeconomic development are all significant at normal levels of testing. In agreement with a priori expectations, inflation had a negative and statistically significant impact on the emergence of credit booms. High inflation, due to effects on uncertainty and the real value of money seem to have a disincentive effect on the willingness to lend in the Caribbean and therefore reduce the likelihood of a credit boom emerging.

The coefficients on the growth rate of GDP per capita and investment as a ratio of GDP are both positive and statistically significant, indicating that booms in the Caribbean are more likely to occur when GDP growth accelerates and/or due to a pick-up in investment activity. The negative

coefficient on the financial development seems to suggest that as the financial market in the Caribbean developments, households and firms seem to seek other sources of funds to finance their transactions. This finding needs to conditioned, however, as shifting financial activities from highly regulated industries (banks) to less well regulated financial companies may have implications for the stability of the financial system.

Table 3: The Impact of Macroeconomic Developments on the Emergence of Credit Booms

	Dependent Variable = Credit Booms (Trend Approach)			Dependent Variable = Credit Booms (Markov Switching Approach)	
Variable	(without fixed effects)	(with fixed effects)		(without fixed effects)	(with fixed effects)
Constant	0.437 (1.487)	-0.145 (-0.359)		-0.037 (-0.109)	0.233 (0.608)
$Inflation_t$	-3.528 (-0.914)	-8.330 (-2.035)**		-13.091 (-2.191)**	-15.514 (-2.994)**
$Growth\ in\ GDP\ per\ capita_t$	1.652 (0.579)	5.875 (3.103)*		9.906 (1.997)*	14.163 (3.364)**
$Investment_t$	0.015 (2.945)**	0.022 (3.262)**		-0.003 (-0.253)	-0.027 (-0.238)
$M2GDP_t$	-0.006 (2.109)**	-0.007 (-2.126)**		0.001 (0.295)	0.001 (0.912)
Log-Likelihood	-165.205	-162.202		-135.307	-133.813
R-squared	0.078	0.107		0.088	0.283
Number of Observations	96	96		96	96

Note: (1) z-Statistics are given in parentheses.
(2) ** and * indicates significance at the 5 and 10 percent level of testing, respectively

6.2 Macroeconomic Policy and Credit Booms

Rather than macroeconomic developments, it is also possible that the activities of policymakers may directly or indirectly influence the emergence of credit booms. Table 4 therefore augments the basic model of credit booms with various indicators of policy shocks. Three interest rate variables are considered: the lending rate, the deposit rate and the interest rate spread. All the interest rate variables were, however, insignificant determinants of credit booms in the region. One possible explanation for this finding is that central banks in the region, in one way or the other, have attempted to affect domestic interest rates. If interest rates are not market determined, the emergence of credit booms is therefore less likely, since policymakers are unlikely to let such a bubble emerge. Changes in the money supply, a more conventional indicator of monetary policy intervention, in contrast, were positive and statistically significant at normal levels of

testing. The significance of this variable indicates that positive money supply shocks could, in some instances, lead to the formation of credit booms.

Government consumption, an indicator of government's fiscal policy stance, was insignificant at normal levels of testing. While this finding would suggest that fiscal policy interventions are not as important as monetary policy changes in the emergence of credit booms, it could also be due to other factors: (1) government consumption may be a poor indicator of government's fiscal policy stance, or; (2) the positive effect of government spending may be off-setting its crowding-out effect.

Trade openness, a proxy for the level of protection being offered to domestic firms, was also insignificant at normal levels of testing. As most Caribbean countries rely on the export of services or primary commodities to protected markets, the removal of trade restrictions is unlikely to trigger an expansion in the demand for these goods, since demand would primarily be driven by demand in source markets. In contrast, the removal of controls on the flows of capital across borders had a positive and statistically significant impact on the emergence of credit booms. This could suggest that opening the capital account in the Caribbean boosts capital flows and thereby finances the emergence of credit booms. Regional governments should therefore ensure that adequate supervisory and prudential controls are in place and maintained after the opening of the capital account.

Table 4: The Impact of Macroeconomic Policy Shocks on the Emergence of Credit Booms

	Dependent Variable = Credit Booms							
Variable	Basic Regression Equation	Lending Rate	Deposit Rate	Spread	Changes in Money Supply	Government Consumption	Trade Openness	Financial Openness
Constant	-0.145 (-0.359)	-0.122 (-0.274)	-0.225 (-0.470)	0.040 (0.094)	-0.172 (-0.407)	-0.242 (-0.320)	0.381 (0.678)	-0.209 (-0.553)
$Inflation_t$	-8.330 (-2.035)**	-1.765 (-0.433)	-1.171 (-0.284)	-1.272 (-0.319)	-5.609 (-1.346)	-8.452 (-2.080)**	-8.980 (-2.272)**	-7.662 (-1.902)*
$Growth\ in\ GDP\ per\ capita_t$	5.875 (3.103)*	3.969 (1.431)	4.074 (1.461)	4.100 (1.488)	3.343 (1.071)	6.029 (1.888)*	6.508 (2.186)**	4.878 (1.560)
$Investment_t$	0.022 (3.262)**	0.015 (2.319)**	0.013 (2.557)**	0.015 (2.875)**	0.024 (3.479)**	0.023 (2.612)**	0.025 (3.724)**	0.025 (3.637)**
$M2GDP_t$	-0.007 (-2.126)**	-0.006 (-2.164)**	-0.006 (-2.196)**	-0.006 (-2.416)**	-0.010 (-2.351)**	-0.007 (-2.015)**	-0.008 (-2.076)**	-0.007 (-2.053)**
$Lending\ Rate_t$	-	0.007 (0.463)	-	-	-	-	-	-
$Deposit\ Rate_t$	-	-	0.022 (0.915)	-	-	-	-	-
$Spread_t$	-	-	-	-0.014 (-0.597)	-	-	-	-
$Changes\ in\ Money_t$	-	-	-	-	2.030 (1.620)*	-	-	-
$Government\ Consumption_t$	-	-	-	-	-	0.005 (0.165)	-	-
$Trade\ Openness_t$	-	-	-	-	-	-	-0.661 (-1.295)	-
$Capital\ Account\ Openness_t$	-	-	-	-	-	-	-	0.122 (1.661)*
Log-Likelihood	-162.202	-149.355	-140.551	-140.644	-158.287	-162.198	-161.902	-161.810
McFadden R-squared	0.107	0.163	0.175	0.188	0.171	0.113	0.149	0.095
Number of Observations	96	86	80	80	92	96	96	96

Note: (1) z-Statistics are given in parentheses.
(2) ** and * indicates significance at the 5 and 10 percent level of testing, respectively

6.3 Political Cycle, External Shocks and Credit Booms

The final group of potential determinants of credit booms attempt to measure the effects of political and other exogenous factors on the emergence of credit booms; the coefficients are summarised in Table 5. In terms of elections, the political business cycle, proxied by an elections dummy had a statistically insignificant impact. This result could imply that its effects may already be accounted for in the inflation and growth variables.

Surprisingly, world growth was negative and significantly correlated with the emergence of credit booms. This result could reflect the increased demand on bank finances that arise during economic downturns. Similarly, capital flows were negatively associated with the emergence of credit booms, suggesting that capital flows may be acting as a substitute for bank finance. The final external shock variable, changes in the terms of trade, had a statistically insignificant impact on the emergence of credit booms. This result may suggest that during positive terms of trade shocks firms may depend more on internal finance.

Table 5: The Impact of External Shocks on the Emergence of Credit Booms

	Dependent Variable = Credit Booms				
Variable	Basic Regression Equation	World Growth	Capital Inflows	Change Terms of Trade	Elections
Constant	-0.145 (-0.359)	0.445 (0.981)	-0.093 (-0.225)	-0.055 (-0.146)	-0.120 (-0.279)
$Inflation_t$	-8.330 (-2.035)**	-10.255 (-2.237)**	-4.775 (-1.276)	-4.088 (-1.042)	-8.376 (-2.044)**
$Growth\ in\ GDP\ per\ capita_t$	5.875 (3.103)*	9.112 (2.338)**	5.665 (1.902)*	5.472 (1.886)*	5.871 (1.883)*
$Investment_t$	0.022 (3.262)**	0.020 (3.135)**	0.016 (2.741)**	0.016 (2.435)**	0.022 (3.294)**
$M2GDP_t$	-0.007 (-2.126)**	-0.005 (-1.817)*	-0.007 (-2.454)**	-0.006 (-2.179)**	-0.007 (-2.041)**
$World\ Growth_t$	-	-0.247 (-1.939)*	-	-	-
$Capital\ Flows_t$	-	-	-0.026 (-2.058)**	-	-
$\Delta Terms\ of\ Trade_t$	-	-	-	0.178 (0.327)	-
$Elections_t$	-	-	-	-	-0.026 (-0.148)
Log-Likelihood	-162.202	-161.449	-131.144	-154.305	-162.197
R-squared	0.107	0.077	0.285	0.200	0.104
Number of Observations	96	96	76	89	96

Note: (1) z-Statistics are given in parentheses.
(2) ** and * indicates significance at the 5 and 10 percent level of testing, respectively

7. Conclusions

An effective and vibrant financial system can have a positive impact on long run economic growth (see Levine (1997). However, a sharp jump in credit, known as a credit boom, can have quite deleterious effects. Such booms usually finance investment in high-risk assets as well as finance an acceleration in consumption expenditure. By stoking inflationary pressures, these two factors often increase financial sector fragility and at the limit lead to balance of payments and/or financial crisis (see Caprio and Klingebiel, 1996; Borio and Lowe, 2002).

This study employs a panel count data regression approach to model the factors that have historically led to the emergence of credit booms and conversely busts in the Caribbean. Three key groups of variables are considered: (1) macroeconomic developments; (2) macroeconomic

policy and (3) external shocks. The reported results suggest that macroeconomic developments were the main determinants of credit booms in the Caribbean, with low inflation, high growth in GDP per capita, investment booms as well as less developed financial systems leading to the emergence of credit booms. In relation to external shocks, the two key factors here were world growth and capital inflations. In terms of policy responses to credit booms the study finds that changes in the money supply and opening the capital account can have the most significant impact on the emergence of booms in the region. The estimated model results indicate that loose monetary policy and capital account liberalisation are significantly correlated with the emergence of credit booms in the region.

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Table A1: Data Description and Sources

Variable	Description	Source
Credit	Credit to the non-financial private sector (US$ Millions) divided by the GDP deflator	IMF's International Financial Statistics and the United Nation's National Accounts Database
GDP per capita	Real GDP ($US Millions) divided by population	United Nation's National Accounts Database
GDP growth	Log change in real GDP per capita	Authors' Calculations
Inflation	Change in GDP deflator	United Nation's National Accounts Database
Investment	Gross fixed capital formation as a percentage of GDP	"
M2GDP	Money plus quasi-money (US$ Millions) as a ratio to nominal GDP (US$ Millions)	IMF's International Financial Statistics and the United Nation's National Accounts Database
Lending rate	Lending rate	IMF's International Financial Statistics
Deposit rate	Deposit rate	IMF's International Financial Statistics
Interest rate spread	Difference between lending and deposit rates	Authors' calculations
Changes in money	Log change in money	IMF's International Financial Statistics
Government consumption	Government consumption as a percentage of GDP	United Nation's National Accounts Database
Trade Openness	Exports plus imports as a percentage of GDP	United Nation's National Accounts Database
Capital Account Openness	Index of capital account openness	Chi and Ito (200x)
World growth	Annual change in world GDP	United Nation's National Accounts Database

Capital flows	Balance on the financial account as a percentage of GDP	IMF's International Financial Statistics
Terms of trade	Log change in the ratio of export and import prices	United Nation's National Accounts Database
Elections	Takes a value of 1 if election occurs in year t	Political Database of the Americas (http://pdba.georgetown.edu/)