CBB Working Paper 2010-…..

LENDING BEHAVIOUR AND CREDIT RATIONING IN BARBADOS: A REGIME SWITCHING MODEL

BY

ROLAND CRAIGWELL AND DONNA KAIDOU-JEFFEREY

CENTRAL BANK OF BARBADOS
Research Department

Lending Behaviour and Credit Rationing in Barbados: A Regime Switching Model

by

Roland Craigwell

Professor of Economics
Department of Economics
University of the West Indies, Cave Hill Campus

And

Research Associate
Research Department
Central Bank of Barbados

Donna Kaidou-Jeffrey

Summer Intern
Research Department
Central Bank of Barbados

July, 2010

Lending Behaviour and Credit Rationing in Barbados: A Regime Switching Model

Roland Craigwell and Donna Kaidou-Jeffrey

- **Abstract**

This paper uses a regime-switching model to assess total and sectoral commercial bank lending behaviour in an environment of credit rationing and non-credit rationing in Barbados. The results indicate that in a credit rationed regime banks reduce lending. The periods of credit rationing determined are periods of uncertainty following global recessions. This indicates that banks exercise caution in their lending behaviour and are risk averse in an environment of uncertainty. All the real economic sectors, tourism, construction, manufacturing and agriculture, are affected except distribution. The paper seeks to inform individual policy makers and business personnel.

JEL Classification: E52, G21

Keywords: regime-switching model, credit rationing, monetary transmission mechanism

1. Introduction

This study examines commercial bank lending behaviour in an environment of credit and non credit rationing. A Markov-Switching model is employed to evaluate how commercial bank lending behaviour differs depending on the state of the economy. During recessionary periods when credit is already constrained, banks are expected to reduce lending to certain categories of borrowers by rationing credit. This behaviour is not clearly defined however, as the credit rationing variable which seeks to measure the degree to which banks use non price terms to differentiate borrowers in the loan market is not easily measurable. Notwithstanding this, during a recessionary period lower demand automatically excludes some borrowers from the loan market. The impact of monetary policy on the amounts and conditions of credit supplied by the banking sector is explained via the credit channel which forms an integral part of the transmission mechanism. Monetary policy tightening should reduce banks' loan portfolio and through the multiplier effect impact on real activity in the economy. There is a greater possibility of banks practicing credit rationing following contractionary monetary policy rather than change interest rates, the decision being dependent on the magnitude to which bank spreads are affected.

Despite the potential importance of bank lending behaviour during credit rationed and non credit rationed regimes, there has been limited research on the Caribbean and in particular Barbados. This study attempts to provide an empirical assessment of the credit rationing phenomenon and bank lending behaviour in Barbados. A survey analysis of the nature of credit rationing in Barbados is conducted by Wood (2004). The findings of this study confirm that bank lending to

those sectors for which banks have little information (high risk sectors) and those which are unable to provide adequate collateral are more likely candidates of credit rationing. The present study formalises Wood's results, in that bank lending during a credit rationed regime is reduced by 0.62 percent but increases by 0.22 percent in a non credit rationed regime. The economic sectors most affected by credit rationing include tourism, construction, agriculture and manufacturing. The contribution of this study to the literature is a empirical assessment of credit rationing and bank lending behaviour using a regime switching model for Barbados. The findings may inform policy makers, business persons as well as monetary policy makers in designing and implementing monetary policy. This paper is divided into five sections. Section one provides a general introduction to the topic followed by a brief literature review covering the theory and empirical testing of credit rationing and the influence of credit rationing on the monetary transmission in both developed and developing countries. Section three presents the empirical approach. Empirical results are outlined in section four while section five concludes with some policy recommendations.

2. Literature Review

2.1 Theory of Credit Rationing

Credit rationing exists when the demand for loans at the going interest rate exceeds the supply made available by financial institutions. The price of the loan, the interest rate, does not fully adjust and hence demand is not completely satisfied. Two types of credit rationing, equilibrium and disequilibrium credit rationing, are distinguished by Jaffee and Modigliani (1969). Equilibrium and disequilibrium credit rationing are sometimes referred to as Type 1 and Type 11 credit rationing respectively by Keeton (1979). Alternatively, Zephirin (1990) recognizes that

these could be grouped by loan size and rationing by exclusion respectively.

Disequilibrium credit rationing is a situation in which borrowers are not given the full amount of the loan requested since lenders do not fully adjust the loan rates to its long run optimal level despite changes in the credit market. Equilibrium credit rationing is the most popular type of rationing and is due to an institutional structure whereby common interest rates are charged to different customers who are sometimes denied loans despite the inability of lenders to distinguish between applicants. Stiglitz and Weiss (1981) argue that the loan rate acts as a mechanism in influencing the bank's loan portfolio via the adverse selection or incentive effect. Adverse selection occurs when the loan rate is raised above some critical level and effectively causes the borrowers, who may be able to pay, to drop out of the market due to their unwillingness to pay higher rates. On the other hand, moral hazard relates to the situation where the higher loan rate may motivate firms or individuals to undertake riskier projects.

The requirement of collateral by borrowers to secure a loan reduces the likelihood of credit rationing mainly because lenders can recover the collateral in default while borrowers may be unwilling to lose the collateral. The requirement of collateral however, may lead to adverse selection in the same manner that the loan rate does. Risky borrowers are in a position to offer more collateral such that the bank reduces its loss in the case of default but there is a higher probability of default (Bester, 1985). Assessing Stiglitz and Weiss' model using a contingent valuation method, Craigwell (1992) concludes that both the interest rate and the collateral can have adverse selection and moral hazard (incentive) impacts contrary to the earlier literature which points to positive incentive effects. Apart from the loan rate and collateral, other terms of

the debt contract such as the leverage of the project and length of maturity or repayment period of the loan can have similar adverse selection and moral hazard influences (Craigwell, 1992).

A great deal of attention has been devoted to the phenomenon of credit rationing mainly because it serves as a channel through which the effectiveness and timeliness of monetary policy can be assessed (Roosa, 1951). The various channels through which monetary policy actions operate are via changes in either the nominal money stock or the short-term nominal interest rate. The bank credit channel can be assessed either through the behaviour of banks with regard to the rationing credit and the credit or lending view. The existence of credit rationing provides a direct channel for monetary policy. However, the credit or lending view relates to how credit market imperfections create a credit channel for monetary policy as well as making the disruptions in credit availability a source of fluctuations in economic activity (Bernanke and Blinder, 1988). The monetary transmission channel that works through interest rates to influence demand can be achieved via the so called credit view which relates to the amount and conditions of credit that are supplied by the financial institution (Jaffee, 1971; Keeton, 1979; Stiglitz and Weiss, 1981). Restrictive monetary policy is likely to lead to an increase in interest rates and consequently a reduction in credit which is expected to have a multiplier effects on investments and spending. The effectiveness of the credit channel however, depends on how dependent borrowers are on banks for their investment decisions and whether monetary policy actually influences the level of credit that banks are willing to extend to borrowers. The efficacy of monetary policy will be affected by credit rationing only if borrowers are sensitive to non-price changes in banking lending behaviour (Harris, 1974). Loan applicants willingness to accept non price requirements of banks infer that credit rationing has no effect on loan disbursements whereas reluctance to accept these changes implies that disbursements will be affected by credit rationing and hence

monetary policy will be strengthened (Harris, 1974).

Studies on the monetary transmission mechanism have been extended to loan commitments which are expected to have implications for the transmission mechanism. An increase in loan commitments may lengthen monetary policy lags as firms can borrow under a commitment and hence delay the impact of policy tightening (Morgan, 1998).

2.2 Empirical Testing of Credit Rationing

Developed Countries

Empirical testing of the theories of equilibrium credit rationing has been limited by the unavailability of micro data on the contractual terms of commercial bank loans. Micro data is utilized by Berger and Udell (1992) who examine over one million individual loan contracts in the United States (US) from 1977 to 1988. Employing the loan rate stickiness test, the study shows that bank margins (total interest rates minus Treasury bill rates) are sticky with respect to shifts in nominal treasury rates. Half of the loans were slow to adjust, indicating the presence of credit rationing but also highlighting that the "stickiness" could be associated with other loan contract terms which could not be varied. Following the methodology employed by Berger and Udell (1992), Crowling (2010) empirically tests the extent to which equilibrium credit rationing is practised by financial institutions who lend to small businesses in the UK. The study differs from that of Berger and Udell (1992) in that a variable which captures subsequent loan default is added. Individual loan contracts issued by the UK Small Firms Loan Guarantee Scheme for the period 1993 to 1998 were used with additional information on ex post loan default. Consistent with other studies, a significant degree of stickiness on bank margins with respect to open market

rates is found. The study concludes that credit rationing is not prevalent in the loan market for most small businesses in the UK but that the problems faced by small firms during recessions are due to informational problems despite their ability to raise collateral.

More direct empirical tests for credit rationing have relied on the extensive use of macro data in the absence of micro data. The responsiveness of commercial loan rates to open market operations and the speed at which the loan rate adjusts associated with the early empirical methodology. Preliminary testing is conducted by Goldfeld (1966) and Jaffee (1971) who examine the commercial loan rate and its speed of adjustment to the open-market rate changes in the US. Results of the study show that slow adjustment of the loan rate indicates the presence of credit rationing whereas Slovin and Shuska (1983) re-examine the data to show that these adjustments were much faster than previously indicated and hence the non-existence of non-price credit rationing. Average commercial loan interest rate is regressed on the contingent value and two quarterly lags of the commercial paper rate.

Instead of testing credit rationing by the traditional way of examining the response of loan rates to other market interest rates, the bank loan demand and supply can be estimated directly to infer whether credit rationing exists. King (1986) estimated US loan supply to be positively related to the volume of deposits and infers that banks are liquidity constrained such that the loan market is dominated by periods of excess demand. The study examines whether US banks act as though they ration credit by assuming that banks operate in three separate markets. A simple disequilibrium framework is used in which loan demand is expected to depend on commercial paper, inflation rate, GNP and the quantity of loans in the previous period. The loan supply is

driven principally by loan and mortgage rates and demand deposits, contrary to the conventional model in which loan supply is expected to depend positively on the loan rate. In the same vein, Perez (1998) uses a model developed by Greenwald and Stiglitz (1990) that allows for a direct test for persistent excess demand for credit. Application of the test to firm-level data reveals that banks ration some firms in every sample examined. The demand for and supply of new loans, rather than the traditional stock of loans to the public and private sectors, in the Czech Republic is estimated using monthly data between 1997 and 2002 by Pruteanu (2004) who employed a similar disequilibrium framework to show that credit rationing was present between 1999 to 2000.

To compensate for the lack of information on the quantity of loans demanded and supplied indirect measures such as survey data and proxy variables have been employed to test for credit rationing. The use of survey techniques is pursued by Harris (1974) with the Federal Reserve's Quarterly Survey of Changes in Bank Lending Practices to prove that non price credit rationing exists and that individual banks changed individual loan terms based on changes in loan market conditions. Survey responses to the number and proportion of bank responses to policy changes over a three month period are categorized as firmer, unchanged or easier policies. The responses are used to construct the balance (fraction of banks reporting firmer policy less fraction reporting easier policy). The balance is considered as a proxy for the actual change in loan terms which is then used to evaluate changes in lending terms and conditions to different policy changes. Correlation coefficients are computed for all possible pairs of loan term series in order to conduct the analysis.

The other indirect measure, proxy variables, in the form of interest rates and changes in interest

rates are studied to signify the level of tight money and hence the existence of credit rationing. A proxy employed by Jaffee (1971) is the ratio of customers who are denied loans (rationed customer) to total demand for loans. The percentage of total loans granted at the prime rate is also used as an operational proxy by Jaffee and Modigliani (2001). The equivalent of the proxy by Jaffee and Modigliani (2001) is designed by Rimbara and Santomero (2000) to evaluate the existence of credit rationing in Japan. The ratio of standard loans to total loans is considered a representative proxy noting that the standard rates refer to the rates applied to all large firms that satisfy the borrowing quantity and maturity classifications set out by the Temporary Interest Rate Adjustment Law in Japan. An unusual proxy for the notion of credit rationing is the "credit standards" variable tested by Lown and Morgan (2002) to examine its role in the monetary mechanism. This variable is captured from Senior Loan Officer Opinion Survey on Bank Lending Practices (conducted quarterly by the Federal Reserve Board).

The practice of credit rationing is expected to be affected by the existence of loan commitments (banks promise to issue credit to a borrower up to an agreed amount). With loan rates under commitments frequent changes in market rates renders credit rationing void. Empirically, testing by Berger and Udell (1992) using their proportions test for commitment lending find that a doubling of nominal rates of interest reduces the proportion of commitment loans by 1 percent, contrary to the hypothesis for credit rationing. The study showed that the proportion of new loans extended under previous commitments does not rise when credit markets are tight since all loans in their data set increased (Berger and Udell, 1992). The collateral test however lends strong evidence in support of the credit rationing hypothesis as the probability of collateralised lending increases when treasury rates rise. Credit effects are tested using a contractual difference across

commercial banks loans by Morgan (1998) using data on loan commitments obtained from survey data between 1975 and 1987. The results indicate that loans made under commitments increase or remain unchanged after policy tightening whereas those not made under commitments slow. Crowling (2010) extend their study to loan commitments concluding that the probability of a loan being made under commitment decreases with real and nominal open-market rates, evidence against the credit rationing phenomenon.

Developing Countries

Testing for credit rationing in Portugal is conducted via the interest rate stickiness approach by Alfonso and St. Aubyn (1998). Monthly data from 1990 to 1997 is utilized to determine the movement of money market rates and credit market rates and the speed of adjustment. A causality test is also employed via a multivariate VAR model to determine the direct effect of money on loans. The existence of credit rationing in Portugal was not supported by the testing procedures used. Similarly, El-Shazly (2005) investigates the significance of the concept of credit rationing equilibrium in a disequilibrium model to estimate bank loan demand and supply directly in Egypt. The study provides evidence of credit rationing in Egypt where loan supply does not depend on the return on credit and the pattern of credit rationing is dependent on the state of the economy.

In the Caribbean context, Wood (1993) argues that credit rationing in Barbados can be associated with the Stiglitz-Weiss "equilibrium rationing" model based on the role of asymmetric information on bank lending behaviour. The survey analysis by Wood (1993) highlights that the monitoring activities of banks in Barbados are routine and not detailed such that banks place

particular emphasis on collateral security as a means of obtaining information pertaining to the credit worthiness of borrowers and a means of protection against lending risk. Banks do not actively engage in screening or other methods of obtaining information on the projects being undertaken by investors such that activities for which banks have little information are considered high risk and investments which are not secured by collateral are more likely to be credit rationed (Wood 1993).

2.3 Credit Rationing and the Monetary Transmission Mechanism

Empirical Evidence

Developed Countries

The influence of monetary policy on economic activity is examined by Blinder (1987), using credit rationing as an operative mechanism to show that monetary shocks have stronger effects when the economy is in a credit-rationed regime. Blinder (1987) makes the assumption that firms rely on credit to produce such that if the credit is unavailable for investing or for production then supply will be reduced, and demand will exceed supply. This channel suggests that if recessions are motivated by supply-side failures, then a contraction in supply will lead to an increase in prices and a reduction in economic activity via the macroeconomic cycle. The central role of banks is thus the provision of money or credit necessary to expand productivity, creating multiplier effects on output and growth. More recent research with a credit standards variable to test for credit rationing by Lown and Morgan (2002) examines its role in the monetary mechanism in the US. The methodology employs a VAR with four variables to represent the macro economy similar to that used by Christiano, Eichenbaum and Evans (1996). The analysis

is based on how bank lending standards are correlated to innovations at commercial banks and in real output. An average of 2.0 percent of banks had tightened their standards for granting and accepting loan following monetary shocks.

Using postwar quarterly US data, McCallum (1991) concludes that there are stronger effects of monetary growth on output when credit market conditions exceed a certain known threshold. He employed three criteria to determine the existence of credit rationing: the level of tightness of monetary policy compared to the average, estimates of credit crunch periods based on Eckstein (1983) and Sinai (1976), and estimates of excess demand for commercial bank lending developed by King (1986). On average, the credit rationing mechanism accounted for half of the total contribution of monetary shocks to fluctuations in GNP in the US during the post-war period and its impacts on output were twice as large following contractionary monetary policies, evidence in support of the credit rationing hypothesis (McCallum, 1991). Later research reveals that the effects of monetary policy on output depend on the flexibility of credit conditions and threshold effects or other non-linearities. Following McCallum's study, Galbraith (1996) utilises data from the US and Canada to show that if the threshold is known a priori then testing is straightforward but if the value is unknown then detecting the threshold effects becomes difficult. Using specific tests that assume the threshold under the null is unknown, Galbraith (1996) found a significant threshold effect for the US, indicating the presence of credit rationing.

Similarly, threshold regime switching models are used by Calza and Sousa (2006) who conclude that the impact of monetary and credit shocks on economic activity are greater in credit rationed regimes. The study follows the methodology of Balke (2000) who utilised aggregate data to

determine the existence of asymmetries in the response of output and inflation to credit shocks (i.e. lending conditions) in the euro area. The threshold level is determined with a VAR model over the period 1981:2 –2002:3 from which formal tests are implemented to determine the presence of threshold effects. Impulse response functions analyze the dynamic response of credit shocks in different regimes.

A dynamic equilibrium model is employed to depict the relationship between credit rationing and economic activity (production) when the system switches between regimes (Azariadis and Smith, 1998). In the model, it is assumed that investments in capital goods must be credit-financed and that credit markets are affected by adverse selection problems. In this situation, the economy may lie in a traditional Walrasian equilibrium regime or in an alternative regime characterized by binding credit constraints. The model allows for regime switching between the two possible equilibrium regimes depending on the value of transitional variables such as an index of savers' expectations about credit market conditions (Calza and Sousa, 2005).

A markov-switching VAR model for the euro area and the US is used by Kaufmann and Valderrrama (2007) to prove that there is asymmetry between money-output and credit-output linkages. The asymmetric transmission of shocks through credit and asset markets is examined using a non-linear vector autoregression, which allows for time-varying parameters that switch according to an unobservable state indicator. In this model given that the state is unobservable and estimated simultaneously with the parameters, the set of variables which determine the threshold and the timing of the regime switches do not have to be determined a priori. Results for the two regions provide evidence highlighting the differences characterized by a bank-based

and by a market-based financial system. Evidence of regime-switching is found in both regions.

Focusing on bank business lending Gertler and Gilchrist (1993) finds that business lending does not respond to policy changes immediately. The decline is mainly from a reduction in consumer and real estate loans. In this same study, a closer analysis of manufacturing firms however show that the elasticity is greater than that of business loans such that borrowing to larger firms increase during tighter policy compared to smaller firms who are relatively unaffected. An alternative view is examined by Kashyap and Stein (1995) who analyse the lending behaviour of large and small banks rather than the sum loaned to large and small firms.

Developing Countries

Empirical testing of the credit channel in developing countries is limited. A stickiness test of the response of loan rates to changes in money market conditions and a VAR are utilised by Afonso and St. Aubyn (1999) to examine the existence of credit rationing and its relevance to the monetary transmission in Portugal for the period 1990 to 1997. The variables used are the money market rates represented by the average treasury rate bill and the credit market rates which are measured by the average credit rates offered by banks to private companies according to different credit lengths. Results of the stickiness tests show that the credit rates in Portugal do not adjust immediately to money market conditions but over time there is some adjustment to changes in money market rates. However, the existence of credit rationing was not supported by the results obtained from the VAR analysis.

3. Empirical Approach

3.1 Model and Data

The basic model in this study is:

$$L = \alpha + \beta_1 GDP_t - \beta_2 Inf_t - \beta_3 Spread_t + \beta_4 MS_t + \beta_5 MSDR_t + \beta_6 CR_t + e_t$$

Where L represents total loans to the private and public sector by commercial banks, GDP is real Gross Domestic Product and MS, the narrow money supply. The "spread" -the difference between the weighted average lending rate and the weighted average savings rate - represents the earnings of commercial banks upon granting credit. MSDR is the minimum savings deposit ratio, the monetary policy tool used by the Central Bank of Barbados. CR is the credit rationing variable, a proxy derived from the ratio of total loans at the prime rate to total loans following the methodology employed by Jaffee and Modigliani (2001). Total loans, real GDP and the money supply are in logarithms. Inflation is the change in the Consumer Price Index (CPI) over the period. The study also analyses the impact of credit rationing on the major economic sectors of tourism, distribution, manufacturing, construction and agriculture. The respective dependent variable is therefore total loans granted to each sector over the study period. In some cases the credit rationing variable is altered to include the total loans granted to the individual sector at the prime rate. The data gathered is on a quarterly basis for the period 1974:1 to 2009:4 and sourced from the data files of the Central Bank of Barbados.

Real GDP is expected to be positively correlated with total loans based on the credit view that an increase in borrowing leads to more investment which in turn stimulates economic activity and growth. A priori, inflation should be negatively related to total loans as a rise in prices reduces

consumer demand, investments and demand for credit through the multiplier effect. A negative relationship is anticipated between the spread and total loans based on the assumption that the larger the spread, the higher the lending rate. Money supply (MS) and total loans should be positively correlated as more funds become available to banks which could be used in their loan portfolios. The minimum savings deposit ratio (MSDR) which is the main monetary policy tool should have an inverse relationship with total loans supplied by banks. Contractionary monetary policy via an increase in the (MSDR) should reduce banks ability to make loans available in that banks will have to cut their loan portfolio. The reverse is true for expansionary monetary policy. The credit rationing (CR) variable is allowed to be regime dependent.

Credit rationing should affect all the major sectors of the economy including tourism, distribution, construction, agriculture and manufacturing. The tourism, construction and distribution sectors are considered more reliable sectors to which lending institutions place a certain level of confidence or have developed business relationships. The sectors which pose the highest level of risk are the agricultural and manufacturing sectors. The level of risk and uncertainty associated with the agricultural sector is due to its size, the nature of the sector in terms of perishable goods and the relative risk which is attached to farmers in that sector who are not always able to put up collateral. Similarly, the manufacturing sector should be affected by its size and the level of vulnerability to the state of the economy particularly during periods of recession. The same is true for the tourism industry which is highly vulnerable to external shocks.

3.2 Markov-Switching Vector Autoregression (MS-VAR)

The MS-VAR provides a framework to analyze changes in credit rationed regimes. The model recognizes various dynamic structures, depending on the value of the state variable, s_t which controls the switching mechanism between different states. The general form of the MS-VAR process is:

$$y_t = v(s_t) + A_1(s_t)y_{t-1} + \dots A_p(s_t)y_{t-p} + e_t \qquad (1)$$

Where $y_t = y_{1t}, \dots . y_{nt}$ is an *n* dimensional time series vector of variables, *v* is the vector of regime-dependent intercepts, $A_1 \dots A_p$ are the matrices containing the autoregressive coefficients and e_t is a white noise vector of *i.i.d N* (0,1). The intercept is allowed to depend on the regime such that there is a smooth transition from one state to the next.

Following his seminal paper, Hamilton (1989) shows that the state variable s_t, is an unobserved discrete-time, discrete-state variable which follows a first order Markov process. The current regime s_t depends only on the regime one period ago, s_{t-1}. The probability matrix is

$$P_{ij} = Pr(s_t = j / s_{t-1} = i) \qquad (2)$$

with $\sum_{j=0}^{N} P_{ij} = 1 \; for \; all \; i.$

A two regime model - a period or regime of credit rationing and a period of non credit rationing - consistent with Equation (1) is applied to the monetary policy transmission mechanism in Barbados. Oxmetrics 6.0 developed by Jurgen Doornik, is the statistical software employed to estimate the Markov Switching or Regime Switching model.

This study employs the linearity test to determine whether a regime switching model is appropriate. The null suggests linearity for which rejection implies use of a non linear model. The optimal number of regimes, one and two regimes, are assessed using the Akaike information criterion (AIC). Two regimes are more appropriate in this study as the rationing variable is expected to be influenced by economic activity which could be either an upswing or a downturn.

4. Results

All variables were tested for unit root using the Augmented Dickey Fuller method ADF (Appendix 1). All variables were stationary in levels I (0). Sample statistics for all variables are included in Table 1. The CR variable was 1.0 at four distinct periods, 1981 (Q4), 1991 (Q4), 1992 (Q1 and Q2), periods of low liquidity and increases in the reserve requirement ratio.

Table 1: Descriptive Statistics

	Mean	Max	Min	Std. Dev.	Skew	Kurt	Obs
CR	0.48	1.00	0.11	0.17	0.80	3.59	144
INFL	1.47	10.54	-3.87	2.07	1.53	7.25	144
MSDR	3.89	8.00	0.00	1.87	-0.43	3.29	144
WALR	11.35	15.20	9.66	1.15	1.17	4.78	144
SPREAD	7.00	12.40	5.00	1.61	1.88	6.39	144
LRGDP	5.37	5.69	5.00	0.16	-0.14	2.38	144
LTOTALLOANS	7.14	8.68	5.56	0.87	-0.04	2.09	144
LMONEYSUPPLY	6.48	8.26	4.43	1.08	0.01	1.98	144
LAGRI	10.29	11.11	8.81	0.48	-0.93	3.25	144
LTOUR	11.72	13.18	10.14	0.88	0.18	1.88	144
LCONST	11.25	13.03	10.34	0.90	0.72	1.92	144
LMANUF	11.45	12.13	10.05	0.54	-1.45	4.04	144
LDIST	12.07	12.96	10.77	0.65	-0.52	1.92	144

Several models – mainly dependent on the different credit rationing and the monetary policy variables utilised –were tried but the model which best represents the theory of credit rationing, the effectiveness of the monetary policy transmission mechanism and bank lending behaviour in Barbados is represented by Model 1. This involves MSDR as the monetary policy tool along with the credit rationing variable specified as the ratio of loans at the prime lending rate to total loans. Consistent with economic theory, the spread and inflation are negatively correlated with the total loans. A larger spread is indicative of higher lending rates which can be associated with lower demand for loans by the borrowing public. Total loans will contract by 0.011 percent with every percentage point expansion in the spread. Following the credit view, a rise in inflation should lead to lower demand which ultimately causes businesses to carry lower inventories and hence reduce demand for loans to finance investments or restocking inventories. Total loans are expected to fall by approximately 0.009 percent with every percentage point increase in inflation. The minimum savings deposit ratio (MSDR), the monetary policy tool, is positively correlated with bank lending by less than one percent for every point rise in the MSDR. Increases in RGDP and the money supply may increase total loans by 0.18 and 0.15 percent respectively.

Results of the model indicate that during a credit rationing regime, total loans may decline by an average of 0.062 percent. When there is no credit rationing, total loans granted by commercial banks to the private and public sector should increase by 0.22 percent. Findings support the theoretical and empirical literature on credit rationing. Generally, loans are expected to decline during a credit rationing period as opposed to a period of no rationing. The probability of remaining in a credit rationed regime is 94.0 percent with a low possibility of moving to a non credit rationed regime (3.5 percent). Similarly, it is highly unlikely that movement from a non

credit rationed regime at 5.4 percent but staying in the regime is more likely at 96.0 percent. The periods of credit rationing highlight that banks exercise caution in periods of uncertainty and do not engage in high risk activities.

Based on the AIC, the two regime model is preferred to a one regime model as the lowest AIC (2.91) compared with -2.27 for the one regime model. Other specification tests for normality, heteroskedasticity and autocorrelation report that the model is correctly specified.

Three distinct periods of credit rationing are identified in the study (Figure 1 and Result 1). The first period ranges from 1975(2) to 1979(4), following a recessionary period. Real GDP grew by an average of 5.02 percent between 1975 and 1980. It represents a period of growth following the global recession in which world commodity shortages caused significant increases in the prices of agricultural prices coupled with the oil crisis in 1973 and 1974. Total loans within that credit rationing period increased by an average of 2.7 percent notwithstanding a spread of 6.0 percent. Commercial banks faced continued pressure from the Central Bank to reduce lending rates leading to a reduction in the maximum prime lending rate from 12.5 percent to 8.5 percent. In light of high liquidity, the reserve requirement ratio increased from 12.0 percent to 20.0 percent during that period while the MSDR (minimum savings deposit ratio) remained steady at 3.0 percent. Credit rationing is not evident during the recession as expected but during a period of recovery. This may be due to high uncertainty in the economy and unwillingness of banks to undertake risks. There is also evidence of the lagged effect of global economic shocks on the domestic economy.

The second period of credit rationing is identified as 1992(1) to 1998 (1), the IMF structural adjustment years. Growth averaged 3.2 percent between 1993 and 1998 when real GDP increased from $785.7 m in 1992 to $951.3 m in 1998. By 1997, the economy had seen 5 consecutive years of growth. This follows the decline between 1989 and 1992 when real GDP fell from $909.1 m to $785.7 m. The MSDR was changed on average 6 times from 7.0 percent to 4.0 percent during that period. The Central Bank continued to ease monetary policy in order to stimulate economic activity and to persuade banks reduce lending rates. The maximum prime lending rate moved from a high of 15.0 percent to 9.75 percent.

The third period of credit rationing is 2002(3) to 2005(3), a recessionary period following the September 2001 events. Average growth of 3.6 percent between 2003 and 2005 followed the contraction of 2.6 percent in 2001. The MSDR was reduced from 3.0 percent to 2.5 then 2.25 percent before being increased to 3.75 and then 4.25 in 2005. The latter increase was aimed at reducing consumer spending thereby preserving the balance of payments position with lesser outflows. Bank spread remained at an average of 7.5 percent. Total loans granted within that period increased by an average of 2.2 percent each quarter.

The periods of credit rationing reveal that the practice is more prevalent following economic shocks economic shocks when there is high uncertainty in the economy. This may be attributed in part to bank policy regarding risks in uncertain economic conditions. Also, the results indicate highlight the lagged effect of global economic shocks on the domestic economy. The results confirm that of Wood (1994), in that activities or sectors which banks have little information about are considered high risk and those which cannot present adequate security or

collateral are more likely candidates of credit rationing in Barbados. It also highlights the delayed effect of external shocks to the domestic economy.

4.1 Sectoral Analysis

Analysis of the individual sectors of tourism, construction, manufacturing, agriculture and distribution reveal that all sectors except distribution are credit rationed (Results 2 to 6). In a credit rationed regime, loans to the tourism sector is expected to decline by 0.27 percent in a credit rationed regime but increase by 0.75 percent in a non credit rationing regime. The impact on the tourism sector can be attributed to the vulnerability of the sector to external shocks despite being the main impetus to growth within the economy.

Loans to the manufacturing and construction sectors should decline by 0.19 percent and 0.24 percent respectively during a credit rationing regime. Within the agricultural sector, total loans may fall by 0.44 percent during credit rationing periods but rise by 0.34 percent in other periods. The level of risk attached to lending to the agricultural sector in associated with the incidence of perishability of food crops, marketing problems and higher administrative costs associated with loans to farmers (Wood, 1994).

5. Conclusion

This study uses a Markov-switching model to examine how bank lending behaviour differs in a credit or non credit rationing regime for Barbados over the period 1974 to 2009. The theory of credit rationing posits that in a period of high demand, banks do not change interest rates but instead they use non price terms to exclude certain groups of borrowers from the market. It is

expected that during recessions when credit is already constrained, credit rationing would be more prevalent than in a boom. Credit rationing remains a difficult concept to measure to the extent that some studies just accept that the phenomenon is present this study employs a proxy variable using the ratio of loans at the prime rate to total loans. The results of this study indicate that banks are more cautious during periods of uncertainty, particularly during or following recessionary periods. Three periods of credit rationing were examined. Analysis of the tourism, construction, manufacturing, distribution and agricultural sectors showed that credit rationing was prevalent in all but one of the sectors, distribution.

Attention should be given to the real sectors of the economy regarding availability and ease of access to credit to these sectors. The tourism sector may not be affected as much as the other sectors due to the level of importance attached to the sector. Also, investors of large projects are normally foreign based or have established business relationships with banks. There still remains a cross section of the borrowers who play a smaller role in the industry but remains highly significant. These may include those persons involved in community or village tourism or the sole trader type businesses who engage in small scale activities which are nevertheless significant to the survival of the tourism industry. These small businesses may be affected by lack of adequate resources such as collateral needed for financing of operations or business expansion. Similarly, the agricultural and manufacturing sectors may be constrained by lack of resources but these sectors are affected by high risk inherent in the sectors.

References

Afonso, A. And St. Aubyn, M. (1999) "Credit Rationing and Monetary Transmisison: Evidence from Portugal" Estudos de Economica 19 (1): 5-19

Azariadis, C. and Smith, B. (1998) "Financial Intermediation and Regime Switching in Business Cycles" The American Economic Review 88 (3) 516-536.

Baltensperger, E. (1978) "Credit Rationing Issues and Questions" Journal of Money, Credit, and Banking 10(2): 170-183.

Berger, A.N. and Udell, G.F. (1992) "Some Evidence on the Empirical Significance of Credit Rationing" Journal of Political Economy

Bester, H. (1985) "Screening vs Rationing in Credit Markets with Imperfect Information" The American Economic Review 75 (4): 850-855.

Blinder, A.S. (1987) "Credit Rationing and Effective Supply Failures" The Economic Journal 97: 327-352.

Calza, A. and Sousa, J. (2005) "Output and inflation responses to credit shocks-Are there threshold effects in the Euro Area?" European Central Bank Working Paper 481

Craigwell, R.C. (1992) "A Theoretical Model of Disequilibrium Credit Rationing Using Contingent Claims Theory" PhD Thesis, University of Southampton, March.

De Meza, D. and Webb, D.C. (2006) "Credit Rationing: Something's Gotta Give" Economica 73: 563-578.

Galbraith, J.W. (1996) "Credit Rationing and Threshold Effects in the Relation Between Money and Output" Journal of Applied Econometrics 11: 419-429.

Gertler, M. and Gilchrist, S. “The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence” The Scandinavian Journal of Economics 95 (1): 43-64.

Jaffee, D.M and Modigliani, F. (1969) “A Theory and Test of Credit Rationing” The American Economic Review 59: 850-872.

Kashyap, A.K. and Stein, J.C. (1995) “The impact of monetary policy on bank balance sheets” Carnegie-Rochester Conference Series on Public Policy 42: 151-195

Kaufman, S. and Valderrama, M.T. (2007) “The role of credit aggregates and asset prices in the transmission mechanism – A comparison between the euro area and the US” European Central Bank Working Paper 816.

King, S.R. (1986) “Monetary Transmission Through Bank Loans or Bank Liabilities” Journal of Money, Credit, and Banking 18 (3): 290-303

Lown, C. and Morgan, D.P. (2004) “The Credit Cycle and the Business Cycle: New Findings using the Loan Officer Opinion Survey” Stockholm Institute of Financial Research 27.

McCullum, J. (1991) “Credit Rationing and the Monetary Transmission Mechanism” The American Economic Review 81 (4): 946-951.

Morgan, J.P. (1998) “The Credit Effects of Monetary Policy: Evidence using loan commitments” Journal of Money, Credit and Banking 30 (1) 102-118.

Perez, J. S. (1998) “Testing for Credit Rationing: An application of Disequilibrium Econometrics” Journal of Macro Economics 20 (4): 721-739.

Ramlogan, C. (2004) “The Transmission Mechanism of Monetary Policy- Evidence of the

Caribbean" Journal of Economic Studies 31 (5): 435-447.

Rahji, M.A.Y. and Adeoti, A.I. (2010) "Determinants of Agricultural Credit Rationing by Commercial Banks in South-Western, Nigeria" International Research Journal of Finance and Economics 37:7-14.

Roosa, R. (1951) "Interest Rates and the Central Bank" Money, Trade and Economic Growth: Esays in Honour of John H Williams, (New York: Macmillan) 270-295.

Sealey, C.W. (1979) "Credit Rationing in the Commercial Loan Market: Estimates of a Structural Model under conditions of Disequilibrium" The Journal of Finance 36(3): 689-702.

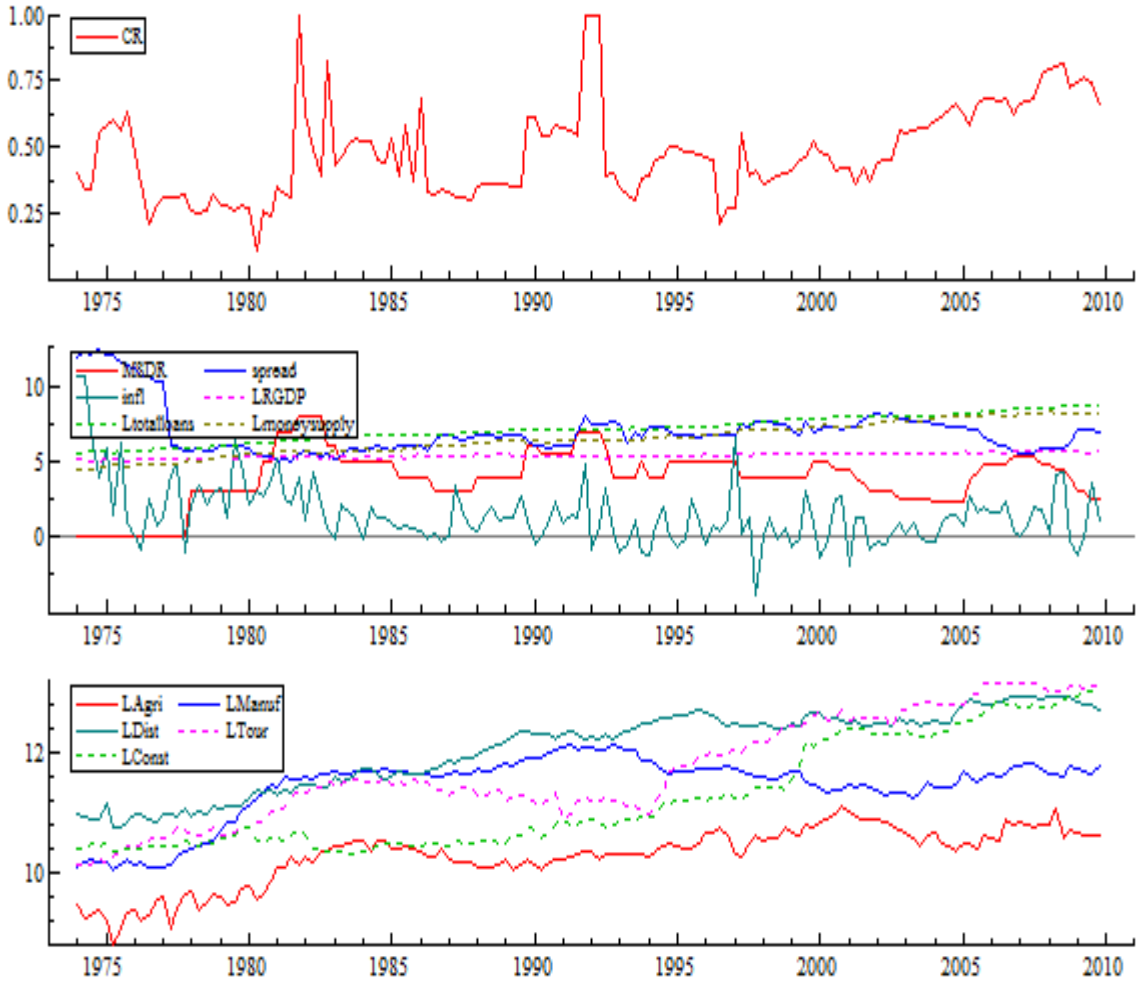
Swank, J. (1996) "Theories of the Banking Firm: A review of the Literature" Bulletin of Economic Research 48 (3): 173-206.

Tucker, D.P. (1968) "Credit Rationing, Interest Rate Lags, and Monetary Policy Speed" Quarterly Journal of Economics

Wood, A.P. (1994) "Bank Lending to Firms and the nature of Credit Rationing in Barbados" Money Affairs Jul-Dec: 109-136.

Appendix 1.

Graphs of Data Series



Unit Root Tests

Appendix 1.

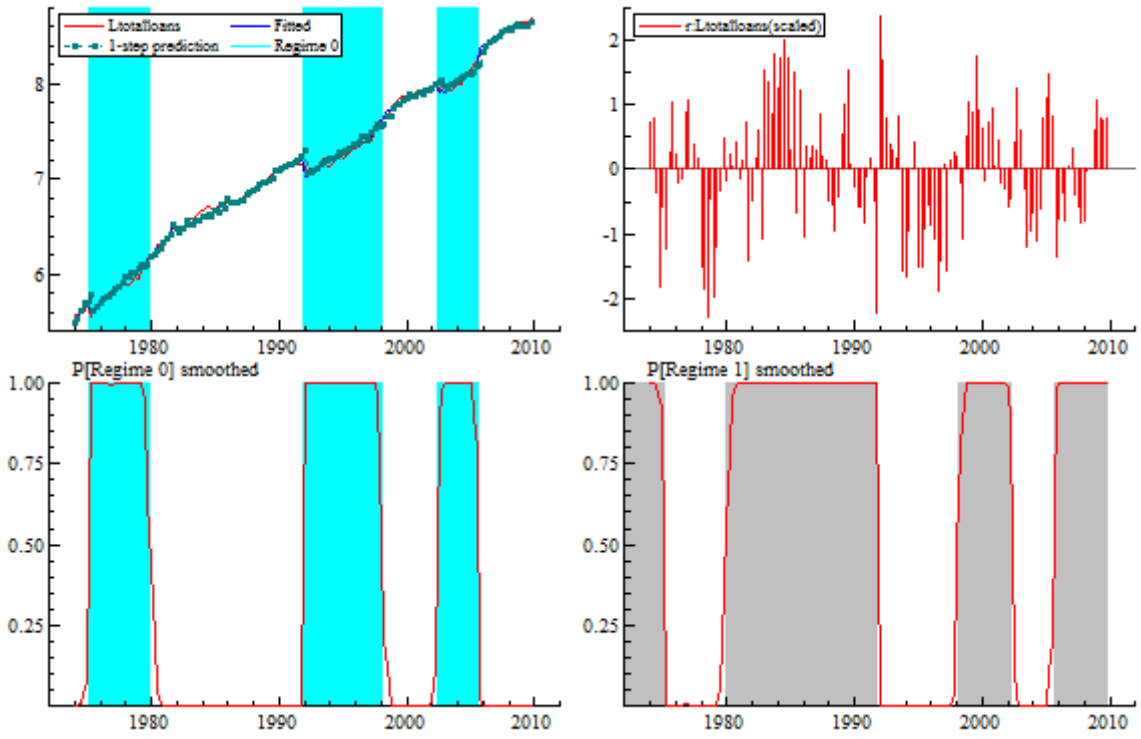
Unit Root Tests

	ADF	Stationarity	Sig
Variable			
RGDP	-4.0132	I(0) trend	
Infl	-4.9552	I(0)	
CR	-3.8293	I(0) trend	** *
MoneySupply	-3.1519	I(0)	*** **
MSDR	-2.8435	I(0)	**
ltotalloans	-3.3283	I(0)	** *
Spread	-3.175	I(0)	** *
Lagri	-2.1606	I(0)	
Ldist	-3.2278	I(0)	*
Ltour	-2.8836	I(0)	** *
lmanuf	-2.7753	I(0)	*
lconst	-1.8756	I(0)	

* @ 10 percent
** @ 5 percent
*** @ 1 percent

Appendix 2: Models testing Credit Rationing

Figure 1. General Model



Results 1. General Model

The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
Constant	4.09503	0.4786	8.56	0.000
Lmoneysupply	0.148810	0.02033	7.32	0.000
LRGDP	0.181008	0.1056	1.71	0.089
MSDR	0.00608915	0.003143	1.94	0.055
spread	-0.0115600	0.004100	-2.82	0.006
infl	-0.00887203	0.002271	-3.91	0.000
Trend	0.0154888	0.0003187	48.6	0.000
Seasonal	-0.0256292	0.01425	-1.80	0.075
Seasonal_1	-0.00665581	0.01176	-0.566	0.573
Seasonal_2	0.0176671	0.01160	1.52	0.130
CR(0)	-0.0620766	0.03260	-1.90	0.059
CR(1)	0.222606	0.02884	7.72	0.000
sigma	0.0441001	0.002696	16.4	0.000
p_{0|0}	0.945627	0.03060	30.9	0.000
p_{0|1}	0.0348976	0.01982	1.76	0.081

log-likelihood	224.702139		
no. of observations	144	no. of parameters	15
AIC.T	-419.404278	AIC	-2.91252971
mean(Ltotalloans)	7.13661	var(Ltotalloans)	0.747638

Linearity LR-test Chi^2(3) = 94.899 [0.0000] approximate upperbound: [0.0000]****

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.94563	0.034898
Regime 1,t+1	0.054373	0.96510

Regime classification based on smoothed probabilities

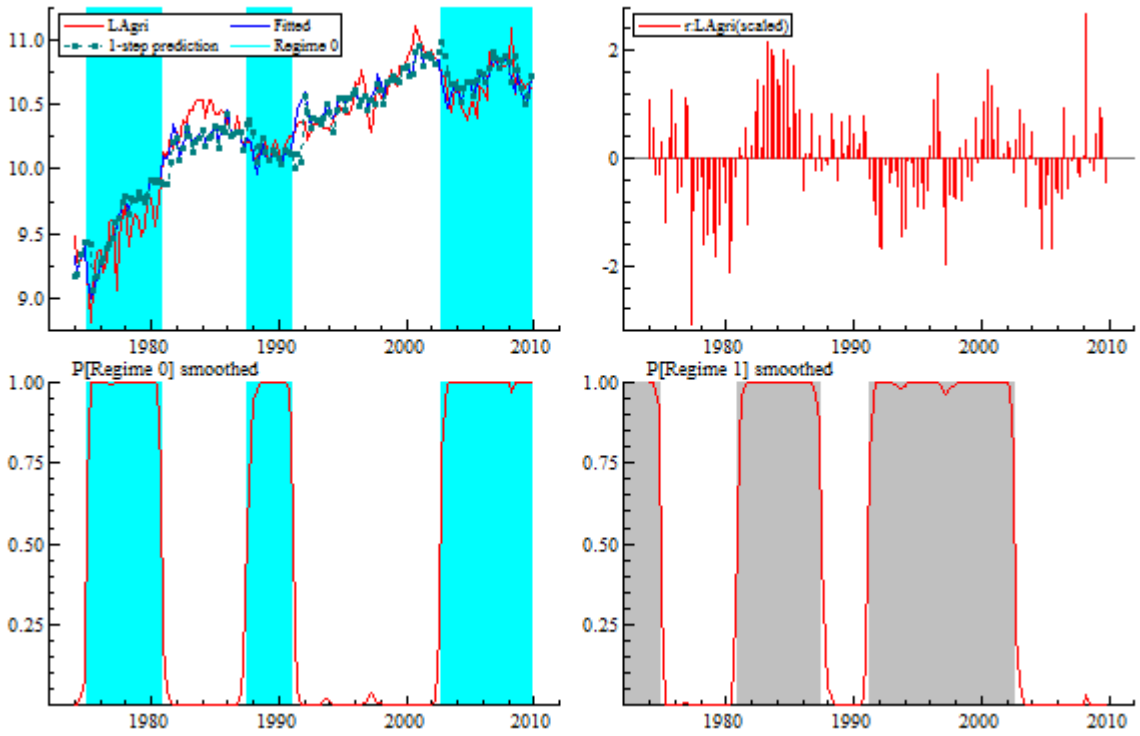
Regime 0	quarters	avg.prob.
1975(2) - 1979(4)	19	0.977
1992(1) - 1998(1)	25	0.978
2002(3) - 2005(3)	13	0.965

Total: 57 quarters (39.58%) with average duration of 19.00 quarters.

Regime 1	quarters	avg.prob.
1974(1) - 1975(1)	5	0.973
1980(1) - 1991(4)	48	0.985
1998(2) - 2002(2)	17	0.973
2005(4) - 2009(4)	17	0.999

Total: 87 quarters (60.42%) with average duration of 21.75 quarters.

Figure 2. Agriculture



Results 2. Agriculutre

The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
Constant	6.39742	1.513	4.23	0.000
LRGDP	0.730514	0.2927	2.50	0.014
infl	-0.0175380	0.007606	-2.31	0.023
spread	-0.0592693	0.01211	-4.89	0.000
Trend	0.00639495	0.001204	5.31	0.000
Seasonal	-0.0833224	0.04767	-1.75	0.083
Seasonal_1	-0.136586	0.03912	-3.49	0.001
Seasonal_2	-0.0252983	0.03845	-0.658	0.512
dagri	0.148955	0.05359	2.78	0.006
CR(0)	-0.435745	0.1030	-4.23	0.000
CR(1)	0.340801	0.1009	3.38	0.001
sigma(0)	0.158928	0.01928	8.24	0.000
sigma(1)	0.144764	0.01596	9.07	0.000
p_{0|0}	0.967303	0.02281	42.4	0.000
p_{0|1}	0.0403862	0.02299	1.76	0.081

log-likelihood	51.3518878		
no. of observations	144	no. of parameters	15
AIC.T	-72.7037755	AIC	-0.50488733
mean(LAgri)	10.2946	var(LAgri)	0.231478

Linearity LR-test Chi^2(4) = 83.850 [0.0000] approximate upperbound: [0.0000]****

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.96730	0.040386
Regime 1,t+1	0.032697	0.95961

Regime classification based on smoothed probabilities

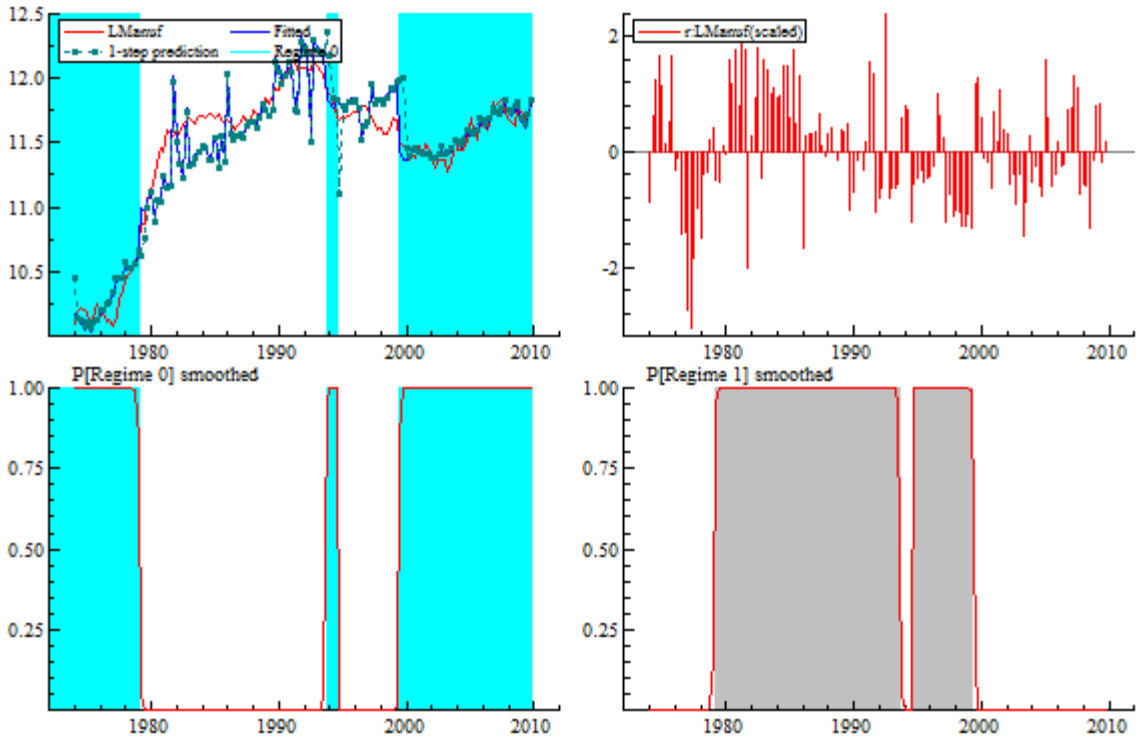
Regime 0	quarters	avg.prob.
1975(1) - 1980(4)	24	0.974
1987(3) - 1991(1)	15	0.938
2002(4) - 2009(4)	29	0.988

Total: 68 quarters (47.22%) with average duration of 22.67 quarters.

Regime 1	quarters	avg.prob.
1974(1) - 1974(4)	4	0.972
1981(1) - 1987(2)	26	0.984
1991(2) - 2002(3)	46	0.985

Total: 76 quarters (52.78%) with average duration of 25.33 quarters.

Figure 3. Manufacturing



Results 3. Manufacturing
The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
Constant	6.24386	1.560	4.00	0.000
LRGDP	0.854732	0.3019	2.83	0.005
infl	0.00578376	0.005845	0.990	0.324
spread	-0.0327486	0.009418	-3.48	0.001
Trend	0.00760082	0.001208	6.29	0.000
Seasonal	-0.0813532	0.03985	-2.04	0.043
Seasonal_1	-0.0812666	0.03145	-2.58	0.011
dummman1	0.746636	0.05339	14.0	0.000
dumman	0.234712	0.06169	3.80	0.000
Seasonal_2	-0.0402712	0.03166	-1.27	0.206
CR(0)	-0.197986	0.09396	-2.11	0.037
CR(1)	1.23302	0.1037	11.9	0.000
sigma(0)	0.0904633	0.009945	9.10	0.000
sigma(1)	0.228384	0.02194	10.4	0.000
p_{0|0}	0.969991	0.02090	46.4	0.000
p_{0|1}	0.0262424	0.01831	1.43	0.154

log-likelihood	52.7811774		
no. of observations	144	no. of parameters	16
AIC.T	-73.5623547	AIC	-0.510849685
mean(LManuf)	11.4513	var(LManuf)	0.293338

Linearity LR-test Chi^2(4) = 148.95 [0.0000]** approximate upperbound: [0.0000]**

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.96999	0.026242
Regime 1,t+1	0.030009	0.97376

Regime classification based on smoothed probabilities

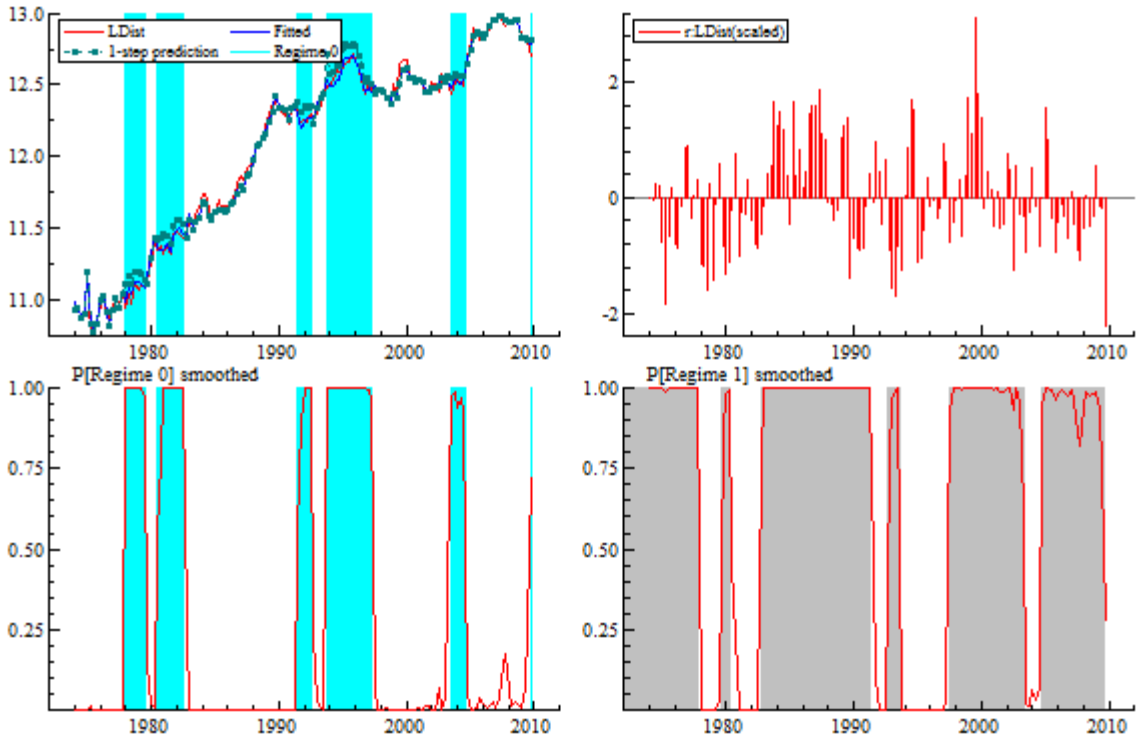
Regime 0	quarters	avg.prob.
1974(1) - 1979(1)	21	0.992
1993(4) - 1994(3)	4	0.986
1999(3) - 2009(4)	42	0.996

Total: 67 quarters (46.53%) with average duration of 22.33 quarters.

Regime 1	quarters	avg.prob.
1979(2) - 1993(3)	58	0.998
1994(4) - 1999(2)	19	1.000

Total: 77 quarters (53.47%) with average duration of 38.50 quarters.

Figure 4. Distribution



Results 4. Distribution

The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
Constant	8.20391	0.4891	16.8	0.000
infl	-0.00410843	0.002057	-2.00	0.048
MSDR	0.0478162	0.003445	13.9	0.000
spread	-0.0117504	0.003933	-2.99	0.003
Seasonal	-0.0389219	0.01260	-3.09	0.002
Seasonal_1	-0.0222113	0.009619	-2.31	0.023
LRGDP	0.309015	0.09351	3.30	0.001
Trend	0.000353440	0.0004352	0.812	0.418
t2	0.00850160	0.0001195	71.1	0.000
CRD(0)	5.34050	0.1203	44.4	0.000
CRD(1)	6.22533	0.1309	47.5	0.000
sigma	0.0384093	0.002625	14.6	0.000
p_{0|0}	0.502199	0.09183	5.47	0.000
p_{0|1}	0.0631360	0.02702	2.34	0.021

log-likelihood	222.27735		
no. of observations	144	no. of parameters	14
AIC.T	-416.554701	AIC	-2.89274098
mean(LDist)	12.0706	var(LDist)	0.425923

Linearity LR-test Chi^2(3) = 67.685 [0.0000] approximate upperbound: [0.0000]****

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.50220	0.063136
Regime 1,t+1	0.49780	0.93686

Regime classification based on smoothed probabilities

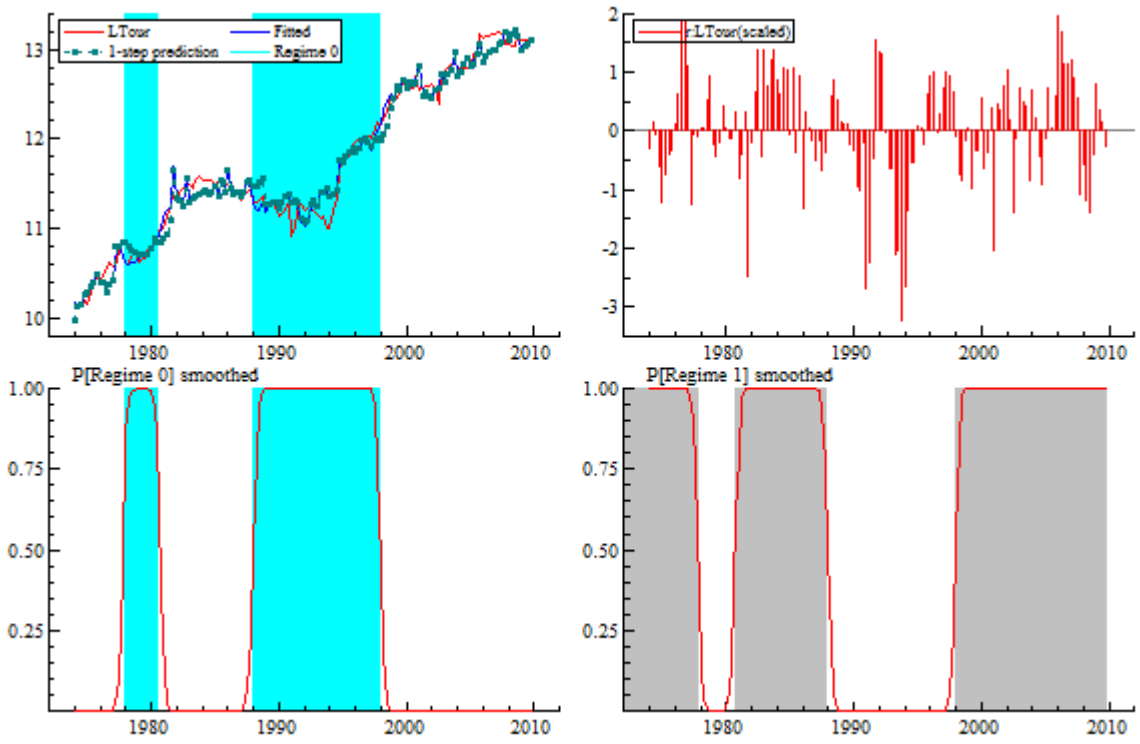
Regime 0	quarters	avg.prob.
1978(1) - 1979(3)	7	0.995
1980(3) - 1982(3)	9	0.923
1991(3) - 1992(3)	5	0.889
1993(4) - 1997(2)	15	0.997
2003(3) - 2004(3)	5	0.958
2009(4) - 2009(4)	1	0.719

Total: 42 quarters (29.17%) with average duration of 7.00 quarters.

Regime 1	quarters	avg.prob.
1974(1) - 1977(4)	16	0.999
1979(4) - 1980(2)	3	0.945
1982(4) - 1991(2)	35	0.993
1992(4) - 1993(3)	4	0.933
1997(3) - 2003(2)	24	0.974
2004(4) - 2009(3)	20	0.949

Total: 102 quarters (70.83%) with average duration of 17.00 quarters.

Figure 5. Tourism



Results 5. Tourism

The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
dumtourism	0.312125	0.04429	7.05	0.000
Constant	7.16835	1.564	4.58	0.000
dumtourism2	0.240355	0.05018	4.79	0.000
dumtourism3	0.151167	0.05196	2.91	0.004
LRGDP	0.728703	0.2988	2.44	0.016
spread	-0.0789269	0.01147	-6.88	0.000
Trend	0.0131571	0.001134	11.6	0.000
Seasonal	-0.121462	0.04222	-2.88	0.005
Seasonal_1	-0.0550266	0.03491	-1.58	0.117
Seasonal_2	-0.0208300	0.03409	-0.611	0.542
infl	0.000380667	0.008072	0.0472	0.962
CR(0)	-0.279582	0.09867	-2.83	0.005
CR(1)	0.749448	0.09331	8.03	0.000
sigma	0.132555	0.007944	16.7	0.000
p_{0|0}	0.960334	0.02762	34.8	0.000
p_{0|1}	0.0218222	0.01529	1.43	0.156

log-likelihood	74.0882267		
no. of observations	144	no. of parameters	16
AIC.T	-116.176453	AIC	-0.806780927
mean(LTour)	11.7228	var(LTour)	0.765699

Linearity LR-test Chi^2(3) = 162.30 [0.0000] approximate upperbound: [0.0000]****

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.96033	0.021822
Regime 1,t+1	0.039666	0.97818

Regime classification based on smoothed probabilities

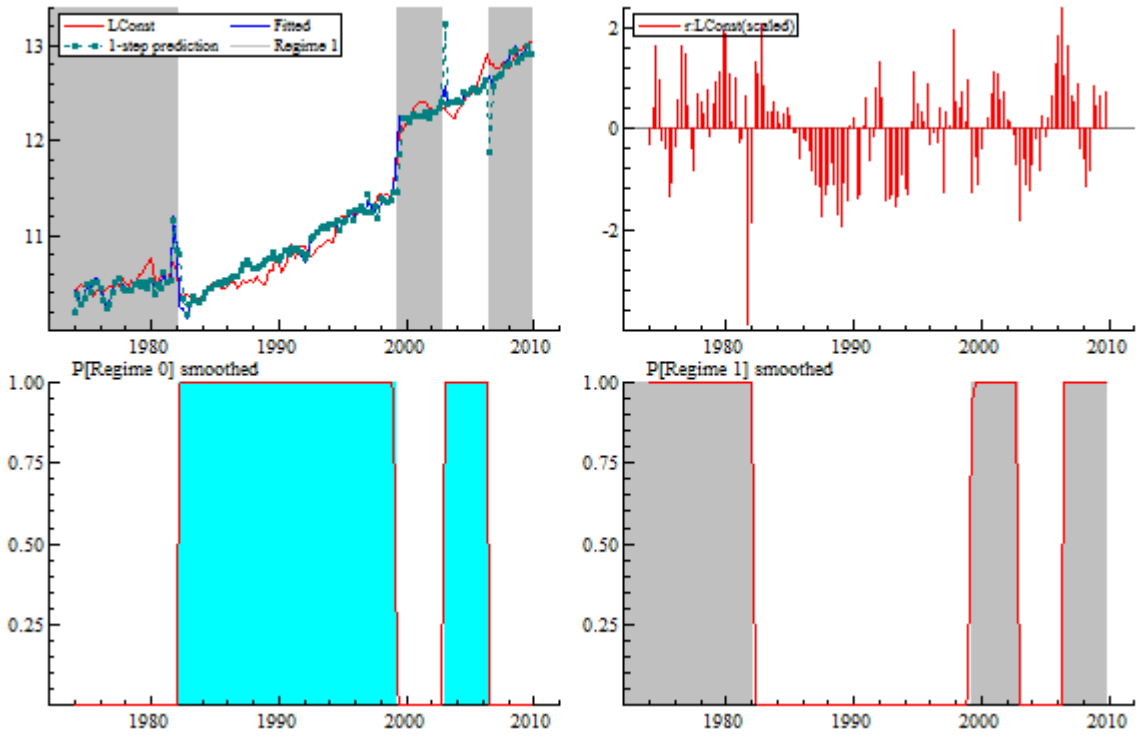
Regime 0	quarters	avg.prob.
1978(1) - 1980(3)	11	0.962
1988(1) - 1997(4)	40	0.973

Total: 51 quarters (35.42%) with average duration of 25.50 quarters.

Regime 1	quarters	avg.prob.
1974(1) - 1977(4)	16	0.963
1980(4) - 1987(4)	29	0.967
1998(1) - 2009(4)	48	0.986

Total: 93 quarters (64.58%) with average duration of 31.00 quarters.

Figure 6. Construction



Results 6. Construction

The estimation sample is: 1974(1) - 2009(4)

	Coefficient	Std.Error	t-value	t-prob
Constant	9.70393	0.9030	10.7	0.000
spread	-0.0225697	0.01107	-2.04	0.044
LRGDP	0.517856	0.2129	2.43	0.016
dumconst	0.217051	0.04150	5.23	0.000
dumconst2	0.780073	0.06134	12.7	0.000
Trend	0.0279051	0.003246	8.60	0.000
infl	0.0165853	0.006008	2.76	0.007
Lmoneysupply	-0.503822	0.1461	-3.45	0.001
MSDR	-0.0205864	0.01029	-2.00	0.047
CR(0)	-0.244565	0.09341	-2.62	0.010
CR(1)	0.953913	0.07842	12.2	0.000
sigma	0.124092	0.007370	16.8	0.000
p_{0|0}	0.975302	0.01724	56.6	0.000
p_{0|1}	0.0323107	0.02248	1.44	0.153

log-likelihood	77.7016065		
no. of observations	144	no. of parameters	14
AIC.T	-127.403213	AIC	-0.884744535
mean(LConst)	11.2548	var(LConst)	0.795637

Linearity LR-test Chi^2(3) = 148.83 [0.0000] approximate upperbound: [0.0000]****

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.97530	0.032311
Regime 1,t+1	0.024698	0.96769

Regime classification based on smoothed probabilities

Regime 0	quarters	avg.prob.
1982(2) - 1999(1)	68	0.999
2003(1) - 2006(2)	14	1.000

Total: 82 quarters (56.94%) with average duration of 41.00 quarters.

Regime 1	quarters	avg.prob.
1974(1) - 1982(1)	33	1.000
1999(2) - 2002(4)	15	0.996
2006(3) - 2009(4)	14	1.000

Total: 62 quarters (43.06%) with average duration of 20.67 quarters.