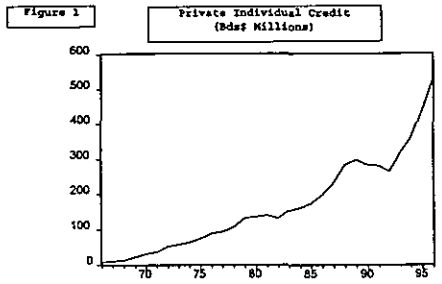

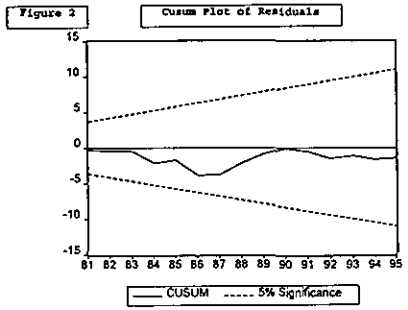

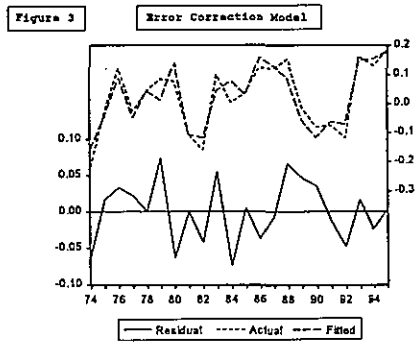

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6. CONCLUSION

This paper used cointegration techniques to estimate a demand function that seeks to explain private individual credit in the Barbadian economy. Using data from 1973 to 1995, it is shown that while current wealth has a significant positive effect in both the long-run and short-run, lagged real disposable income and inflation has significant negative effects over the short-term. However, over the long-run, the effects of both of these variables on the amount of personal consumer credit traded in the Barbadian economy are positive and negative, respectively. Interest rates only impacts on the stock of personal debt in the long-run. In addition, this paper also finds that credit controls constrained consumer borrowing, a result which appears counter to the Central Bank of Barbados policy stance - the Bank removed credit controls in 1993 on the presumption that they weren't functioning properly.

Studies on other developing countries are lacking but these findings are in accord with those of the Hartropp (1992) study on the UK. Further work should explore factors such as sanguine attitudes toward debt and demographic changes [see Pollin (1988)] and also the estimation of a disequilibrium model comprising of demand and supply side influences on private consumer debt in the Barbadian economy.

TABLE 1

TESTS FOR UNIT ROOTS: 1975 - 1996

SERIES	AUGMENTED DICKEY FULLER [ADF (1)]		PHILLIPS PERRON PP(2)	
	WITHOUT TREND	WITH TREND	WITHOUT TREND	WITH TREND
ld	-0.9052	-2.8006	-0.6195	-2.2543
D(ld)	-3.4706	-3.4680	-3.5831	-3.5370
la	-0.7747	-3.0872	-0.5347	-3.0442
D(la)	-3.5259	-3.6962	-4.1195	-3.8907
li	-2.7129	-2.9960	-2.7428	-2.9046
D(li)	-4.8614	-4.7239	-3.4491	-3.3452
ly	-1.4633	-1.5522	-1.4454	-1.4089
D(ly)	-3.4325	-3.4775	-4.1419	-4.0961
infl	-2.4418	-4.4097	-3.0992	-4.7176
MacKinnon 5% Critical	-3.0114	-3.6454	-3.0114	-3.6454
Values 10%	-2.6457	-3.2602	-2.6457	-3.2602

$$
\begin{aligned}
Dld \;=\; & -0.0302 + 0.475Dld(-1) + 0.834Dla - 0.030Ddum \\
& (1.487)\ (2.726)\qquad (5.727)\quad (3.719) \\
& -0.556Dly(-1) + 0.004infl(-1) - 0.943ecm(-1) \\
& (2.579)\qquad (2.092)\qquad (5.737)
\end{aligned} \tag{3}
$$

$Adj R^2 = 0.80$ $\sigma = 0.05$ $D.W. = 2.31$ $Norm = = 0.932$ $BG = 1.67$

$ARCH = 0.02$ $RR = 0.04$ $ADF(1) = -2.6156\ (-1.9602)$ $CHOW = 0.74$

D represents the first difference operator. Norm is the Jarque-Bera test for normality which is based on a test of kurtosis and skewness of the residuals. BG is the Breusch-Godfrey Lagrange Multiplier test for serial correlation. ARCH is Engle's k-th order Autoregressive Conditional Heteroscedasticity test statistic and RR is Ramsey's Reset specification error test using the square fitted values. All other variables are described as before. For a further discussion of the referred diagnostic tests see Greene (1993).

The results of the diagnostic tests show that empirical model is adequately specified. The value of the R^2 is quite high (0.80), suggesting reasonably good success of the regression predicting the stock of personal credit. In addition, the residuals do not violate the classical assumptions of normality, homoscedasticity and serial independence. They displayed a white noise process. Moreover, the CHOW breakpoint test and cusum plots indicate that the parameters of the model are stable (see Figure 2 for cusum plot). Also, the Ramsey Reset test show that the model does not suffer from misspecification bias. The actual, fitted and residual plots suggests that the ECM does fairly well in predicting the actual changes in the stock of private individual credit.

The impact of current wealth on the level of consumer borrowing in the short-term is positive and higher than the long-run estimate of 0.76. An increase in real disposable income impacts positively on the amount of personal consumer debt, but has a stronger and negative lagged effect in the short-run. Inflation, which is significantly negative in the long-run, has a lagged and positive impact in the short-run. On the other hand, the nominal interest rate doesn't influence private consumer debt in the short-run, a result contrary to its long-run impact. The credit control variable has a negative impact on personal debt. The short-run adjustment of the amount of private consumer credit traded in the Barbadian economy is 0.48%. The error correction term (ecm) is negative and significant - confirming the long-run cointegrating results - and has a coefficient of 0.94 indicating a rapid speed of adjustment to its long-run equilibrium relationship.

$$ld = -1.723 - 0.282li + 0.764la - 0.001infl + 0.163ly - 0.0439dum \quad (2)$$

$$Adj\ R^2 = 0.89 \quad D.W = 1.60 \quad ADF = -3.65\ (-3.0114) \quad PP = -3.7351\ (-3.0199)$$

Equation 2 is the EG cointegrating regression. Given the small size of our sample (22 observations) the bias in the EG estimator of the long-run relationship could be significant. Therefore, the standard errors and t-values of the estimated regression coefficients are not reported since these statistics are not valid [see Banerjee et al (1986)]. Adj R^2 is the adjusted coefficient of multiple linear determination, and D.W is the Durbin-Watson statistic for first order serial correlation.

The results indicate that the five variables d, a, y, i, infl and dum are cointegrated since both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests reject the null hypothesis of non-stationarity of the residuals at the 5% level of significance. In addition, the autocorrelation and partial autocorrelation functions of the residuals correlogram also indicates a stationary series. Thus, the variables constitute a cointegrating set which gives a necessary assurance against a spurious regression. All the variables have the correct a priori signs. Note that another interesting feature of the results is the significance of the dum variable which may be surprising to Central Bank officials who removed credit controls in 1993 on the presumption that they were quite inoperative.

According to the Granger Representation Theorem (1987), if the set of variables are cointegrated, then a valid Error Correction Mechanism (ECM) of those variables can be formulated and vice-versa. Therefore, the ECM - which nests the long run and short run dynamics of the variables - is estimated next. To achieve this, a general to specific approach that assumes a general lag structure of order one (because of data constraints) is adopted to pick up any (perhaps costly) adjustment process of moving consumers to their desired level. The unrestrictd ECM of the variables of interest can be written in the form:

$$Dlnd_t = \beta_0 + \beta_1 Dlny_t + \beta_2 Dlny_{t-1} + \beta_3 Dlna_t + \beta_4 Dlna_{t-1} + \beta_5 Dli_t + \beta_6 Dli_{t-1}$$
$$+ \beta_7 infl_t + \beta_8 infl_{t-1} + \beta_9 Ddum_t + \beta_{10} Ddum_{t-1} - \beta_{11} Dld_{t-1} + \lambda ecm_{t-1}$$

Various deletion tests and restrictions were performed in order to test down the initial ECM to a more parsimonious model. These results are given in equation 3 along with some diagnostic test statistics.

compiled from various statistical publications of the Central Bank of Barbados. Consumer borrowing outstanding (including mortgages for private dwellings) is advances made by commercial banks to private individuals. Disposable income is nominal gross domestic product (GDP) at factor cost minus personal income taxes. Liquid assets, which are measured as private individual deposits at commercial banks, is used to proxy wealth. Unfortunately, data on non-liquid assets are not available. Nominal base interest rate is the prime lending rate at commercial banks. Inflation is the rate of change in the consumer price index (base year 1994). All the above series except the dummy variable, were first converted to real terms using the GDP deflator (1974=100) and then to their natural logarithms. The dummy variable (dum) took the value of one when credit controls were initially instituted, that is, in 1977. Thereafter, it was increased by one as more stringent controls or major revisions were put in place. This was done for the years 1978, 1979, 1981, 1982 and 1986 - i.e. dum=2 for 1978, dum=3 for 1979, dum=4 for 1981 and so on[1].

[1]For a detailed description of the amendments and revisions to the hire-purchase and selective credit controls see the latest edition of "Chronicle of Central Bank Policy" compiled by Saunders and Wood (1997).

5. EMPIRICAL RESULTS

The EG approach, which is utilised to estimate the demand model, proceeds in two steps. First, estimate the coefficients from the cointegrating regression, then take the residuals from the estimate and use them lagged in a Vector Autoregression (VAR) of the changes of the explanatory and dependent variables. Both steps require only OLS estimation. It is preferred to the Johansen (1988) maximum likelihood method since it is more powerful in small samples [see Inder(1993)]. However, the use of the EG procedure assumes that there is not more than one cointegrating vector.

The estimation procedure began by testing the temporal properties of the variables. Table 1 reveals that the logarithms of four of the series (ld, la, ly, and li) are all integrated of order I(1) as judged by the Augmented Dickey - Fuller (ADF) and Phillips Perron (PP) unit root statistics. Therefore, their first differences are stationary. The series' correlograms (not reported) also corroborates the unit root test results. The inflation variable, however, is I(0). The dum variable was not tested for stationarity since the power of the unit root tests can be affected by such step functions as depicted by the dum variable. The next step in the analysis is to test for the long-run equilibrium relationship.

3. THE MODEL

The theoretical model presented here is based on the standard two-period framework of Hartropp (1992). Demand is 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. The demand for consumer borrowings (d) is postulated to depend on disposable income (y), liquid assets (a), nominal base interest rate (i), inflation (infl) and government policy on credit (dum). Formally, the theoretical model can be expressed as:

$$d = f(y, a, i, infl, dum) \qquad (1)$$

Therefore, our empirical long-run model can be written in log form as:

$$lnd_t = \alpha_0 + \alpha_1 lny_t + \alpha_2 lna_t + \alpha_3 lni_t + \alpha_4 lninfl_t + \alpha_5 lndum_t \qquad (2)$$

where α_i represents the long-run elasticity coefficients on each variable respectively .

An increase in disposable income, ceteris paribus is expected to result in positive borrowing as is likely to happen if households preferenes (and opportunities) favour spending now rather than later - that is, in a two-period world, if the change in current income is less than the current change in consumption. Increases in wealth is also expected to increase consumer debt. This occurs because a positive marginal propensity out of wealth implies that for a given income level ceteris paribus higher consumer expenditure results in a higher level of borrowings. An increase in interest rate augments the cost of borrowing and the demand for consumer debt is reduced in the process ceteris paribus. Inflation also decreases the value of consumer debt since an increase in prices, ceteris paribus reduces real income which in turn diminishes the stock of debt an individual can accumulate. The policy variable on consumer credit is designed to curb the flow of credit and ease the foreign exchange reserve pòsition. Thus, it is expected that the sign on dum will be negative ceteris paribus.

4. DATA AND VARIABLES

The model was estimated in logarithms using ordinary least squares over the sample period 1972 to 1995. The analysis was constrained to this period because of the unavailability of the wealth variable. All estimations were performed in the econometric statistical programme EVIEWS 2.0. The data were

consumer credit traded in the Barbadian economy is demand-determined. Further work will seek to explore the demand and supply interaction.

The remainder of this paper is organised as follows. Section 2 provides a brief review of the literature on credit demand. Section 3 outlines the theoretical model to be estimated, while Section 4 presents the data and variables included in the empirical model. This is followed, in Section 5, by the empirical results. Section 6 provides some concluding remarks.

2. A BRIEF REVIEW OF THE LITERATURE

To date there has been no empirical studies on the determinants of the demand for private individual credit in Barbados. The closest work to this literature was attempted by Cox and Zephirin (1978). They examined the relationship between prices, credit and the balance of payments in the Barbadian economy utilising a regression equation with import prices, export prices, commercial bank credit and real wages as explanatory variables. The balance on goods and services was used as the dependent variable. They found the price of imports to be the only significant variable.

Due to the paucity of research on the Barbadian economy and indeed the Caribbean, related studies from developed countries may offer some insights. In this regard, Pollin (1988) and Hartropp (1992) may be useful. Pollin (1988) offered four demand-side factors to explain the rise of net borrowing to income in the U.S.: increasing sanguine attitudes towards debt, demographic changes, variation in the real cost of credit and real assets yields, and increased necessitous borrowing linked to declining median incomes and rising housing costs. The regression results revealed two major demand-side influences on net borrowing in the U.S. economy: the rise in housing prices concurrent with declines in the real median incomes since the mid-1990s, and the attraction of financial investment when real borrowing costs are falling and bank yields are rising.

Hartropp (1992) developed a demand function to explain the flow of non-mortgage lending to households. He includes explanatory variables of real income, wealth, interest rates (real and nominal) and a credit control policy dummy in the estimated model. He found that current income and past wealth have significant positive influences on consumer borrowing. The rate of interest (whether nominal or real) and credit controls both had a significant negative effect. Past levels of income had no impact. It is this model that we employ as a point of departure.

ABSTRACT

In real terms, personal consumer borrowing has moved from BDS$0.5 million in 1966 to BDS$118.4 million in 1995. Utilising the standard two-period framework developed by Hartropp (1992), this paper examines the extent to which the variation in private consumer debt traded in the Barbadian economy can be explained by changes in demand-side factors like income, wealth, nominal and real interest rates, inflation and government policy controls. The Engle and Granger (1987) two-step procedure is utilised for estimation purposes. Regression results show that current wealth has a significant positive impact in both the long-run and short-run. Real disposable income and inflation have significantly negative lagged effects on the amount of private consumer debt traded over the short-term. However, over the long-term real disposable income and inflation have positive and negative influences, respectively. Interest rate effects only matter in the long-run. In addition, government policy controls were found to restrict consumer borrowing in the short-term, a result which appears counter to Central Bank's policy stance.

JEL:E5

Figure 1 shows that commercial bank credit to private individuals has grown tremendously over the past thirty years. In real terms, personal consumer debt has moved from BDS$0.5 million in 1966 to BDS$118.4 million in 1995. In a small open economy, like Barbados, this phenomenal growth in consumer debt can have serious repercussions for the balance of payments and the economy as a whole since most of this credit is used to import commodities, thereby depleting the stock of foreign reserves. Policy makers therefore must try to ascertain the causes of this credit growth - and the effectiveness of policies designed to curb it - if any attempts to influence consumer borrowing are to have a reasonable likelihood of success. So far there have been no such studies on the Barbados economy.

This paper examines the extent to which the variation in consumer borrowing by private individuals in Barbados can be explained by changes in demand-side factors, like income, wealth, interest rates and government policy controls. In this study, the Engle and Granger (1987) two-step procedure (hereafter EG), which incorporates cointegration analysis and error-correction modelling is used to test the hypothesis stated above and to further explain the short-run dynamics among the stock of private consumer credit and the variables of the credit demand function. A supply function is not modelled in this paper since it is argued that the quantity of

A DEMAND FUNCTION FOR PRIVATE INDIVIDUAL CREDIT IN BARBADOS

by

Darrin A. Downes
Roland C. Craigwell
Kevin C.D. Greenidge
Research Department
Central Bank of Barbados
P.O. Box 1016
Bridgetown
Barbados

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1. INTRODUCTION

Over the last two and a half decades Barbadians have enjoyed a relatively good standard of living. Improvements in real disposable income, which began during the oil price shocks in mid-1970s, encouraged many households to increase their purchases mainly of consumer durables. With this advancement in the lifestyles of the majority of the population, a pattern of consumption began to evolve which eventually could not sustain the increased, but limited spending power of an expanding middle-class. Credit facilities later became available, but only to a few.

During the late 1970s and early 1980s the demand for consumer instalment credit was strong, as evidenced by the imposition of selective credit and hire-purchase controls by the Central Bank of Barbados. However, these were later abolished in 1993 presumably because of their ineffectiveness. Commercial banks increased their lending and more loans were guaranteed against insurance policies.

In the 1990s, credit cards, debit cards and Automatic Teller Machines (ATMs) are commonplace and most furniture and appliance stores are providing easy credit instalment and hire-purchase terms, particularly to those at the lower end of the income scale.