The Impact of Credit Constraints on Consumption

Chanit'a Holmes[1]
Monetary Analysis and Programming Department
Research and Economic Programming Division
Bank of Jamaica

August 2010

Several studies have argued that if some consumers are liquidity-constrained, then aggregate consumption should be "excessively sensitive" to credit conditions as well as income. Against this background, this paper analyzes empirically the relationship between aggregate consumption and credit availability in Jamaica. Accordingly, this paper uses Instrumental Variable/Two Stage Least Square estimation and builds on credit constraints literature by incorporating NPLs as a proxy for credit constraints. The empirical analysis indicates that credit conditions have a substantial impact on consumption. Similarly, it shows that foreign exchange market has an adverse impact on consumer spending patterns in Jamaica.

---

[1]The views expressed in this working paper are those of the author and do not necessarily represent those of the Bank of Jamaica (BOJ).

1.0 Introduction

Most literature when researching the determination of aggregate consumption often focuses on the life cycle permanent income hypothesis. One important implication of the permanent income hypothesis is that monetary policy can only affect consumption via permanent income. However central banks usually believe that the behaviour of demand is heavily influenced by the cost and availability of credit. Thus central banks, especially during crisis periods, will rely not only on "traditional" monetary policy actions but also "unconventional" credit easing measures to affect the behaviour of consumption.

The global economic crisis which started in 2008 was considered to be the worst economic and financial crisis since the Great Depression. In response to this global financial turmoil and economic weakness, central banks took unprecedented actions in their conduct of monetary policy. Most notably in the United States, England and Japan where the central banks reduced the federal funds rate to a range to 0.25 basis point and made credit available to institutions and markets in which it had not previously intervened. This approach however was not taken by the Bank of Jamaica, as there was a gradual increase in interest rates in order to combat or stabilize the depreciation of the Jamaican Dollar. This approach was seen as vital as the stabilization of the Dollar was the major concern of the Central Bank in containing inflation. Concurrently, the demand for credit was reduced, partly due to higher interest rates which made it more expensive for consumers to borrow as well as the impact of the global financial crisis on income.

This paper is of particular interest in that it aims to determine if credit conditions are important to consumers. That is, it examines if consumer spending in particular would declined as a result of

households not being able to gain access to credit in order to finance their expenditures. This paper is different from other consumption studies done in Jamaica. This is the first-known empirical study that is done in Jamaica that includes credit conditions as a function of consumption. In essence, the paper aims to deepen the understanding of credit variables significance to consumption growth. This understanding is considered to be vital for Jamaica as a context where private consumption accounted for an average of seventy-one per cent (71%) of GDP over the period of 2000 to 2009. Moreover, this paper is of utmost importance as the results can allow the Government to implement policies that focuses on the variables that are more effective which can help the country during recessions.

The paper is organized as follows: The next section presents a brief review of the theory of consumer behaviour and the role that credit conditions play in consumption decisions. Section 3 reviews the empirical literature that used aggregate data to explore whether liquidity constraints matters for consumption. Section 4 describes the data used in the empirical work and their time series properties. The empirical framework is summarized in Section 5, while Section 6 reports the empirical results from estimation. Section 7 contains the conclusion and possible policy implications.

2.0 Theory

Friedman's permanent income hypothesis (PIH) serves as the foundation of consumption literature. The hypothesis posits that the aggregate consumption patterns of consumers are heavily hinged on their desire to maximize their lifetime utility function subject only to their lifetime budget constraint. Thus household's consumption is unrelated to current income but is

instead dependent on permanent income (Y_{Pt}) which is the annuity value of lifetime resources (Friedman 1957), that is:

$$Y_{Pt} = A_t + E_t \left[\sum_{i=0}^{\infty} \beta^i Y_{Lt+i} \right]$$
(1)

where A_t represents the real value of an individual's nonhuman wealth at the beginning of period t, β is the discount factor, Y_{Lt+i} is real disposable income and E_t is the expectations operator conditional on information available to the individual at time t. Even though actual income may vary from permanent income in different periods, according to theory, these fluctuations will only affect consumption if it alters household's expectations of its permanent income. Instead, when faced with such deviations, households are presumed to borrow and lend in order to smooth their consumption path.

Following Friedman (1957) work, Hall (1978) postulated that if rational expectations are also assumed, consumption follows a random walk process, resulting in the well-known result:

$$\Delta c_t = \alpha + \varepsilon_t$$
(2)

where c_t is the log of consumption and ε_t is the innovation in the log of consumption. He concluded that a close approximation to the stochastic behaviour of consumption under the PIH is that, conditional on lagged consumption, no other variable observed in earlier periods should have any predictive power for current consumption.

Several empirical studies however, have argued for the rejection of this rational expectations permanent income hypothesis.[2] These studies found that consumption spending does not follow a

---

[2] See Campbell and Mankiw 1989, 1990, 1991; Flavin 1981 and Hayashi 1982

martingale (or random walk) process as consumption can be partially explained by current disposable income. Most notable is Campbell and Mankiw (1990) who, modified the PIH framework, estimated:

$$\Delta c_t = \alpha + \beta E_{t-1} \Delta y_t + \varepsilon_t \tag{3}$$

They concluded that the PIH holds for a portion of the population that they called "life cycle consumers" who consume their permanent income, and does not hold for another fraction of the population, the "rule of thumb" consumers who consume their current income. The coefficient on β captures the share of "rule of thumb" consumers in the population, or the excess sensitivity of consumption (c_t) to disposable income (y_t), and is estimated to be around 0.5.

While several reasons have been established for the failure of the permanent income life cycle hypothesis, the one that has been given more popularity is that of liquidity constrained consumers.[3] One of the key assumptions of PIH is that there exists a perfect capital market in which households can borrow or lend against their permanent income, thus being unable to smooth their consumption. However, in practice uncertainty is inherent to financial markets thus households may be prevented from obtaining credit to finance as much consumption as their permanent income requires. As a consequence of being financially constrained, consumers spending and consumption patterns may be determined by their current income rather than their permanent income.

---

[3]Campbell and Mankiw (1990) supported this notion. They stated that the rule of thumb consumers are reflective of credit market imperfections. Credit constrained consumers, particularly when their desired consumption is higher than their current income, consume their current income.

If the liquidity constraint theory holds, then aggregate consumption should not only be sensitive to income but also to credit conditions as well. Ludvigson (1999) provided a theoretical framework in assessing the relationship between consumption and credit constraints. Empirically, she showed that by re-specifying equation 3 to incorporate credit variables, her model can be estimated as:

$$\Delta c_t = \alpha + \beta E_{t-1} \Delta x_t + \varepsilon_t \tag{4}$$

where β is a vector of coefficients, X_t is a column of vector including disposable income as well as credit indicators.

3.0 Literature Review

Several empirical studies have examined the link between credit constraints and consumer spending. Using macro-economic variables Flavin (1985), Jappelli and Pagano (1989), Vaidyanathan (1993) and Wilcox (1989) have provided empirical evidence which suggests that the excess sensitivity of consumption to current disposable income can be explained, to some extent, by credit constraints. It follows that limited access to credit markets prevents young consumers, as well as other consumers who are experiencing a temporary loss in income, from borrowing against their expected lifetime income, thus preventing households from smoothing their consumption pattern. Due to the fact that credit constraints are unobservable, a number of variables have been used as proxies: the rate of unemployment (Flavin 1985; Wilcox 1989), the ratio of current disposable income to previous consumption (Muellbauer 1983) and the total consumer credit to consumption ratio (Jappelli and Pagano 1989). However the problem that arises from choosing proxies is that the validity of the indicator can always be questioned. Madsen and McAleer (2000), for example, posited that it might be a case that these proxies may

be detecting movements other than credit constraints. For example including unemployment rate in the consumption function may be a measurement of changes in consumers' lifetime income, or a measurement of uncertainty of future income or even both.

Other studies have tried to capture the role of credit constraints in consumer spending by including variables that capture price and/or quantity restrictions on credit in consumption functions. Wilcox (1989) tried to capture price restrictions by assessing the relationship between consumption and a nominal borrowing rate (measured as the Treasury bill rate) and a nominal lending rate (which is the nominal, before-tax, interest rate on auto loans). His hypothesis is that the lending criteria based on payment ratios often inappropriately constrain borrowing and therefore consumption. The evidence indicated that the variables presumed to proxy for payments (that is, interest rates) significantly affected consumption growth in the manner suggested by the liquidity-constraint hypothesis.

Bacchetta and Gerlach (1997) also tried to capture price restrictions on credit however instead of assessing interest rates individually like Wilcox (1989), Bacchetta and Gerlach (1997) generated a wedge between interest rates applied to lenders and borrowers. This wedge represents the lending deposit rate spread between the bank prime lending rate minus the three month Treasury bill. This premium fluctuates over time, rising as credit constraints tighten and falling during credit expansions. Moreover, Bachetta and Gerlach (1997) found that empirically the borrowing/lending wedge is a significant determinant of consumption in the United States, Canada and Japan. They also concluded that if consumers are liquidity-constrained, aggregate consumption is excessively sensitive to credit constraints.

Lenders may also decrease the supply of credit available by tightening lending requirements, rather than raising loan rates. Credit growth for both consumer and mortgage credit has been shown to play an important role in consumer spending (e.g. Beaton 2009, Ludvigson 1999). The explanation is that consumer credit and consumer spending is highly correlated and mortgage credit has facilitated consumption through equity loans. The inclusion of credit in the consumption function has been shown to reduce the estimated excess sensitivity of consumption income, suggesting that the perfect capital market assumption is the key reason why the PIH hypothesis does not hold empirically. [4]

Most studies when including borrowing restrictions impose them exogenously rather than as endogenous responses to credit risk. Murphy (1998) found that the ratio or debt service to income reduces disposable income and is thus negatively correlated with future growth of consumer spending. His findings showed that a rise in the debt-service ratio/credit risk resulted in a tightening of credit conditions which in turn leads to a decline in consumption spending. As a measurement of household debt reimbursement problems, Rinaldi and Sanchis-Arellano (2006) used non-performing loans (NPL's) and built on Lawrence (1995) life cycle hypothesis model that introduces explicitly default option. [5] They found that a rise in NPL's resulted in a tightening of credit. Accordingly they concluded that NPL's (default loans or high debt) provides some incremental power for forecasting consumption spending.

---

[4] See Ludvigson 1999, Smith and Song 2005.
[5] See Lawrence (1995).

4.0 Data
4.1 General

The data series of consumption, income and credit are quarterly with the sample period beginning from the first quarter in 1997 and ends with the first quarter of 2010. All credit variables are rendered real by using the GDP deflator.

Private Consumption

In estimation, existing literature states that it's best to calculate consumption as total expenditures on non-durables and services. Due to the unavailability of data, it was not possible to disaggregate consumption into these components. Consequently, consumption figures reported in this study are real private aggregate consumption.

Consumer Credit

In modelling private consumption, consumer credit is proxied as personal loans that have been extended by commercial banks. Personal loans were chosen as the best proxy as these are considered to be more consumer-oriented loans.[6] Additionally, proxying for credit constraints using personal loans captures the price restrictions on credit.

Non-performing loans

Non-performing loans (NPL) were included in the estimation of the consumption function to capture the impact of credit risk on banks-future lending decisions.[7] Growth in NPLs represents

---

[6] This is similar to that used by De Broweur (1996), however it was end of year loans that were used given that fact that he was using yearly data. Personal loans were seen as the best proxy in Jamaica's case seen that it is the largest component of loans given to households which is inclusive of car loans, installment credit and credit cards receivables.
[7] Non-performing loans are defined as loans that are in arrears for at least three (3) months.

an increase in credit risk by lending agencies, which usually leads to the tightening of lending standards. A tighten of lending standards reduces the availability of credit to households, making them liquidity-constrained, that is consumers are prevented from borrowing to finance their consumption.

Disposable Income

Household disposable income is defined as total personal income less personal current taxes plus transfer payments. However, in Jamaica's case the unavailability of this data series render the use of real Gross Domestic Product as a proxy for disposable income.[8] Studies such as Vaidyanthan (2003) and De Broweur (1996) also used this variable as a proxy when faced with similar data constraints.
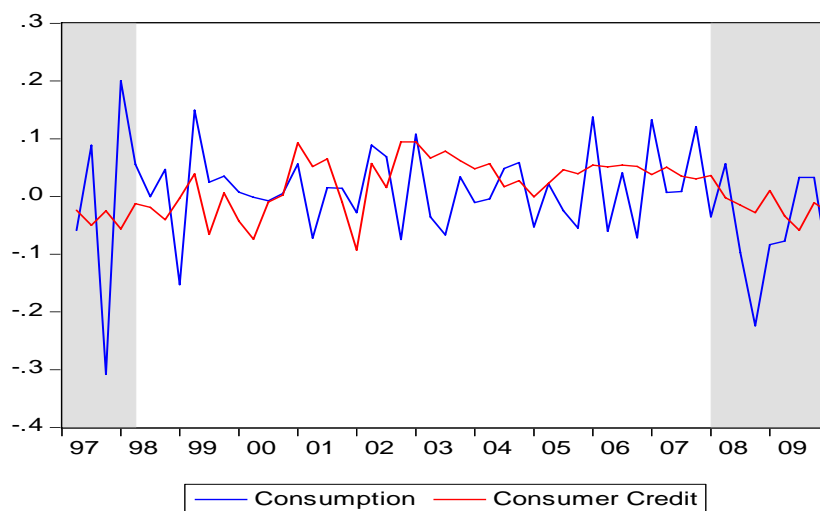
4.2 Consumption and credit growth

An examination of the data showed results which suggested that consumer credit could be a good indicator of credit constraints during periods of financial crisis (shown by shaded regions in Figure 1). Real growth in consumer credit declined, albeit, slightly during the first crisis periods, contrary to expectations of large decreases. Noticeably, following approximately five years of steady growth, consumer credit still exhibited a downward trend since the onset of the global financial crisis,

Despite the positive correlation between consumer credit and consumption, changes the correlation coefficient was relatively low at 0.12. There were periods in the sample when

---

[8] National income was also considered as an approximation of disposable income, however this series was reported in annual data and any interpolation (or averaging) could result in the loss of quarterly variations.

consumption declined or increased sharply relative to modest changes in credit. This was particularly evident during periods of financial crisis, where consumption declined drastically relatively to the decline in consumer credit.

Figure1: Real Consumption and Consumer Credit growth
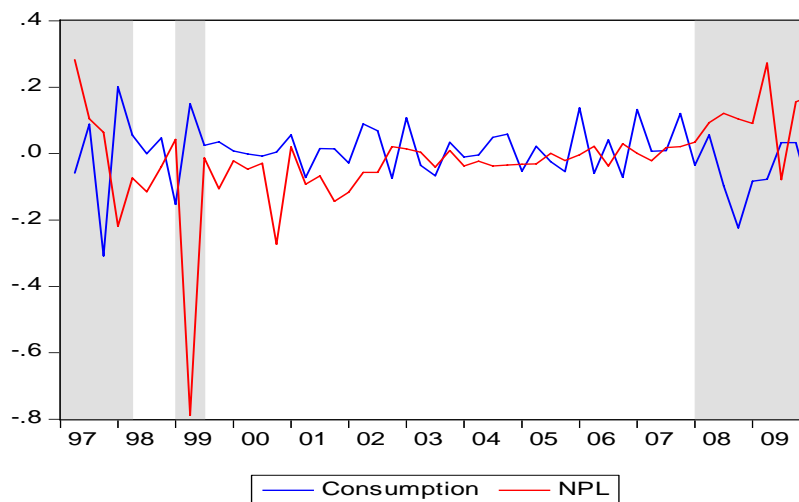

Note: Shaded periods depict both Jamaica financial and global crisis.

A major consideration for banks when deciding whether to extend or restrict credit is the perceived ability of the borrower to repay, which would affect credit supply. Figure 2 provides reassurance that the NPL series captures credit supply shocks. For example, NPL was high in 1997 following the negative credit shock that occurred during Jamaica's financial crisis. Moreover, it captured a major financial innovation in 1999 where there was a large decline in NPL. This was partially due to the development of the Financial Sector Adjustment Company (FINSAC) Limited (which was established to help renovate the financial sector) that purchased NPL during this time period. The growth in NPLs over the last five quarters can be associated with the negative supply shock which is largely due to the weak economic environment during the global crisis.

It is expected that the changes in NPLs will give better results in the model than consumer credit. This is due to the relatively high (negative) correlation coefficient of 0.43 in comparison to 0.12 for consumer credit. This suggests that empirically there may be some support for the hypothesis that NPL negatively affects consumption spending (see Figure 2).

Figure 2: Real Consumption and NPL growth

Shaded regions predict Jamaica financial crisis, the absorption of NPL by FINSAC and the global crisis respectively.

5.0 Econometric Framework

This paper focuses on the liquidity constraint hypothesis and uses equation 4 that was proposed by Ludvigson (1999). Credit variables are incorporated in the consumption function along with a fixed excess sensitivity coefficient:

$$\Delta c_t = \alpha_t + \beta \Delta \mathbf{X}_t + \varepsilon_t \qquad \textbf{(5)}$$

where $\mathbf{X}_t$ is a column vector that includes disposable income and proxies as credit market indicators.

An IV estimation procedure is employed as the error term is not necessarily orthogonal to changes in disposable income therefore an ordinary least square estimate will be inconsistent. Following Campbell and Mankiw (1989, 1990, 1991), it is customary to lag the instruments at least two periods to avoid the problems associated with an MA (1) error process. The main reason is that if PIH is held in continuous time, quarterly-average measures of consumption growth will be correlated with the previous period consumption. Thus the consumption equation error term will be correlated with one period lagged variables and are thus not valid instruments.

As indicated earlier, the validity of a proxy can always be questioned, however consumer credit and NPL were used based on data availability and significance.[9] Thus, three x_t variables were employed: the logarithms of real disposable income, real consumer credit and real NPL. Real interest rates were not included (which concur with literature) as preliminary estimates indicated that they were not significant.

6.0 Estimation and Results

It is useful to review the behaviour of the time series used in estimation was conducted before analyzing the results from the formal econometric estimates. Both consumption and credit series

---

[9] Mortgage credit and unemployment were also considered as potential variables however they were found to be insignificant and were not reported. This result coincides with findings from Beaton (2009), who employed an ECM technique. Like Beaton (2009), it was expected that mortgage credit would be more, not less significant, given that consumption includes non-durables and service. However since consumption cannot be disaggregated, no sensitivity analysis can be done to see if this result would also hold if consumption of non-durables and services was used as is common in literature. One reason why unemployment rate might be insignificant in explaining consumption is that Jamaica is the largest recipient of remittances which act as a substitute for the loss of income which occur.

were seasonally adjusted accordingly.[10] The de-seasonalized series was then checked for

stationary using the Augmented Dickey-Fuller and Phillp-Perron test (as reported in Table 1).

Table 1
Results of Unit Root Test (All variables in logs)

1997:Q1 - 2010:Q1	ADF[1]		PP[2]		Degree of Integration
	Level	**Difference**	**Level**	**Difference**	
Null Hypothesis	Unit Root		Unit Root		
Cons[3]	-0.078	-9.533***	-0.083	-9.527***	I(1)
DI[4]	13.566	-11.489***	13.249	-8.927***	I(1)
CC[5]	1.036	-3.824***	1.198	-3.840***	I(1)
NPL	-0.518	-3.752***	-1.431	-6.466***	I(1)

***· ** and * denotes significance at the 1%, 5% and 10% levels, respectively. [1]Augmented-Dickey Fuller test statistics, [2]Phillp-Perron test statistics, [3]Consumption, [4]Disposable Income and [5]Consumer Credit.

Based on both tests it was concluded that consumption, consumer credit and NPLs were

stationary after being first-differenced without the inclusion of a constant or trend. Disposable

income however had to be first differenced with a constant in order for the variable to become

stationary.

Further diagnostic tests which includes analyzing historical data and "eye-balling" the residuals

graph, suggested that there might be structural breaks in the data. Consequently, in order to take

into account these transitional periods in the Jamaican economy, a dummy variable was added to

model as an attempt to explicitly control for these potential structural. [11]The dummy variable was

defined as:

---

[10] Consumption tends to exhibit an increase in the second and fourth quarter which may be attributed to back to school and Christmas spending respectively. Consumer credit also seems to exhibit the same pattern even though it is not as volatile as consumption. Each series was de-seasonalized using the Census X12.

[11]This measure was chosen as formal tests such as the Chow test and the Chow forecast could not have been employed due to insufficient observation to test the periods of suspected breaks.

$$dummy = \begin{cases} 1 & foreign \text{ exchange } rate \text{ instability} \\ 0 & otherwise \end{cases}$$

Foreign exchange rate instability represents periods of large depreciation of the Jamaican dollar to the US dollar. It was observed that the dummy variable was significant in the estimation of the model and was thus incorporated with disposable income and both credit variables in the Two Stage Least Square estimation.[12]

6.1 Instruments

As stated earlier one period lagged variables are not valid instruments thus variables were lagged from periods two through four. In assessing the validity of instruments chosen, a two-step procedure was used: 1) Instruments were chosen base on economic intuition and were then used as regressors for the endogenous variable. 2) By process of elimination the variables that were found to be significant were used. The R^2 and F-stat was then examined. The following instruments were used:

$cc_t; y_{t-4}, cc_{t-2}, un_{t-2}, mc_{t-2}, mc_{t-4}$

$y_t; y_{t-3}, (y*d)_{t-2}, (c*d)_{t-2}, (c*d)_{t-3}, cc_{t-2}, cc_{t-4}, (cc*d)_{t-2}, (cc*d)_{t-4}, npl_{t-2}, npl_{t-3}, (un*d)_{t-2}, (un*d)_{t-4}$

$npl_t; npl_{t-2}, (npl*d)_{t-3}, (y*d)_{t-3}, cc_{t-4}, (cc*d)_{t-2}, (cc*d)_{t-3}, (c*d)_{t-2}, (un*d)_{t-2}, mc_{t-4}, (mc*d)_{t-3}, (mc*d)_{t-4}, dum_{t-2}, dum_{t-3}$.[13]

The results of Table 2 show that NPL would have been the only valid instrument chosen, using the criteria of a high R^2 and F-stat which is higher than the rule of thumb of 10.0. [14] However, both disposable income and consumer credit were also considered as valid, as according to

---

[12] See relevant dates of the Economic Update and Outlook (PIOJ) publications. Not all periods of foreign exchange instability were used, just the ones that were found to be highly significant in explaining the movements in consumption. These periods include: 1997Q4, 1998Q3, 2003Q1 to 2003Q4, 2008Q1, 2009Q1.
[13] Y denotes disposable income, c for consumption, npl for NPL, dum for dummy, mc for mortgage credit and (.*d) represents the dummy interaction for the specific variable.
[14] See Bound, Jaeger and Baker (1995).

Baum, Schaffer and Stillman (2003) the measure of validity used by Bound et al, is only appropriate for estimation with a single endogenous variable, whereas this paper has three.[15]

Table2
R^2 and F-stat results for instrumental variables

	R2	F-Stat
DI	0.457	3.751
CC	0.425	6.298
NPL	0.863	16.741

6.2 IV results

Results from estimating equation 4 with appropriate instruments and dummy variables are reported below in Table 3.

The first three regressions display the relationship between consumption and all three variables considered. The results show that consumption shows excess sensitivity to consumer credit and NPLs. The estimated coefficient on disposable income is 0.701 which is higher than the estimate given by Campbell and Mankiw (1989, 1991), however this variable was found to be insignificant.

---

[15] Moreover, data constraints prevented the use of other instruments.

Table 3
IV estimates of $\Delta c_t = \alpha + \beta x_t + \varepsilon_t$

	DI	CC	NPL	DI*Dum	CC*Dum	NPL*Dum	Trend	$\overline{R}^2$	Jaque-bera
(1)	0.701 -0.735						-0.001* (-1.701)	0.8	0.824
(2)		0.894** -2.237					-0.001* (-1.886)	-6.0	0.579
(3)			-0.221*** (-7.005)			-0.533*** (-1.719)		21.6	0.941
(4)	0.666 -0.711	0.291* -1.822					-0.001* (-1.917)	2.6	0.842
(5)	0.904 -1.202	0.176 -0.874		-3.300*** (-4.927)	1.495*** (-3.590)		-0.001* (-1.515)	16.5	0.988
(6)	0.173 (-0.240)		-0.218*** (-6.856)			-0.531* (-1.736)		20.0	0.932
(7)			-0.231*** (-5.869)	-2.739*** (-3.985)	1.652*** -4.107			30.7	0.914

Note: Newey-West standard errors in parentheses, assuming MA (1) errors.
***,** and * denote significance at the 1%, 5% and 10% respectively. (.)*Dum represents the dummy interaction with the respective variable. The $\overline{R}^2$ is for the second stage least square and is reported in percentages.[16] The p-value of the Jaque-bera is reported. A trend was included to capture changes in consumer tastes and preferences. [17]

This finding might be as a result of one or a combination of two reasons:

    i.   A frequent problem of estimating Campbell and Mankiw equation is that it might be difficult to find instruments that keep the same level of significance as the endogenous variable, which might be the case occurring here.[18]

---

[16] A negative $\overline{R}^2$ normally occur when too many regressors are included in the model, however this is not the case in this model. This result is common in IV estimations. Studies such as Bachetta and Gerlach (1997), Ludvigson (1999) and Wilcox (1989) also reported negative $\overline{R}^2$.

[17] The trend is insignificant when NPLs are included in the model and are thus not reported. One reason for this is that NPLs have cyclical components thus a trend will be insignificant.

[18] Bachetta and Gerlach (1997) also had the same problem in estimating income growth in Japan and France where similar instruments were used.

ii.   51.6 per cent of total income is concentrated to 20 per cent of the richest persons in

        Jamaica whom normally tend to have a higher marginal propensity to save than the

        poor.[19] Due to this greater concentration of income to the rich, the true significance of

        disposable income to consumption might not be revealed. It might also be the case that

        real GDP is not a good proxy alone as wealth effects, such as stocks, are also missing.

        Also the inclusion of remittances in the model might have given been better results,

        given the relatively high ratio to GDP (14.3 per cent remittance to GDP ratio).[20]

Row 2 and 3 shows that both credit variables exhibit excess sensitivity to consumption, with both

NPL (during times of foreign exchange rate instability and otherwise) being significant at the 1%

level. Individually, as judged by the $\overline{R}^2$, NPL appears quite important in explaining consumption

spending, while consumer credit seems to matter less.

The next three rows include income combined with another variable. The coefficient of

consumer credit has the expected sign in Row 4, however the significance is marginal. Row 4a,

shows that when the interaction dummy of disposable income and consumer credit is added to

the regression, both are significant at the 1 per cent. However, the inclusion of the dummy

interaction of consumer credit renders consumer credit to be insignificant to the model. This

might be due to correlation issues of both regressors, which is quite frequent in IV estimation.[21]

The adjusted R^2 increased significantly from 2.6 per cent to 16.5 per cent which means that

excluding credit constraints (during periods of instability in the foreign exchange market) from

the consumption function may lead to omitted variable bias. Interestingly, during periods of

---

[19]See UNDP website for statistics
[20] See BOJ quarterly report (September 2009)
[21] See Wooldridge (2009).

foreign exchange rate instability in Jamaica, disposable income has a negative impact on consumption growth. This result is supportive of the notion that during these periods consumers are willing to save more as insurance against uncertainty. In addition, prices tend to rise faster than the growth in disposable income due to the exchange rate pass through. So in real terms consumers spend less .There is also an obvious incentive of moving income from domestic currency to foreign currency deposits which leads to reduction in consumption.[22]

NPL remained significant at the 1.0 per cent, when regressed with disposable income (as seen in Row 6) however in times of instability, NPL becomes significant in explaining consumption at the 10.0 per cent level. Noticeably, the estimated coefficient on disposable income is reduced drastically to 0.173. This result is consistent with the notion that NPLs affect consumption in many channels, one being through disposable income. When households' balance sheets deteriorate, the proportion of disposable income that is available for consumption usually falls, as households reallocate resources. Consumer will use some of the reallocated resources to prevent outstanding loans payments from growing faster.[23]

In Row 6, the interaction of NPL, the interaction variable of income and consumer credit were still significant at the 1% level with a slight increase in the $\overline{R^2}$ to 30.0 per cent. Based on the coefficients, it can be concluded that during periods of volatility in the exchange market, disposable income and consumer credit are robust determinants of consumption.

---

[22] See Eichengreen and Hausmann (1999).

[23] NPLs do not mean that a person has completely stopped paying on one's loans, it just means that the banks consider the loans a loss to its financial statement. Thus consumers will still be trying to make loan payments.

7.0 Conclusion and Policy Implications

This paper employs Instrumental Variable/ Two Stage Least Square Estimation to analyze if credit constraints affect consumption. Consumer Credit and Non-Performing Loans were used as proxies for credit constraints and both were found to be significant in explaining consumption. It was also concluded that NPL was a robust determinant of consumption while consumer credit was highly sensitive to the specification of the model. Overall, the empirical evidence presented in this model provides considerable support for the hypothesis that credit constraints influence aggregate consumption. This suggests that the PIH is rejected for Jamaica due to credit constraints. The analysis also suggests that households reduce consumption in periods where there is sharp depreciation in the exchange rate. Additionally, during periods of uncertainty, consumers are more concerned about preserving their wealth, rather than the need to smooth their consumption.

The paper points to the need for policy makers to implement policies to stimulate consumption. This is in a context where the credit variables were found to have a significant impact on consumption. This taken in conjunction with the large share of consumption (71%) in GDP, suggests that there could be some incremental growth in the economy above projection from policies aimed at stimulating consumption. One such policy is for the central bank to further loosen monetary policy in 2010. Concurrently, the Government should examine if there is any scope within its fiscal programme to reallocate resources to benefit the consumer. The findings also support the actions taken by the BOJ during periods of sharp depreciation in the exchange rate. Most notable, is the extraordinary measure that Bank of Jamaica had taken during the

December quarter of 2008 to stabilize the exchange rate and contain inflation. In the absence of this, the research suggests that private consumption and consequently GDP would have fallen even more sharply.

The Bank should accelerate the process to construct an index of consumer constraints similar to those of central banks such as the Bank of England, Bank of Canada and the Federal Reserves. This index would be built from responses to a senior loan survey of commercial banks and other financial institutions conducted quarterly. Work has started in the Monetary Analysis & Programming Department to construct the survey.

Further work should be done in empirically assessing the impact of other variables on private consumption to incorporate private transfers and household wealth. It would also be of interest to do an error-correction model to determine if there is a long-run relationship between disposable income and consumption and whether credit constraints are just short-term shocks.[24]

---

[24] The researcher was unable to employ this method as there was not enough data to robustly determine if a long-run relationship existed.

References:

Bacchetta, P and Gerlach, S. (1997), 'Consumption and Credit Constraints: International Evidence', *Journal of Monetary Economics* Vol. 40, pp. 207-238.

Baum, C.F, Schaffer, M. and Stillman, S. (2003), 'Instrumental variables and GMM: Estimation and Testing'. *Stata Journal* Vol.1, pp. 1-31.

Beaton, Kimberley. (2009), 'Credit Constraints and Consumer Spending', *Bank of Canada* Working Paper 2009-25.

Bound, J., Jaeger, D. and Baker, R. (1995), 'Problems with Instrumental Variables Estimation when the Correlation between the Instruments and the Endogenous Explanatory Variable is Weak'. *Journal of the American Statistical Association* Vol.90, pp. 443-450

Campbell, J.Y. and Mankiw, N.G. (1989), 'Consumption, Income, and Interest rates: Reinterpreting the Time Series Evidence', In: Blanchard, O.J., Fischer, S (Eds.), *NBER Macroeconomics Annual*. MIT Press, Cambridge.

Campbell, J.Y. and Mankiw, N.G. (1990), 'Permanent Income, Current Income, and Consumption*, Journal of Business and Economic Statistics* Vol.8, pp. 265-767.

Campbell, J.Y. and Mankiw, N.G. (1991), 'The Response of Consumption to Income- A Cross-Country Investigation', *European Economic Review* Vol. 35, pp. 723-767.

Gordon de Broweur (1996), 'Consumption and Liquidity Constraints in Australia and East Asia: Does Financial Integration Matter?', Reserve Bank of Australia.

Eichengreen, B and Hausmann, R. (1999), 'Exchange Rates and Financial Fragility', NBER Working Paper Series 7418

Flavin, M. (1981), 'The Adjustment of Consumption to Changing Expectations about Future Income.' *Journal of Political Economy*Vol.89, pp.974-1009

Flavin, M. (1985), 'Excess Sensitivity of Consumption to Current Income: Liquidity Constraints or Myopia?' *Canadian Journal of Political Economy* Vol. 18, pp.117-136.

Friedman, M. (1957), A Theory of Consumption Function. Princeton, NH: Princeton University Press.

Hall, R.E. (1978), 'Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence', *Journal of Political Economy* Vol. 86, pp. 971-987.

Hayashi, Fumio (1982), 'The Permanent Income Hypothesis: Estimation and Testing by Instrumental Variables', *Journal of Political Economy* Vol. 90, pp. 366-383.

Japelli, T. and Pagano M. (1989), 'Consumption and Capital Market Imperfections: An International Comparison'. *American Economic Review*. 65, pp. 203-209.

Lawrence, E. (1995), 'Consumer Default and the Life Cycle Model', *Journal of Money, Credit and Banking* Vol.27, pp. 939-954.

Ludvigson, S. (1999), 'Consumption and Credit: A Model of Time-Varying Liquidity Constraints', *The Review of Economics and Statistics* Vol. 81, pp. 434-447.

Madsen, J.B. and McAleer M. (2000), 'Direct Tests of the Permanent Income Hypothesis under Uncertainty, Inflationary Expectations, and Liquidity Constraints', *Journal of Macroeconomics* Vol. 22, pp.229-252.

Muellbauer, A. (1983), 'Surprises in the Consumption Function', *Economic Journal* Vol. 93, pp. 34-50.

Murphy, R. G. (1998), 'Household debt and consumer spending', *Business Economics,* pp. 38-42.

Rinaldi, L. and Sanchis-Allelano. (2006), 'Household Debt Sustainability. What explains Household Non-Performing Loans? An Empirical Analysis', *European Central Bank* Working Paper Series No 570/January 2006.

Smith, P. and Song L.L. (2005), 'Response of Consumption to Income, Credit and Interest Rate Changes in Australia', *Melbourne Institute* Working Paper Series No. 20/05.

Vaidyanathan, G. (1993), 'Consumption, Liquidity Constraints and Economic Development', *Journal of Macroeconomics* Vol. 15, 591-610.

Wilcox, J.A. (1989), 'Liquidity Constraints on Consumption: The Real Effects of "Real" Lending Policies'*, Economic Review*, Federal Bank of San Francisco: 39-52