Stress Testing Household Data in Trinidad and Tobago to Assess the Implications of Changes in the Economic Environment

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Abstract

The Central Bank of Trinidad and Tobago employs financial soundness indicators and stress testing to assess the vulnerability of the financial system. However these methodologies focus on the financial institutions and more specifically commercial banks. This paper seeks to use data gleaned from the 2008/2009 Household Budgetary Survey (HBS) to assess for the first time in Trinidad and Tobago the financial vulnerabilities of citizens of Trinidad and Tobago, thus complementing the traditional stress testing used by the Central Bank. Using information on individual debt in the form of credit cards, hire purchase and loans, as well as income and expenditure, a financial margin for individuals is defined and tested for a variety of shocks. The results indicate that the percentage of persons who are vulnerable to default on their debts when interest rate and inflation shocks are applied is very similar. Movements in the unemployment rate had the largest impact on citizens. Notably an investigation into mortgage debt reveals that this type of debt is very resilient to the different types of shocks.

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1. <u>Introduction</u>

The recent financial and sovereign debt crises experienced globally highlighted the vulnerabilities not only of the financial (more specifically the commercial banks) sector but also that of households. Thus central banks have noted the importance of monitoring the level of household indebtedness, as high indebtedness can amplify shocks to and from the financial system. Indeed in 2014 there have been expressions of concern of the high levels of household debt in countries such as Sweden[2], and Canada[3]. While much of the analyses of economic distress are conducted at the macro level, it is recognised that stress tests of the financial system should take into account the individual characteristics of the households. In many countries information on loan to value or debt to value ratios are routinely collected and enable financial sector supervisors to keep an eye on household indebtedness. However household level data can provide more insight into the amount of households and the per cent of debt affected by shocks. In Trinidad and Tobago, as in many other countries, credit quality is a regular concern and the low interest rate environment may be encouraging households to leverage more.

In Trinidad and Tobago the rate of credit growth has been propelled by a long sustained period of low interest rate. However most recently the Central Bank of Trinidad and Tobago has signalled the end of this low interest rate environment though the increase in the repo rate. A rise in the interest rate may lead to persons becoming unable to service their debt and thus lead to problems in the commercial banking system as the level of non-performing loans may subsequently rise. One manner in which this issue can be investigated is through stress testing of household income and expenditure. At present the Central Bank routinely stress tests the commercial banking system[4], thus stress testing of household loan portfolios can be seen as a complement to the routine tests given that household loans account for around 41.9 per cent of banks' lending, and a sizeable share of banks' balance sheets. Using household data can allow for the identification of groups of persons who would be particularly vulnerable to shocks as well as illustrate which shocks can affect which group of persons the most.

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[2] http://www.nasdaq.com/article/household-indebtedness-poses-risks-for-swedish-economy--imf-20140613-00057 and http://www.cnbc.com/id/101942770#.

[3] http://www.torontosun.com/2014/09/03/bank-of-canada-stays-neutral-frets-over-household-debt

[4] The stress tests conducted examined the impact of changes in interest rate, exchange rate, credit and liquidity risks and sensitivities to energy prices and local or regional disasters on the commercial banking system. For more details see Exploring the Benefit of Stress Testing: The Case of Trinidad and Tobago by A. Hilaire et al (2011) available at http://www.central-bank.org.tt/sites/default/files/Research%20Paper%20Vol.%202%20No.%201%20December%202011.pdf .

This paper will seek to investigate the vulnerability of household debt to shocks in the macroeconomic environment. Using the 2008/2009 Household Budgetary Survey (HBS) data and employing the financial margin approach, which examines the difference between a persons' income and the level of their debts, this paper seeks to look at the impact of changes in interest rate, inflation and employment on the ability of persons to service their debt. This approach which has been adopted by central banks in Europe, Australia and Canada to examine household debt has never been used by Caribbean Central Banks in their examination of financial stability. Hence this paper can be seen as an innovation in the assessment of the financial system in the Caribbean.

The structure of the paper will take the following format. In the next section an overview of household debt regionally and in Trinidad and Tobago will be undertaken. This is followed by a literature review, and description of the methodology used in the paper. The results of the stress testing of household debt are revealed as well as some limitations in the current analysis and the paper then concludes.

2. Overview of Household Debt

Among the CARICOM member states, estimates[5] from Credit Suisse Research Institute (2013) suggest that during 2000 to 2007 average household debt levels were on the increase, but then fell during the early years of the global financial crisis. More recently the household debt levels have once again been on an upward trajectory. Notably the average household debt level in CARICOM is approximately four times lower than that estimated for the world. Within the region the Bahamas has the highest level of household debt followed by Antigua and Barbuda and Barbados, indeed in the pre-2008 period the Bahamas debt levels were higher than those estimated for the world. While debt, in its various forms whether public, business or household, has the potential to foster economic growth, after a certain threshold it is recognised to be unsustainable. Cecchetti, Mohanty and Zampolli (2011) find a threshold of 85 per cent of Gross Domestic Product (GDP) for household debt. Combining the estimated household debt from Credit Suisse (2013) with the GDP estimates from the International Monetary Fund (2014), enables a calculation of the household debt to GDP ratio. The figures suggest that for 2013 the household debt levels in CARICOM are below the Cecchetti, Mohanty and Zampolli (2011) threshold,

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[5] The estimates are generated using a combination of Household Budgetary Survey data, other survey data, econometric techniques (in particular the Seemingly Unrelated Regression model) and imputation using movements in stock market indices, house price indices, or growth of GDP.

ranging from a high of 22.26 per cent in St Vincent and the Grenadines to a low of 3.30 per cent in Haiti. Trinidad and Tobago had the second lowest rate in the CARICOM region at 4.04 per cent.

Chart 1: Household Debt per Adult
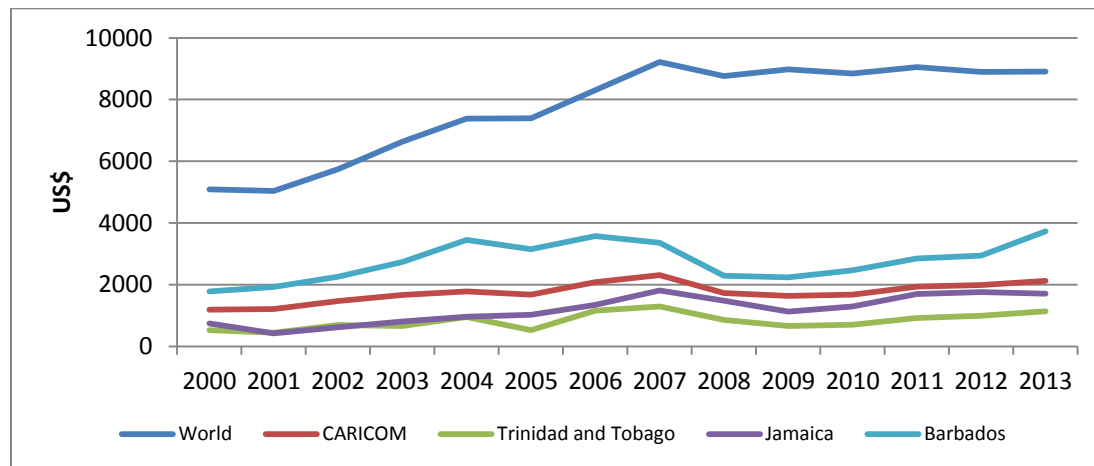
Source: Credit Suisse (2013)

In Trinidad and Tobago commercial banks are a key source of funds. However the current high state of excess liquidity may be prompting banks to offer loans to those who may not be in the best position to repay them. Indeed over the last few years there has been a proliferation of the advertisements offering loans for items such as vacations, carnival costumes and the like, as well as offers of loans several times the size of one's salary. In addition the excess liquidity as well as the accommodative monetary policy stance taken by the Central Bank of Trinidad and Tobago has meant that interest rates have been low. These developments make the analysis attempted in this paper of great interest to policy makers.

Over the period 1995 to 2013 loans[6] represented an average of 42.9 per cent of the commercial banking sector assets, with consumer loans accounting for 41.9 per cent of total loans provided by the commercial banking system.

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[6] Institutions other than commercial banks which offer loans include credit unions, insurance companies, the unit trust corporation, the home mortgage bank, Trinidad and Tobago mortgage finance company, the National Entrepreneurship Development Company Ltd and certain businesses (such as large furniture stores).

Chart 2: Consumer Real Estate Mortgage and Consumer Credit Card Loans
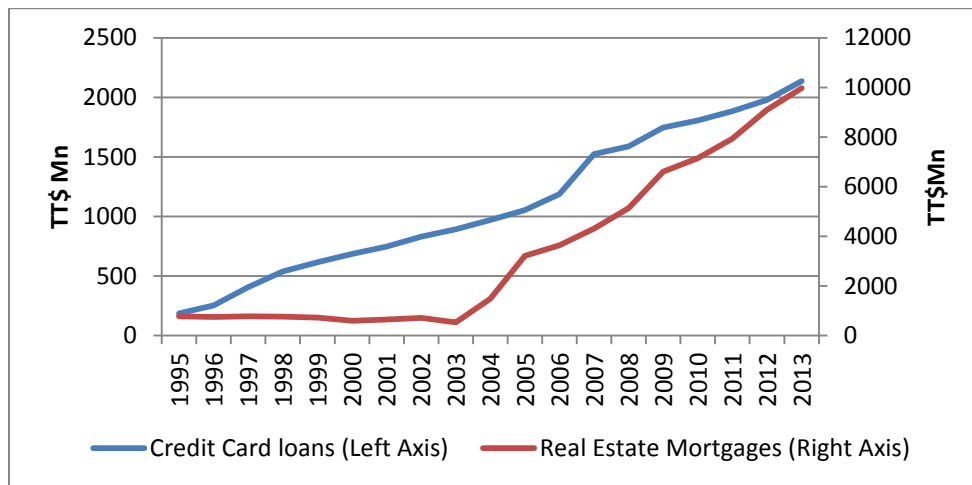
Real estate mortgage loans account for a significant per cent of the loans provided by the commercial banking sector; in 2013 this type of loan represented 42.56 per cent of all loans provided to consumers. The data also revealed that the use of credit cards has also continued to increase over the last decade. The other major purposes of consumer loans from the commercial banking system were for the purchase of motor vehicles, refinancing, debt consolidation and renovation/refurbishment of homes.

3. Literature Review

The investigation of household debt has in recent years gained prominence with central banks particularly in Europe and Canada employing household level data for the analysis. While some countries depend on the household budgetary surveys conducted by the country's statistical agency, others undertake surveys for themselves in order to acquire the necessary data. In some papers where household expenditure data is not available, an estimate of basic living costs can be generated from poverty analysis.

Early studies such as that by Zajaczkowski and Zochowski (2006) saw the need to assess threats to financial stability due to the rising indebtedness of households. They acknowledge that such an analysis is important in an environment where banks may be facing significant competition and thus may be

pressured to ease credit standards and/or offer loans to lower income groups. They conclude that in Poland in 2005 the percentage of households with problems repaying loans amounted to between 12.2 and 13.5 per cent. However this percentage fell when examining households that were repaying mortgage loans. Mortgage loans were found to be sensitive to changes in the interest rate and foreign exchange rate. Another early study was that of Johansson and Persson (2006) which found that the Swedish household sector's ability to repay its debt was sensitive to increases in the interest rate and to changes in the unemployment rate. More recently Albacete and Fessler (2010) examined the impact of various stresses on the ability of the Austrian household to repay its debts. Using data from the OeNB's Household Survey on Housing Wealth 2008, they estimated that around 10 per cent of indebted households would have difficulties if a shock were to occur, with rising interest rates having the strongest impact. Hlavac, Jakubik and Galuscak (2013) found that low-income households in the Czech Republic were the most vulnerable to the different stresses, and a shock to the unemployment rate had the largest impact followed by inflation and interest rates. Bilson and Rodgers (2013) looked at household debt in Australia over a three year period, their analysis revealed that interest rate shocks have the largest effect on the household's ability to repay their debts, followed by unemployment shocks, with the asset shocks having no effect.

Investigations into household debt in the Caribbean have been limited to exploring the factors which influence the level of debt. Carter, Moore and Jackman (2012) examined the total level of household debt in Barbados using data from commercial banks, credit unions and trust and finance companies. They noted that household debt grew from under BDS$ 500 million at the end of 1990 to BDS$ 4.5 billion by the end of 2010. They estimated that the average household in Barbados owed about BDS$ 53,000 in debt in 2010. The authors found a positive relationship between household debt and economic growth, inflation, and wages, and a negative relationship with interest and unemployment rates. An earlier study on household debt in Trinidad and Tobago by Roopnarine (2007) estimated that at the end of 2005 the debt levels had reached $ 20.6 billion (21.7 per cent of GDP). Roopnarine (2007) used aggregate data from the commercial banking sector as well as data from large retailers that provide credit to households in order to assess the magnitude of household debt in Trinidad and Tobago.

4. <u>Methodology and Data</u>

The financial margin[7] methodology (which is described in more detail below) is used in many of the studies previously conducted on household debt. The calculation of a financial margin, which is the first step in the analysis, provides a measure of the ability of the household to service the debt. The second stage requires the definition and implementation of shocks – popular shocks include increases in the level of unemployment, interest rates and prices. Other shocks which may be examined include changes in the value of financial assets, and changes in exchange rates. Further occasionally the effect of some combination of selected shocks is also looked at. In several papers the final step is to look at the impact on banks by looking at exposure at default (EAD) and losses given default[8] (LGD), with these measures occasionally calculated for different segments of the society. In reviewing the literature no similar study on the Caribbean was found.

In this paper the financial margin (FM) is defined as follows:

FM=NI-EE-INST

Where NI is the individual's monthly income, EE is the essential monthly expenditure (defined in this paper as expenditure on food, drinks and clothing) and INST is the monthly payment on debt. The individual is defined as being in financial distress when FM is negative. Notably in some studies the essential expenditure category is expanded to include other items such as education, medicine and rent. However in Trinidad and Tobago education is provide free up to tertiary level education, and the public health system is also without costs to the country's citizens[9].

The investigation into the vulnerability of households, or in this case, individuals to events that affect either their income or costs of living, can provide information on possible bank losses. Following Albacete and Fessler (2010) a probability of default is assigned for each individual, which takes a value of 0 if their financial margin is greater than or equal to 0, and 1 if the financial margin is negative. The exposure of default, which measures the percentage share of total debt held by vulnerable households is defined as follows

$$EAD= \frac{\sum pd\, D}{\sum D} * 100$$

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[7] In addition to the financial margin approach, an alternative methodology is the threshold approach under this model it is assumed that a household would default if the debt servicing costs goes beyond a certain level.
[8] The Trinidad and Tobago HBS dataset did not have information available to estimate this measure.
[9] There is no separate figure for rent in the available dataset.

Where pd is the probability of default and D is the debt of the household/individual.

Following in the footsteps of other central banks the debt burden of households and individual can be examined through use of information gathered in the household budgetary survey. In Trinidad and Tobago the HBS is conducted every ten years by the Central Statistical Office, with the last one being held in 2008/2009. The HBS provides information on income and expenditure on over 21 thousand individuals. For the purpose of this paper the database is curtailed to contain only those who have reported some level of debt, resulting in 2180 data points. It should be noted that the complete HBS dataset includes children who are not likely to be able to incur any debt, and in addition it may be possible that persons simply did not provide the necessary data. Table 1 presents the average characteristics of individuals with and without debt. It can be seen that the average income for those with debt is higher than those without debt, suggesting that loans may be concentrated in high income households.

Table 1: Average Characteristics of Individuals With and Without Debt from the Trinidad and Tobago 2008/2009 Household Budgetary Survey

Indicators	With Debt	Without Debt
Net Income Per Month	TT$ 7222.40	TT$ 1885.97
Essential Expenditure Per Month	TT$ 982.60	TT$ 448.76
Monthly Debt Payments	TT$1234.13	0
Individuals With Mortgage	20.0%	0
Age of Individual	43.34	32.97
Size of Household	3.90	4.37
No. of Individuals	2180	21596

Source: Central Statistical Office of Trinidad and Tobago

From a theoretical standpoint the reasons for incurring debt is often linked to the life cycle and permanent income hypothesis put forward by Ando and Modigliani[10] (1963) and Friedman[11] (1957). In essence consumers are basing their purchases on what they expect to earn over their working life, with the debt smoothing consumption. The theories postulate that when individuals are young their debt should be high and decline as they age. However given that the average age of individuals with debt is higher than those without debt it may suggest that lending agencies may find that young persons may

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[10] Albert Ando and Franco Modigliani "The Life-Cycle Hypothesis of Saving: Aggregate Implications and Tests", American Economic Review, 1963, Vol. 53, pp. 55-84.
[11] Milton Freidman, "The Permanent Income Hypothesis", 1957, Princeton University Press, pp.20-37.

not have the best credit qualifications[12], thus while the demand may be there the supply of credit may not. Some of the factors which can influence the demand and supply of credit are identified in the table below.

Table 2: Factors affecting household borrowing costs and access to credit

Factor	Variable
Cost of Credit	Nominal Interest Rate
	Price and wage inflation
	Tax relief
Size of loan instalment	Period of repayment
	Fixed versus variable versus adjustable rates
	Central Bank guidance on interest rates
Access to credit	Institutional Rules

Source: Adapted from Reiakvam and Solheim (2013)

Baseline Scenario

Using the restricted dataset, which includes only those with debt, to calculate the financial margin by subtracting the debt and essential expenditure from income reveals that approximately 10.18 per cent of the sample population is vulnerable to defaulting on their debts, with 35.14 per cent of these being male. The average debt to income ratio was 25.41 per cent. The level of debt exposed amounted to 13.9 per cent of total debt. Examining the segment of the population that owes a debt finds that debt payments outweigh expenditure on the essential items. Further expenditure on consumer loan payments tend to on average be greater than expenditure on other types of debt incurred. A further examination of the characteristics of the individuals who incur debt is undertaken using logistical analysis[13]. The following equation is estimated[14]:

$$p(FM) = \alpha_0 + \alpha_1 gender + \alpha_2 age + \alpha_3 marital\ status + \alpha_4 education + \alpha_5 job$$

The results suggest that there some characteristics of an individual which are associated with having a high probability of a negative financial margin. Persons who do not have a job, have only a pre-school level of education, and are female are more likely to default on their debt.

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[12] A simple correlation test between the debt and age among only those who only have debt confirms this hypothesis with a positive relationship between the variables.
[13] The predictive test and the Hosmer-Lemeshow goodness of fit test indicate that the model is well structured.
[14] The number of children and the size of household variables were found to be insignificant.

The data was also disaggregated by the various regional corporations in Trinidad and Tobago to identify any particular area that may host persons that are susceptible to defaulting on their debts. This investigation revealed that the Sangre Grande and Diego Martin areas had the highest level of vulnerable persons at 15.63 per cent and 15.51 per cent respectively. Point Fortin and Port of Spain had the lowest levels of vulnerable persons[15].

Stress Scenario[16]

As mentioned earlier studies in other countries, for example Johansson and Persson (2006) and Albacete and Fessler (2010), have tended to simulate three types of shocks: unemployment, interest rates, and inflation. Shocks to the unemployment rate will affect household income, interest rates will affect payment of loans, and inflation will affect the cost of essential expenditure.

To apply the shocks an examination is undertaken of the key variables over the period 1993 to 2013. While for most of 2014 the inflation rate in Trinidad and Tobago has been under the 5 per cent[17], during the period under review the annual inflation rate has ranged from a high of 14.5 per cent (in 2008) to a low of 1.3 per cent (in 2009), and over 1993 to 2013 has averaged 6.3 per cent. In the case of commercial bank lending rate the prime interest rate and more specifically the mortgage rate both have similar characteristics averaging 12.6 per cent and 12.9 per cent respectfully.

In the case where interest rates are variable a rise will affect the debt service capacity of an individual in the short term. In the longer term fixed interest rates may also be affected if there is renegotiation. Debt service can be separated into principal and interest with the interest payments being the segment that would be affected by the change in interest rate. However the HBS data set simply has a figure for monthly payments on mortgage, credit card, hire purchase, consumer loans and other loans. Thus Table 3 describes the effects of increases in the interest rate on the ability individuals to repay their debt. In the first instance only the impact of a rise in mortgage rates is examined. Residential mortgages provided by commercial banks in Trinidad and Tobago tend to be provided on an adjustable rate basis,

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[15] In the stress testing of the data, as described in the following sub-sections, disaggregation by area revealed that changes in the inflation and interest rates affected only a few areas, namely San Juan/Laventille, Tunapuna/Piarco, Penal/Debe, and Mayaro/Rio Claro. On the other hand changes in the unemployment rate affected all the areas but one (San Fernando).

[16] Note the analysis examines all debt not just those only owed to commercial banks. If only commercial bank debt was included the figures would alter slightly, but the trends would remain the same.

[17] In August and September 2014 the inflation rate rose to 7.5 and 7.8 per cent respectively.

with the re-pricing of the loan permitted once per year. With the average size of monthly mortgage payments being $1054.55, the stress tests indicate that even in the case of a 10 per cent rise in the monthly mortgage payment, the default rate remains at 10.18 per cent, meaning that 10.18 per cent of the population had a financial margin below zero. A rise in interest rates is unlikely to only affect mortgages; other forms of debt including credit cards, higher purchase, and consumer loans may also be affected. The average size of the monthly credit card payments was $1004.32 and the average consumer loan was $1220.82, while average higher purchase instalment was a mere $278.52. An examination of different interest rate increases on the total debt of the individuals finds that there some impact on the per cent of individuals that could default on their debt obligations. As the interest rate increases on total debts the per cent of individuals with a negative financial margin increases. The percentage of debt exposed increased marginally from the baseline of 13.9 per cent to 14.7 per cent in the extreme case of a 10 per cent increase in interest rates.

Table 3: Effects of interest rate increases on Per Cent of Individuals with a Negative Financial Margin

	Baseline Scenario	Increase of 1 per cent	Increase of 5 per cent	Increase of 10 per cent
Mortgage rates	10.18	10.18	10.18	10.18
All interest rates	10.18	10.28	10.51	10.64

Inflation

The Central Bank's remit is the "*promotion of such monetary credit and exchange conditions as are most favourable to the development of the economy of Trinidad and Tobago*". A key element of this has been the maintenance of a low and stable inflation rate. During the 1993-2013 period there have been significant fluctuations in inflation rate from one year to another. For example inflation moved from 7.6 per cent in 2007 to 14.5 per cent in 2008 before falling again to 1.3 per cent in 2009. In Trinidad and Tobago food inflation is the main driver of overall inflation and expenditure on food, according to the HBS, accounts for approximately 16.5 per cent of an individual's overall expenditure, while collectively the cost of food, drinks and clothing comprises 23.1 per cent of overall expenditure. Thus increases in the cost of these items should have some impact on the individual's financial margin. The results of the stress test validate this hypothesis. Rising inflation levels only result in a marginal increase in the level of

debt exposed, as a 20 per cent rise in prices results in only a 0.8 per cent rise in the level debt being exposed to default when compared to the baseline scenario.

Table 4: Effects of Inflation on Per Cent of Individuals with a Negative Financial Margin

	Baseline Scenario	Increase of 1 per cent	Increase of 5 per cent	Increase of 10 per cent	Increase of 20 per cent
Food, Drinks and Clothing	10.18	10.28	10.55	10.64	11.10

Unemployment

In many of the studies looking at household debt, an examination of changes in the unemployment rate is undertaken utilizing a model that first determines the probability of being unemployed and then combines the results with the newly unemployed persons receiving unemployment benefits. This allows for the calculation of the financial margin. In Trinidad and Tobago when someone loses a job there is no unemployment benefit from the state to receive. However persons may have savings and other assets which may enable them to pay their monthly debts. Following the literature, the first stage is to assess the probability that a person is unemployed. This can be expressed as:

$$Prob(u_i) = \emptyset(\alpha + \beta x_i)$$

Where the probability of a person being unemployed is a function of their characteristics, such as age, gender, education and marital status and $\emptyset$ is the cumulative density function of a standard normal distribution. Using the 2008/2009 HBS data this model is applied to the part of the population that either have a job or was looking for a job (this is in line with the accepted definition for calculating the unemployment rate). The constant α is adjusted until the rate of unemployment for the set of individuals reaches the required level for the stress testing. In order to simulate the effects of an increase in the unemployment rate the coefficients from the probit model are applied to the individuals with debt and the probability that an individual will unemployed calculated. If the individual chosen is has a high probability that he/she will be unemployed then his/her income levels are dropped to zero. The results indicate that the loss of jobs has a significant impact on the ability of the population to pay their debts. An increase in the unemployment level also has a significant impact on the per cent of debt

exposed, with this reaching 23.4 per cent in the case of a 10 per cent increase in the unemployment rate.

Table 5: Effects of A Rise in Unemployment on Per Cent of Individuals with a Negative Financial Margin

	Baseline Scenario	Increase of 1 per cent	Increase of 5 per cent	Increase of 10 per cent
No savings	10.18	16.56	20.32	24.50
Savings	9.27	14.95	18.35	22.20

In addition to a monthly income persons may have some form of savings which could be used to pay their debts in the event of becoming unemployed. Thus an analysis of the individual's ability to pay their debts in the event of unemployment using cash on hand or in the bank is also undertaken. In this case the monthly income and savings figures are combined when calculating the financial margin. While the results still indicate a significant increase in the number of persons with a negative margin, the inclusion of self-financing lowers the per cent of the vulnerable individuals by approximately 2 per cent when compared to the assessment ignoring the availability of savings.

To further aid in the analysis the individuals are divided into three groups, those earning less than $5,000 per month, those earning between $5,000 and $10,000 per month, and those earning $10,000 per month and above. By dividing the sample into different groups it may be possible to identify pockets of vulnerability. In Johansson and Persson (2006) the households were divided into 5 groups of equal size, while Albecete and Fessler (2010) analyse 4 income quartiles. However in several other studies there is no disaggregation. The results indicate that for those earning $10,000 and above, only the loss of a job will have any impact on their ability to pay, as they are adequately situated to deal with all other shocks. Less than 10 per cent of the individuals in this grouping are affected with potential debt defaults of under 6 per cent. For those earning less than $5,000 the level of debt exposed ranges from 44 per cent to 55 per cent. Notably of the three groups they have the least aggregate debt.

Multi-Factor Shock

In order to provide a more real world example of the effect of shocks many studies move beyond the single factor shocks and combine various shocks. A slowdown in the economic activity in a country is unlikely to affect only one element. Indeed as the financial crisis that began in the US in 2008 illustrated, economic growth, unemployment levels, and interest rates can all be impacted at the same time. Looking over the 1993 to 2013 period provide some guidance to set up this multifactor scenario. Based on movements that occurred in 2002 compared to 2001, the model will take into consideration a rise in interest rate of 2 per cent, inflation of 2 per cent and an increase in the unemployment rate of 5 per cent. Recalculating the financial margins for individuals using these parameters finds that the number of vulnerable individuals increases by 10.46 per cent (to 20.64 per cent) and the level of debt exposed increases by 6.84 per cent (to 20.74 per cent).

5. Limitations of the Model

It is important to note some of the limitations of the model used. Given the static data the results can only provide a guide as to the effect of an economic shock. Secondly assumptions had to be made about the interest rates applied. In this paper we use individual level data, not household level data as has been used in other studies. There may be cases where although an individual may have a negative financial margin, through pooling of resources from other members of the household the individual may be able to service the debt. As with any survey on income and expenditure it is possible that the survey respondent may not provide accurate information on their level of debt and income earned. Another limitation of this particular analysis is that we were unable to calculate the loss given default ratios as there was no information on the value of asset wealth – for example the value of real estate holding. While conducting household level surveys may be beyond the scope of the central bank, providing input into the design of such surveys or undertaking complementary surveys may help in filling in some of the data gaps required for further analysis.

6. Conclusion

 Macro prudential tools have proven to be effective in maintaining financial stability and protecting the economic output of countries. However these tools work best when implemented ex ante. In Trinidad

and Tobago and indeed in many countries of the region timely and comprehensive data which could be used to formulate macroprudential policy is often not available. Information from sources such as the Household Budgetary Survey can form the basis for analysis and decisions on the implementation of macro prudential tools. In this first investigation into the debt of individuals the investigation reveals that an increase in unemployment had the largest impact on the overall population. The low wage earners are particularly susceptible to increases in the interest rate. However when shocks are combined as could happen in a real situation, the effects are magnified and under a plausible scenario the exposure of credit institutions to default would increase by just under 7 percentage points. It should be emphasised that given the rapid growth in consumer loans, credit card use and mortgage loans in the post-2008 period it is likely that the sensitivity of individuals to shocks may have increased. The results from this study also indicate that persons holding mortgages are unlikely to default even in the face of rising interest rates. These results suggest that when designing tools such as loan to value ratios that both the type of loans and the socio-economic characteristics of the population should be taken into account.

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Appendix 1

Base line

Income Bracket	% of vulnerable individuals	EAD
1 (< 5000)	24.56	43.76
2(>=5000 <10000)	1.39	8.86
3(>=10000)	0	0

Mortgage rise

		1		5		10
Income Bracket	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD
1 (< 5000)	24.56	43.80	24.56	43.95	24.56	44.13
2(>=5000 <10000)	1.39	8.87	1.39	8.92	1.39	8.99
3(>=10000)	0	0	0	0	0	0

Unemployment rises

		1		5		10
Income Bracket	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD
1 (< 5000)	33.06	49.95	36.45	51.96	40.42	54.15
2(>=5000 <10000)	7.64	13.31	12.15	17.23	17.13	21.59
3(>=10000)	2.61	1.05	5.65	3.67	8.48	5.86

Inflation rises

		1		5		10		20
Income Bracket	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD
1 (< 5000)	24.68	44.47	25.38	47.14	25.61	50.20	26.67	56.40
2(>=5000 <10000)	1.51	9.13	1.51	9.26	1.51	9.46	1.62	10.03
3(>=10000)	0	0	0	0	0	0	0	0

All Interest Rates Increase

		1		5		10
Income Bracket	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD	% of vulnerable individuals	EAD
1 (< 5000)	24.68	44.02	25.15	45.36	25.50	45.82
2(>=5000 <10000)	1.51	9.10	1.62	9.55	1.62	9.56
3(>=10000)	0	0	0	0	0	0