



Investigating the Macroeconomic Determinants of Household Debt in South Africa

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ABSTRACT

Following the 2007 global financial crisis, the understanding of the relationship between debt and other economic indicators has become crucial for policymakers worldwide. In this study, we investigated the macroeconomic determinants of household debt for the South African economy using macroeconomic variables such as gross domestic product (GDP) growth, consumption, interest rates, inflation, housing prices and domestic investments. Our mode of empirical investigation is the quantile regression approach which is applied to quarterly time series data spanning from 2002:q1 to 2016:q4. Our empirical results imply that inflation and consumption are insignificantly related with household debt; GDP growth and house prices are only related with household debt at moderate to high levels of distributions whereas interest rates and investment are related with household debt across all quantile distributions. All-in-all, these empirical findings bear important implications for South African policymakers.

Keywords: Household Debt, Quantile Regressions, South Africa

JEL Classifications: C32, C51, R20

1. INTRODUCTION

The political transition South Africa went through in 1994, from the apartheid regime into a democratically elected government, brought about many opportunities, not only for citizens, but also for companies and the economy as a whole. Financial institutions began to open up to the world economy, thus enabling healthier competition which eventually lead to institutions increasing credit extension and lowering minimum requirements in order to target more potential consumers (Hurwitz and Luiz, 2007). Policy makers worldwide particular believed that allowing greater access to credit would reduce unemployment through increased capital projects and in the long run strengthen capital markets whereas on the demand side, the availability of credit would allow more households the opportunity to consume now for future payment (Van der Walt and Prinsloo, 1993). However, the effect of this was that even households that had previously preferred the method of financial planning and savings stopped building safety nets. The lack of financial planning and lack of savings, saw considerable growth in household borrowing over

the past couple of decades, both in absolute and relative terms to household income.

The rapid accumulation of debt has attracted attention over the years from national and international authorities due to its potential effect on both the sustainability of households and the stability of the financial system. The increasing number of households defaulting on their payments has led to concerns on the ability of people to repay what they owe, especially in the event of a sudden change in economic circumstances. According to Meniago et al. (2013) with escalating debt, the household sector may run the risk of being too exposed to several adverse surprises such as unemployment shocks, asset price shocks and shocks from income. Several countries experienced this during the 2007/2008 global financial crisis which was to a large extent a debt crisis. Empirical research carried out since the crisis showed that there is an important link between debt and macroeconomic fluctuations with credit booms being found to be a valuable predictor for financial crises (Schularick and Taylor, 2012). The events of 2007 did not only demonstrate that credit is an important

macroeconomic aggregate but it also demonstrated that it makes a difference which sectors are taking on debt and that an overly indebted household sector eventually collapses and triggers a recession (Mian and Sufi, 2009).

This 2007 financial crisis, also popularly known as US subprime mortgage crisis is considered by many economists to be the worst financial crisis that has occurred since the great depression of the 1930s. By mid-2008, the contagion effects of the crisis spread into many regions of the world, with South Africa bearing no exception to the rule, however to a smaller extent than other industrialized countries such as Germany, Japan, Denmark and the Netherlands. Although the South African economy was not as significantly affected, it did plunge into a recession for the first time in 17 years following the ensuing global recessionary period of 2009 and has since battled to recover from the after-effects of the crisis. With the causes of the last recession being mainly attributed to debt, in conjunction with the recent downgrade of the country's sovereign status, it is therefore imperative that an understanding be obtained on what macroeconomic factors are behind the increase in household debt. However, the studies which have examined the determinants of household debt in South Africa are quite limited with the works of Meniago et al. (2013) sufficing as the only previous empirical study, to the best of our knowledge, for the country.

In this current study we contribute to the literature by examining the macroeconomic determinants of household debt in South Africa over a period of 2002-2016. In differing from other previous studies found in the literature, we deviate from the traditional use of linear econometric frameworks and opt to use the quantile regressions methodology as popularized by Koenker and Bassett (1978). In essence this method examines the effects of the dependent variable at many points of distribution. Therefore, in comparison to other linear techniques, quantile regression provide a more complete picture of the relationship between household debt and its covariates. In turn, this approach will provide a richer empirical analysis which will present a wider range of policy implications for South African policy authorities. On a broader scope, our study will become the first, to the best of our knowledge, to examine the possibility of a non-monotonic relationship between household debt and its determinants.

Against this background, we structure the rest of the paper as follows. The following section of the paper present the theoretical and empirical review for the associated literature. The third section of the paper outlines the empirical methodology used in the study. The fourth section of the paper presents the data and empirical results whereas the study is concluded in the fifth section of the manuscript.

2. LITERATURE REVIEW

2.1. Theoretical Review

Several theories seeking to explain household indebtedness have been formulated which have been useful in researchers attempting to find the determinants of household debt. The absolute income hypothesis was developed by Keynes (1936) where he assumed

that consumption is a determinant of the current level of income. According to Keynes an economic agent by natural instinct will on average, increase his consumption as his income rises, but not by as much as the increase in income. This theory suggests that income is the sole determinant of consumption (Tsenkwo, 2011). However, Kuznets (1946) analysed the U.S average propensity to consume over the period 1869-1938 which fluctuated between 0.84 and 0.89 excluding depression years and found that consumption was a proportion rather than a function of income (Baykara and Telatar, 2012).

Modigliani and Brumberg (1954) found that not enough evidence could be gathered to accentuate the Keynesian theory, hence the life cycle hypothesis (LCH) was developed in order to explain both the consumption and borrowing behaviour of households. This model captured the effect of liquid assets on consumption by proposing that household savings and consumption are a reflection of the life cycle stage of the household. In periods during which income is low relative to the average lifetime income of the household, the household will borrow to fund current consumption, and repay the loan in periods during which income is high. It further stated that as most households experience a rising income through their life, debt will tend to be high relative to income early in life, and then gradually decline with age. If income increases in the future during working years and declines at retirement, households tend to borrow when they are young, save during middle age and spend down during retirement (Yilmazer and DeVaney, 2005). The LCH, according to Ando and Modigliani (1963) further proposes that consumption is a linear function of available cash and the discounted value of future income. Households will choose to maximize their utility by controlling their consumption over time, which depends on their lifetime income and the level of interest rates.

As for its uses, borrowing allows individuals to smooth their consumption in the face of income whilst borrowing allows firms to smooth investment and production in the face of variable sales. It also allows governments to smooth taxes in the face of variable expenditures, and it improves the efficiency of capital allocation across its various possible uses in the economy. It should, in principle, also shift risk to those most able to bear it. Without debt, economies cannot grow and macroeconomic volatility would be greater than desirable. However, debt involves risk, and an increase in debt levels increases the potential for borrowers to default where instead of high, stable growth with low, stable inflation, debt can mean disruptive financial cycles eventually leading to the financial system collapsing, taking the real economy with it (Cecchetti et al., 2011). That is why an economy with good financial standing is associated with low debt levels in its household sector. In lieu of this, it is unfortunate to observe that South Africa records a considerably high debt level.

2.2. Review of Associated Literature

The current literature is dominated by studies which have investigated the determinants of household debt for different economies using different econometric approaches applied to datasets consisting of various debt determinants covering differing time periods. In general, these studies can be segregated

into those which investigate household debt determinants for industrialized economies and those concerned with developing countries. Prominent examples of studies focused on industrialized economies include the works of Jacobsen (2004), Barnes and Young (2003), Tudela and Young (2005), Magri (2007) and Meng et al. (2013). Beginning with the study of Jacobsen (2004) who uses simple OLS estimates to examine the determinants of household debt in Norway between 1994 and 2004. The author establishes that household debt is mainly influenced by housing stock, interest rates, the number of house sales, the wage income, the housing prices, the unemployment rate, and the number of students.

In a different studies, Barnes and Young (2003) as well as Tudela and Young (2005) used the overlapping generations model to analyse the household debt in the United States and United Kingdom, respectively. For both countries the authors discover that changes in interest rates, house prices, preferences, and retirement income primarily affect household debt. On the other hand, Magri (2007) examined the determinants of household debt by employing a pooled probit estimations for Italy employed on data collected between 2002 and 2003. The results suggest that age, income, living area, and the enforcement cost of banks, have significant influences on household debt. Meanwhile, Meng et al. (2013) explored the possible causes of Australian household debt using a Cointegrated Vector Autoregression model using data collected between 1988 and 2011. Their study found that gross domestic product (GDP), number of new dwelling approvals, housing prices, interest rate, unemployment, consumer price index and population to analyse the main reasons why Australian households record high debt levels.

The second strand of empirical works in the literature is focused on developing economies and prominent examples include Meniago et al. (2013), Raboloko and Zimunya (2015), Catherine et al. (2016) as well as Khan et al. (2016) and notably a majority of these studies have been conducted in periods subsequent to the global financial crisis. Meniago et al. (2013) investigated the prominent factors that contribute to the rise in the level of household debt in South Africa using a vector error correction model (VECM) and quarterly time series data for the period 1985-2012 was analysed. Results confirmed that increases in household debt was found to be significantly affected by positive changes in consumer price index, GDP and household consumption. Furthermore, house prices and household savings were found to positively contribute to a rise in household debt but this relationship was found to be statistically insignificant. Alternatively, household borrowing was found to be affected by negative changes in income and the prime rate.

Using a similar VECM framework, Raboloko and Zimunya (2015) identified the factors that are influential in determining the growth of household debt in Botswana using data collected from 1994 to 2012. The empirical findings indicate that GDP per capita, interest rates and money supply determine changes in household debt in the long-run. Further analysis shows that household debt, interest rates and money supply influence changes in household debt in the short-run. In another study, Catherine et al. (2016) analysed the determinants of household indebtedness in five

ASEAN countries: Malaysia, Singapore, Thailand, Philippines and Indonesia during the period 1990-2012. The empirical results indicate that macroeconomic factors such as interest rates, inflation rate and unemployment rate mainly influence household debt in developed Asian economies whilst consumption, savings and population mainly influence such debt in less developed Asian countries.

Finally, Khan et al. (2016) examined the determinants of household debt for Malaysia using the autoregressive distributed lag modelling approach to data collected between 1999 and 2014. Their findings revealed that in the long run period, an increase in income level, housing price and population would have a positive impact on mortgage debt while a rise in interest rates and cost of living would exert a negative influence. In addition, their findings were that households use debt as a substitute for income to finance the rising consumption because of a higher living cost.

3. METHODOLOGY

The studies baseline empirical model assumes the following functional form:

$$Y_t = \beta_0 + \beta_1 x_t + e_t \quad (1)$$

Where Y_t is the observation of the dependent variable, household debt, x_t represents a vector of conditioning variables, β represents the associated regression coefficients and e_t is a normally distributed error term. Concerning the explanatory variables contained, the choice of conditioning variables of the household debt are based on previous literature. For instance, the study firstly includes GDP as the first conditioning variable courtesy of the life cycle theory which is a well - known policy that suggests that households mainly go in for large amounts of debt to smooth their consumption and for the possession of long lasting commodities (houses, cars, etc). The model assumes that a household can maximise utility over its life time subject to an intertemporal budget constraint. This implies that by smoothing their consumption, households can maximize utility over their life-cycle. Clearly, the model foresees that consumption in each period is dependent on expectations about life time income, hence the second conditioning variable is consumption (con). The third conditioning variable is the interest rate. In this regard, Prinsloo (2002) argues that a change in interest rates by the monetary authority could have an effect on credit extended to households. The higher the indebtedness, the greater the effects of a rate hike on the interest expense and disposable income of borrowers. The fourth conditioning variable is inflation (inf) which is an important link in the transmission mechanism and relays changes in monetary policy to changes in the total demand for goods and services. The fifth conditioning variable is house price data (hp) which as reported by recent studies has a close connection to household debt, according to Mian and Sufi (2016) evidence suggests that an expansion in credit supply tends to raise house prices, and an increase in house prices allows homeowners to borrow more. The last conditioning variable is investment (inv) which theory suggests is a substitute for debt. Collectively, the baseline empirical specification can be illustrated as follows:

$$hh_yd = \beta_0 + \beta_1 gdp_t + \beta_2 con_t + \beta_3 hp_t + \beta_4 inf_t + \beta_5 int_t + \beta_6 inv_t + u_t \quad (2)$$

From the empirical regression (1) in conjunction with regression (2), the conventional OLS estimates would be obtained by finding the vector β that minimizes the sum of squares residual i.e.

$$\min_{\beta \in R^k} \left(\sum_{i \in \{i: y_i \geq x_i \beta\}} y_i - x_i \beta \right)^2 \quad (3)$$

On the other hand, the quantile regression estimators adopted is a generalization of the median regression analysis to other quantiles. On the other hand, the quantile regression estimators adopted is a generalization of the median regression analysis to other quantiles. In particular, the mean average deviations (MAD) estimator can be computed as: N tiles. In particular, the MAD estimator can be computed as:

$$\min_{\beta \in R^k} \left(\sum_{i \in \{i: y_i \geq x_i \beta\}} |y_i - x_i \beta| \right) \quad (4)$$

The estimate depicted in regression (4) can be re-specified as equation (5) as seen below:

$$\min_{\beta \in R^k} \left(\frac{\sum_{i \in \{i: y_i \geq x_i \beta\}} \tau |y_i - x_i \beta|}{\sum_{i \in \{i: y_i \geq x_i \beta\}} (1 + \tau)} \right) / |y_i - x_i \beta| \quad (5)$$

Where τ represents the τ^{th} quantile and is specifically set at 0.5 for the MAD estimator. The general intuition of the quantile regression estimates is to use varying values of τ bound between 0 and 1 hence yielding the regression quantiles for varying distributions of GDP growth given the set of explanatory variables contained in the vector X . In our study we opt to use 9 quantiles with intervals of 0.1 between the quantiles i.e., $\tau = \{0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 \text{ and } 0.9\}$.

4. METHODOLOGY

4.1 Empirical Data Description

The study employs quarterly time series data which was extracted from the South African Reserve Bank (SARB) for the period 2002Q1 to 2016Q4. Our dataset consist of household debt to

disposable income of households; GDP per capita, ratio of consumer expenditure to GDP, total consumer prices (CPI), ratio of gross fixed capital formation to GDP, the repo rate and the growth in the house price index for medium-sized houses. Whilst all variables are collected from the SARB online database, the housing price data has been collected from the ABSA housing price index. The summary statistics of the time series variables are summarized in Table 1 whilst the time series plots are presented in Figure 1. The summary statistics reveal a number of interesting stylized observations. For instance, the average of inflation in our sample period is 4.72 which is a figure which lies between the 3 and 6% target as set out by the Reserve Bank. Similarly, GDP growth rates have averaged 2.86%, which is a relatively low figure and noticeably falls below the 6% target growth rate as set by policymakers. It is also interesting to note that interest rates have averaged 7.73% during this period which is well above the rates of most developed countries, however still stable in the South African context.

Table 2 shows the correlation matrix of the time series data. The results illustrate negative household debt and GDP relations which is in line with economic assumptions which declare that an increase in household debt in relation to GDP is a strong predictor of a weakening economy. The results further show a negative household debt and consumption as well as house prices relations which are contrary to theory. Previous studies have suggested a positive relationship between house prices and household debt, however, our results prove otherwise. Further, the positive relation of household debt and inflation as well as the negative relation between debt and interest rates are in line with South African policymakers recommendations as the economy is stabilized by manipulating these variables. Investments are thus expected to be negatively related to debt.

4.2. Empirical Estimates

Having provided the descriptive statistics and the correlation matrix between the time series variables, the quantile regression empirical estimates are conducted. The results of the OLS estimates of the regression are shown in Table 3. As can be observed the GDP variable coefficient produces a negative estimate and is insignificant, theory suggests that rising household debt is a predictor of lower GDP growth thus in line with the results shown. The coefficient on the consumption variable is also negative and insignificant, which seems to be contrary to the LCH theory as Meniago et al. (2013) suggests that consumption is positively related to household debt as the more South African households

Table 1: Descriptive statistics of time series

Descriptive Statistic	HH_YD	GDP	CONS	HP	INF	INT	INV
Mean	73.99	2.86	3.32	2.56	4.72	7.73	5.61
Median	78.70	2.95	2.95	2.15	5.05	7.00	7.00
Maximum	87.80	7.40	10.60	9.68	12.30	13.50	25.50
Minimum	51.70	-6.10	-5.10	-2.02	-11.20	5.00	-25.20
Std. Dev.	10.76	2.63	3.44	2.59	3.61	2.47	9.06
Skewness	-0.94	-0.73	0.01	0.53	-1.38	0.93	-0.77
Kurtosis	2.46	3.87	2.64	3.08	8.47	2.76	4.08
Jarque-Bera	9.57	7.25	0.32	2.92	94.25	8.88	8.85
Probability	0.01	0.02	0.85	0.23	0.00	0.01	0.01

GDP: Gross domestic product

Figure 1: Time series plots of the variables

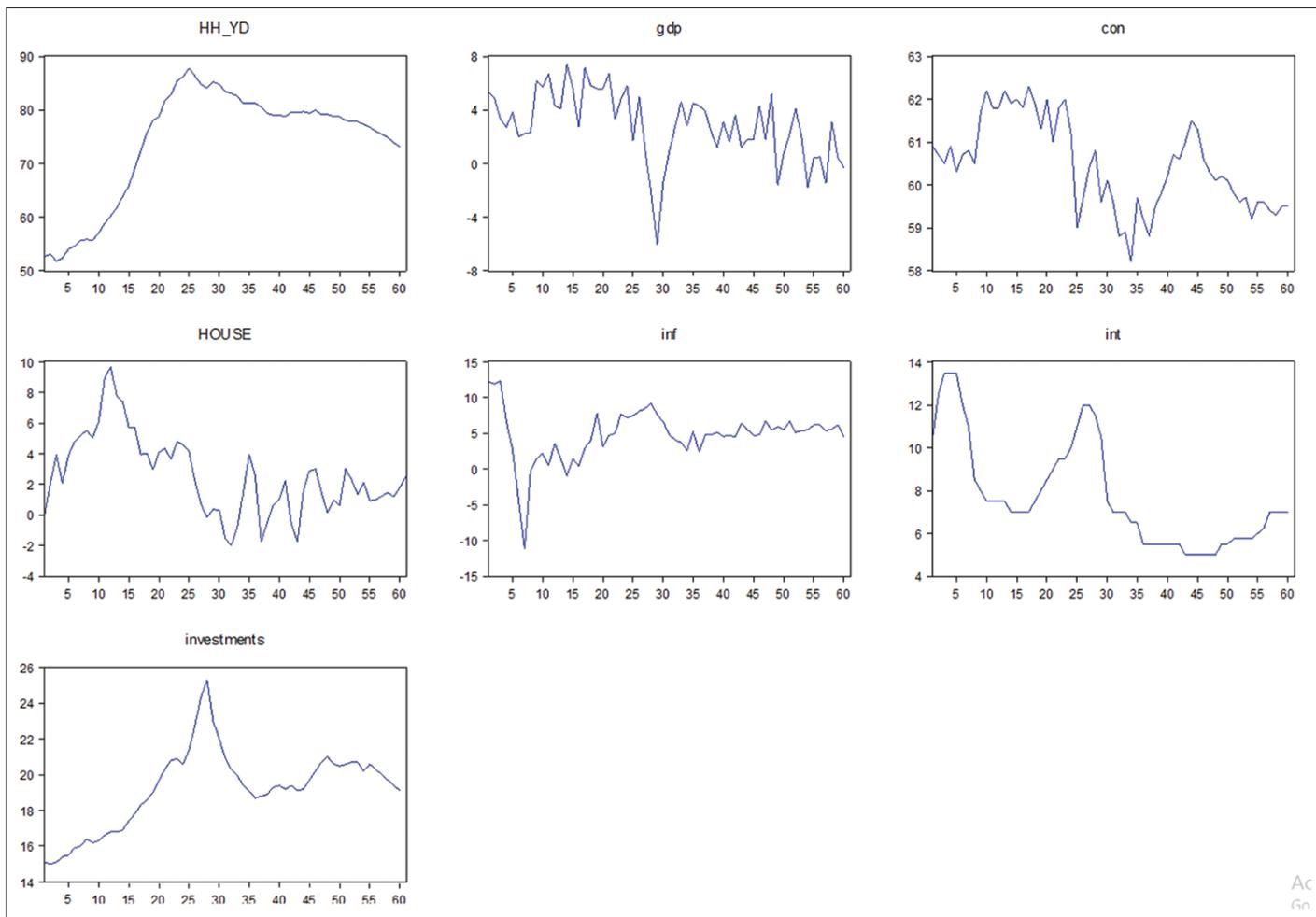


Table 2: Correlation matrix

	HH_YD	GDP	CONS	HP	INF	INT	INV
HH_YD	1						
GDP	-0.3	1					
CONS	-0.28	0.71	1				
HP	-0.51	0.48	0.48	1			
INF	0.31	-0.18	-0.36	-0.44	1		
INT	-0.41	0.05	-0.12	0.22	0.12	1	
INV	-0.27	0.6	0.48	0.49	-0.21	0.26	1

Table 3: OLS regression estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-0.36	0.69	-0.53	0.60
CONS	-0.39	0.59	-0.66	0.51
HP	-1.19	0.58	-2.06	0.04***
INF	0.60	0.57	1.06	0.29
INT	-1.81	1.02	-1.77	0.08***
INV	0.15	0.20	0.76	0.45

***, **, * represent 1%, 5% and 10% significance levels, respectively

rates depict a negative significant relationship. These results are in line with theory as an inverse relationship between inflation and interest rates is assumed. Furthermore, according to Raboloko and Zimunya (2015) an increase in inflation reduces the future value of debt. By adding the inflation premium to real interest rates, the tendency of inflation to stimulate demand for credit is cancelled out by the increase in the nominal interest rates hence the net effect of inflation is not significant. Finally, the study notes an insignificant coefficient on investments. 'The figure of

consume the more they go into debt. Also note that the coefficient on the house prices are negative and prove to be significant in explaining household debt levels. On the other hand, the results illustrate an insignificant yet positive relationship between inflation and household debt as seen by a negative coefficient whilst interest

the household debt partialled on other regressors are shown in Figure 2

However, the OLS estimates have been heavily criticized for constraining the coefficient on the regress and variables to be

Figure 2: Household debt vs other variables (Partialled on regressors)

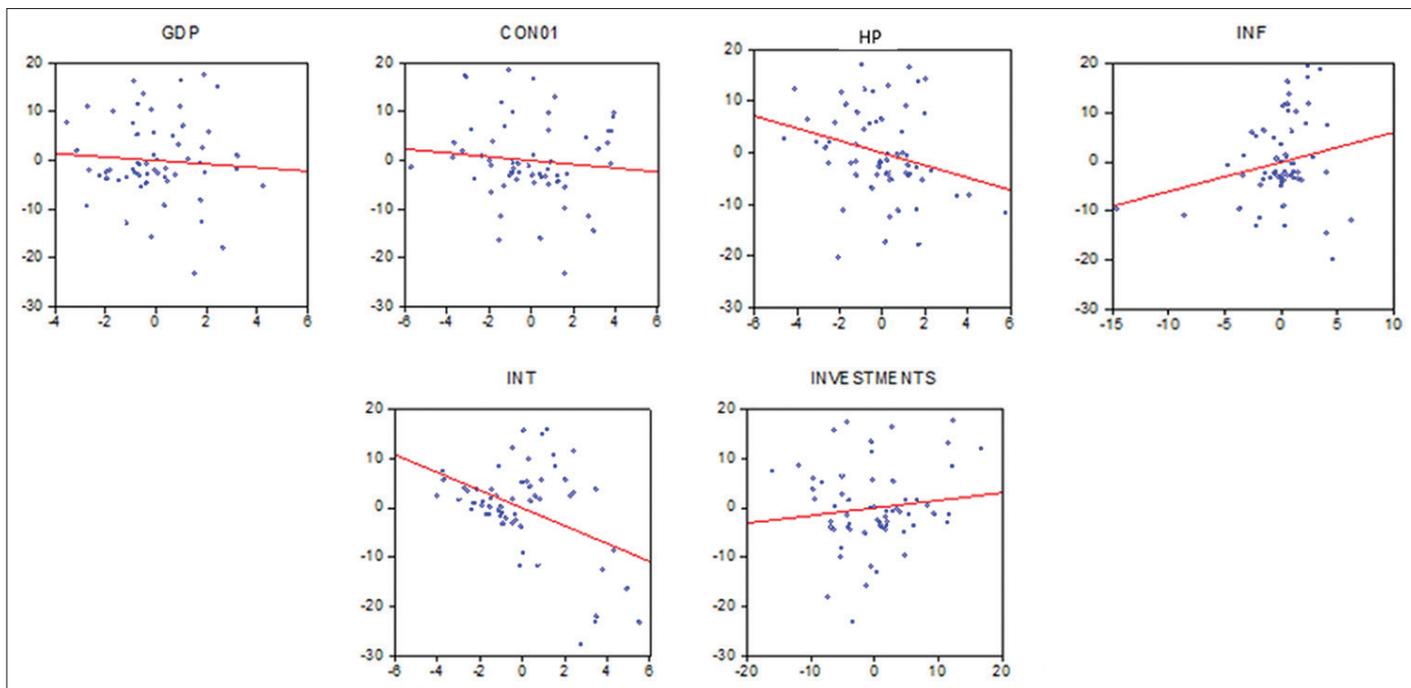


Table 4: Quantile regression estimation results

Quantile	GDP		CON		HP		INF		INT		INV	
	C-E	P	C-E	P	C-E	P	C-E	P	C-E	P	C-E	P
0.1	0.13	0.80	-2.03	0.28	-0.07	0.92	-0.05	0.76	-1.01	0.01**	3.25	0.00***
0.2	0.09	0.87	-1.94	0.40	-0.04	0.96	-0.01	0.98	-0.82	0.05*	3.47	0.00***
0.3	0.61	0.18	0.01	0.99	-1.06	0.01**	-0.09	0.59	-1.29	0.00***	3.35	0.00***
0.4	0.80	0.02**	-0.31	0.83	-0.89	0.03**	-0.08	0.63	-0.91	0.04*	4.12	0.00***
0.5	0.78	0.01**	-0.51	0.69	0.68	0.12	0.01	0.99	-0.90	0.03**	4.06	0.00***
0.6	0.85	0.01**	0.25	0.84	-0.75	0.11	0.01	0.97	-0.64	0.15	4.70	0.00***
0.7	1.13	0.00***	-0.98	0.23	-0.21	0.62	0.04	0.80	-0.84	0.03**	5.09	0.00***
0.8	1.07	0.00***	-0.86	0.24	-0.11	0.81	0.08	0.62	-0.97	0.01**	5.00	0.00***
0.9	1.06	0.00***	-1.07	0.09*	-0.18	0.60	0.07	0.62	-0.87	0.00***	5.44	0.00***

***, **, * represent 1%, 5% and 10% significance levels, respectively. C-E denotes the coefficient estimate. GDP: Gross domestic product

the same across different quantiles. Therefore, the study presents the empirical estimates of the quantile regressions which have been performed for 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th and 90th quantiles with the results been reported in Table 4. The regression estimates indicate that the GDP coefficients for GDP are positive across all quantiles with these positive coefficients increasing in value as one moves from the lower quantiles to higher quantiles and being only statistically significant from the fourth quantile upwards. Note that these quantile estimates are contrary to those obtain in the OLS estimates and are now in alliance with conventional theoretical predictions of a positive relationship between household debt and GDP. Conversely, we note negative coefficients across all quantiles on the consumption variables with all coefficients being statically insignificant with the sole exception of the last quantile which is a 10% significant. This later result is more-or-less similar to that found in the previous OLS estimates.

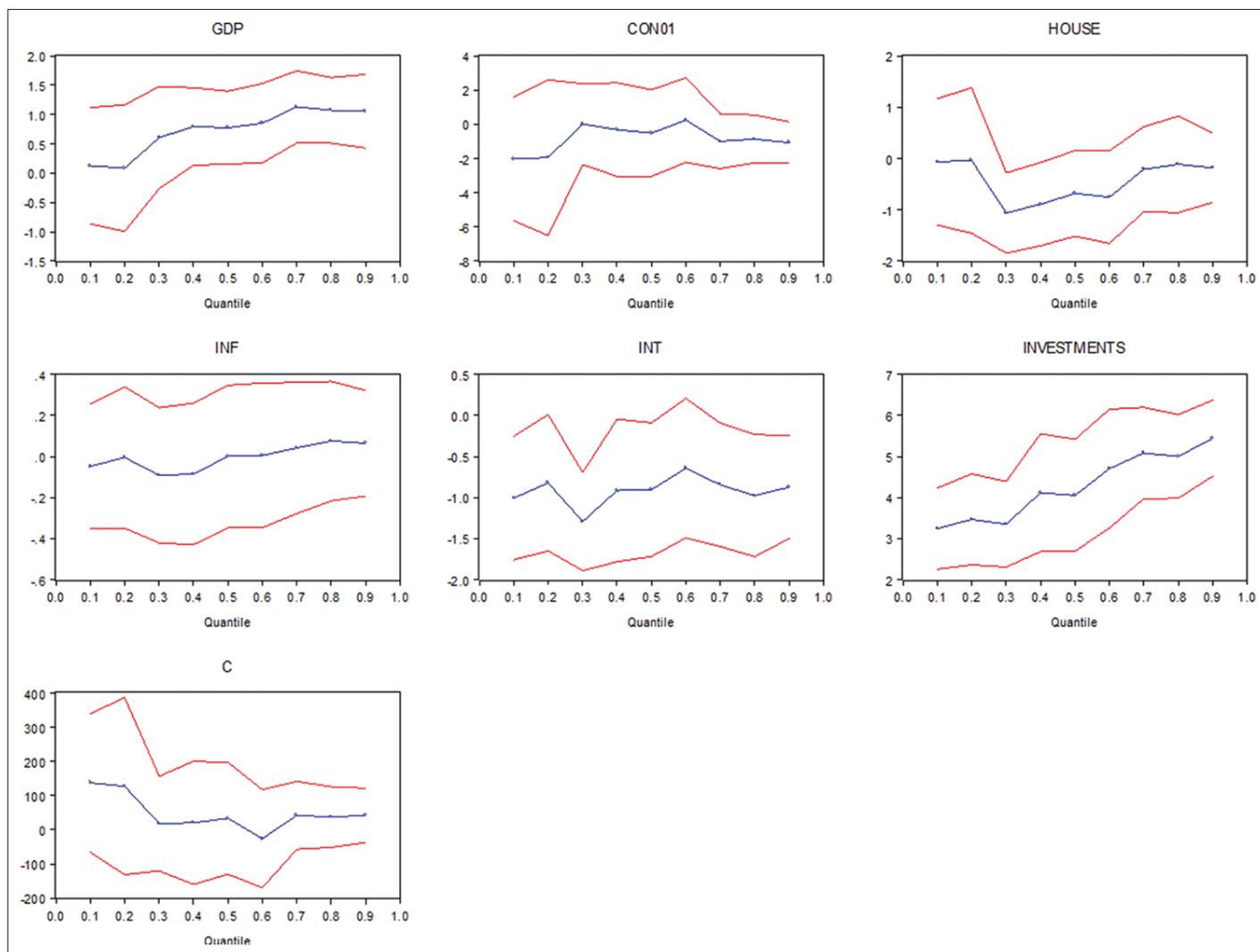
We are also able to find negative coefficients on the housing prices variable across all quantiles albeit only being significant at a 5% critical level in the 30th and 40th quantiles. Concerning, the inflation variable we observe that from the 10th to the 40th quantile,

the coefficients produce negative estimates whereas from the 50th quantile onwards the coefficients turn positive. However, none of the quantile estimates associated with inflation variable is statistically significant. On the other hand, the quantile coefficient estimates of the interest rate variable are negative and statistically significant at all quantile distributions with the negative effect diminishing as one moves up the quantiles. The associated plots of the quantile processes are depicted in Figure 3. Finally, the quantile estimates investments are positive and significant at all critical levels, with the positive value on the coefficients increasing as one moves across from the lower quantiles to the higher quantiles.

5. CONCLUSION

The objective of this study has been to investigate the macroeconomic determinants of household debt in South Africa (i.e. GDP, consumption, interest rates, inflation, housing prices and domestic investments) using interpolated quarterly data spanning between 2002:q1 and 2016:q4. Our mode of empirical investigation is the quantile regression methodology which

Figure 3: Quantile process estimates



presents the advantage of analysing the effects of household debt on different variables across several distribution points. In summarizing our empirical results, we firstly note that consumption and inflation produce insignificant coefficients across all quantiles hence indicating the irrelevance of these macroeconomic variables in influencing debt levels. On the other hand, we observe positive and significant influences of GDP on household debt at moderate to high levels of GDP hence insinuating that households tend to acquire higher debt the better the outlook of the economy. Similarly, housing prices only bear a significant effect at moderate levels or middle quantiles albeit this effect being negative towards household debt implying that moderate growth in housing prices at moderate levels causes household debt to decrease. Lastly, our empirical results also show that interest rates and domestic investment are the only two macroeconomic determinants of household debt which are significantly correlate throughout all quantiles, with increases in interest rates exerting diminishing negatives effects as one moves up the quantiles whereas domestic investment exerts increasing positive effects on household debt as on moves across the quantiles.

In a nutshell, these empirical results bear some useful policy implications. For instance, the observation of a negative effect of interest rates on household debt implies that the implementation of the inflation targeting regime by the SARB which requires manipulation of interest rates in efforts to maintain inflation within its 3 to 6% target range. According to our empirical results, increases interest rates will assist in reducing household debt levels since although it should be cautioned that much higher levels of interest rates have a diminishing negative effect on reducing household debt. In line with this result, we find that GDP growth, at least at moderate to higher levels, moves in the same direction as household debt. Similar sentiments are drawn for the investment variable yet throughout all quantiles of distribution. We find the latter two findings as being plausible since an increase in interest rate, as its working through the monetary transmission mechanism, should, in effect, result in a reduction in both investment and output levels which as previously highlighted should be accompanied by a reduction in household debt. Thus at face value we are able to deduce that local policy authorities are faced with a dilemma of being unable to simultaneously attain high economic growth and low debt levels. In moving forward, the primary focus

of policymakers should be to design programmes in which government will be able to simultaneously accommodate for higher levels of economic growth which are accompanied with lower debt levels.

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