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The determinants of household saving behaviour in Malta

William Gatt[1]

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[1] *The author is a Senior Research Economist at the Modelling & Research Department. Correspondence: gattw@centralbankmalta.org.* *The author would like to thank Dr Aaron G. Grech, Dr Bernard Gauci, Mr Brian Micallef, Dr Aleksander Markowski and Mr John Caruana for useful comments and suggestions on an earlier draft, and Mr Ian Borg, Mr John Farrugia, Ms Tiziana Gauci and Mr Owen Grech for assistance with some data. All errors are my own. The opinions expressed are those of the author and do not necessarily reflect those of the Central Bank of Malta.*

Abstract

This study analyses the determinants of the aggregate household saving rate in Malta; an important macroeconomic variable which in standard short-term analysis is considered as a 'residual'. The aggregate household saving rate, fluctuated significantly over the past thirteen years, rising from 6.4% in 2000 to 10.3% by 2002, falling significantly to 4.1% by 2006, doubling to 8.4% during 2007 and stabilising between 5% and 7% in the years 2008 to 2012. Such sharp swings warrant an investigation to uncover the underlying drivers, and this paper finds evidence that the estimate of the saving rate correlates with a set of macroeconomic variables The results of an estimated equation are in line with the theory and robust to different estimation techniques. One should keep in mind that there are no official statistics on disposable income and therefore this paper uses an in-house estimate of disposable income, which may be subject to measurement errors.

It results that developments in bank deposit rates played a major role in driving the saving rate over the period of interest. In addition it appears that households tended to be somewhat 'Ricardian' by increasing their saving following a deterioration in the government budget deficit, although only around a third of changes in public savings were offset with a corresponding change in household saving. The absence of complete Ricardian equivalence is in line with other studies on the Maltese economy. An element of precautionary saving, a feature at the heart of the literature surveyed, was also observed. Faced with uncertainty, households attempt to keep a buffer stock of wealth proportional to their income as a means of 'saving for a rainy day'. In the context of a falling fertility rate over the past forty years and an ageing population, demographic factors do not seem to have had an influence on saving decisions over the period covered in this study, even though they are bound to have some impact in the coming years through a lower household saving rate, unless corrective actions are taken.

JEL Classification codes: E01, E21, E62
Keywords: Saving rate, precautionary savings, real deposit rate, incomplete Ricardian offset

"Waste and extravagance unsettle a man's mind for every crisis; thrift, which means some form of self-restraint, steadies it."

- Rudyard Kipling

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1. Introduction

The analysis of household aggregate consumption, one of the largest components of GDP[2], aims at understating the factors behind the observed fluctuations. In the Central Bank of Malta's macro-econometric model consumption is a function of disposable income, credit, a measure of uncertainty and wealth (Grech *et al.*, 2013). Aggregate household saving, the other side of the coin of household resource allocation,[3] is analysed indirectly as a residual in the short term, while the cointegrating vector in the error-correction model implies that the relative gap between consumption and income, namely the saving rate, is a negative function of the wealth to income ratio in the long run.[4] In this paper I model the household saving rate explicitly and shed light on other factors which influence saving decisions in Malta. For example, while in the current version of the macro-econometric model there is only an indirect channel from interest rates to consumption (namely through developments in credit markets), in the model analysed in this paper there exists a direct, and important, role for interest rates in household behaviour.

The aggregate household saving rate in Malta fluctuated significantly over the past thirteen years. It rose from 6.4% in 2000 to 10.3% in 2002, fell significantly to 4.1% by 2006, doubled to 8.4% during 2007 and stabilised between 5% and 7% in the years 2008 to 2012. Such wild swings warrant an investigation. It is discussed that developments in bank deposit rates have played a major role in lowering the saving rate, although the increase in supply of and demand for credit may have also played a role, although this effect is not estimated with precision. In addition it appears that households tended to be somewhat 'Ricardian' by responding to changes in the government deficit, although only around a third of changes in public savings were offset with a corresponding change in household saving. The absence of complete Ricardian equivalence is in line with other studies on the Maltese economy (Grech, 2000). An element of precautionary saving, a feature at the heart of the literature surveyed, was also present. Households tended to adjust their saving so as to keep a buffer of financial resources as insurance against future shocks to income.

[2] The so-called great ratio of consumption to GDP averaged 64.3% between 2000 and 2012 in real terms, as per the National Statistics Office's News Release number 237/2013.

[3] The subject of resource allocation and sustainability is central to the study of economic systems. A popular measure which is used a lot by economists and the financial industry is a country's current account position. This indicator *"reflects the investment and saving patterns of the different sectors of the economy, including the fiscal policy adopted by the government. In turn, investment and saving decisions reflect an economy's output and consumption performance over time."* (Grech, 2000; p.51). This paper focuses on one element of this identity, household saving, to empirically assess what factors led to the observed dynamics in the household saving rate over the period 2000 to 2012.

[4] The estimated restricted cointegrating vector, excluding the constant, implies that the long run consumption function takes the following Cobb-Douglas functional form:

$$C = Y^{0.85} W^{0.15}$$

where C is consumption, Y is disposable income and W is net wealth. It is shown in Appendix 1 that in the long run the saving rate s is implied to be a negative function of the wealth-income ratio:

$$s = 1 - \left(\frac{W}{Y}\right)^{0.15}$$

The rest of the paper is structured as follows. Section 2 surveys some of the related literature on the determinants of household saving, section 3 discusses the data that was used in this study, while section 4 discusses the method that was used and presents the results. Section 5 concludes.

2. Theoretical determinants and empirical studies

The literature on household consumption and saving behaviour is vast. John Maynard Keynes had proposed a simple consumption function which implied that households save a constant proportion of income. In the relatively long strand of literature on saving behaviour drivers of saving are typically grouped into three motives: retirement planning, a bequest motive and a precautionary motive (Sturm, 1983). Retirement and precautionary motives are linked to Modigliani's Life Cycle Hypothesis[5] and risk considerations respectively.

Following the pioneering work of Lucas (1976) which led to the Rational Expectations revolution, economists abandoned this simplistic view, focusing instead on the importance of managing expectations of future developments, such that households save primarily with the scope of smoothing consumption over a lifetime. Such a rethink led to so-called 'Ricardian' behaviour. Later on studies showed that, while the theory was elegant, this model failed to represent observed behaviour.[6] However government expenditure can also have the opposite influence on the economy; welfare programs can be perceived as safety nets, which may cause households to relax their precautionary behaviour. In an effort to bring the models closer to the data, Dynamic Stochastic General Equilibrium (DSGE) models nowadays incorporate both Ricardian and credit-constrained households, adding more interesting dynamics to story-telling on household consumption and saving behaviour[7].

To this effect variables which are expected to have a bearing on saving decisions are listed below, together with the expected relationship to the saving rate (Sturm, 1983; Callen and Thimann, 1997; Masson *et al.*, 1998):

- Economic growth (+): growth has a positive effect on saving, even when the latter is negative.[8]
- Consumer credit (-): improved access to credit, such as through financial liberalisation, results in a lower saving rate, as the need to finance transactions from disposable income diminishes.[9]

[5] Modigliani (1970).

[6] One reason is that households typically do not form expectations similarly to what such a model would imply (so-called 'model-consistent expectations'; see De Grauwe (2008)). A somewhat related example is the seemingly relevant role of government spending in boosting aggregate demand (Christiano *et al.*, 2011).

[7] One of the first attempts was made by Galí *et al.* (2007). An interesting application of this concept can be found in Stähler and Thomas (2011).

[8] In a growing economy, net savings are required to be positive so as to keep a constant capital-to-income ratio.

[9] Improved access to credit can be measured by an increase in the stock of capital.

- Interest rates (+/-): the effect of interest rates on saving can be either positive or negative, depending on the relative strength of the income and substitution effects. Higher interest rates encourage more savings, but households which are net borrowers might experience a fall in income from higher interest payments, reducing the proportion of income that is saved.
- Income uncertainty (+): an increase in uncertainty over future income streams is expected to induce households to save more to insure themselves against such a risk.
- Public savings (-): an increase in deficits, and hence government debt, should cause households to anticipate higher taxes in the near future to repay such debt, causing an increase in saving.[10]
- Old dependency ratio (-): a relatively 'old' population is expected to save less compared to a population with a higher proportion of working-age households, as expenditure tends to be higher than income.[11]
- Life expectancy (+): the longer a household expects to live, the more it must save to finance consumption after retirement.
- Retirement age (-): a higher retirement age causes a fall in the saving ratio, as, ceteris paribus, the amount of resources need to finance consumption after retirement falls.

In a study of household saving rates in G7 countries, Hüfner and Koske (2010) show that wealth, government debt, the old-age dependency ratio, inflation rates, long-run interest rates and real disposable income all played a role in explain saving dynamics in most of the G7 countries.

Mody *et al.* (2012) construct a model in which the representative household faces a stochastic income stream as well as a stochastic rate of return on saving. The mechanism generating the variable income stream is associated with the risk of the household becoming unemployed with some constant probability. Similarly the varying rate of return on saving is meant to capture investment risks. It results that the optimal solution for this scenario is that household should aim for a specific wealth to income ratio, such that they build a buffer of resources which serve as insurance against fluctuations in the two sources of income described above. The authors show that unemployment and saving are positively related, such that when unemployment rises, households reduce consumption to accumulate precautionary savings. On the other hand they argue that the effect of an increase in investment risk is ambiguous as, depending on the calibration of the model, both the income effect and the substitution effect can dominate. Nevertheless it is argued that the impact of investment risk on the saving rate is small.

[10] As discussed above, assuming that households are rational and forward-looking, these realise that public debt has to eventually be paid at some point in time in the future, through an increase in taxation or reduced expenditure, causing households to adjust their consumption immediately. In an extreme case, an increase in government expenditure, financed entirely through the issuing of bonds, will have no impact in boosting aggregate demand, as households put aside the same the same amount of resources in anticipation of the future liability. In practice it is hard to observe this full effect, while some studies find no evidence of such behaviour; see Masson *et al.* (1998) for a brief survey of the literature.

[11] The relationship may break down in countries with ample old-age pensions. In Sweden, for example, pensioners were shown to have a higher propensity to save than younger households (Markowski and Palmer, 1979). A similar consideration may influence the effect of life expectancy on the saving rate, which is the subject of the next bullet point.

To test this model empirically the authors estimate the equation below using annual panel data for 27 advanced economies for the period starting in the late 1980 running up to 2010, using both fixed and random effects models:

$$s_t = \alpha_0 + \alpha_1 UR_t + \alpha_2 E_t\{\Delta \ln DI_{t+1}\} + \alpha_3 r_t + \alpha_4 V_t + \alpha_5 SM_t + \alpha_6 W_{t-1} + \varepsilon_t \quad [1]$$

where s is the saving rate, UR is the unemployment rate, $E\{\Delta \ln DI\}$ is the (expected) log change in household real disposable income, r is the real deposit interest rate, V and SM are the volatility of GDP and the stock market respectively, and W is the ratio of household wealth to disposable income.

In the various specifications that were tested the estimated coefficients had the right sign and were statistically significant. An increase in the unemployment rate, the deposit rate and income uncertainty all motivate an increase in savings, while an expected increase in disposable income one year into the future causes savings to fall. Consistent with the behaviour predicted by the theoretical model, investment risk is not a statistically significant determinant of savings, while a fall in the wealth-income ratio is estimated to increase savings. The authors further augment their regression with other variables which theory predicts should affect savings behaviour. The government structural budget balance, the dependency ratio and credit growth are added to capture the effects of Ricardian Equivalence, the Life-Cycle Hypothesis and credit tightness respectively. In line with these theories, saving across the countries sampled is found to be negatively related to all three of these variables.

A similar study was conducted by Carroll *et al.* (2012), who use the model derived in Carroll and Toche (2009) to match theoretical predictions of saving behaviour with US data. The model posits saving to be a negative function of wealth, a negative function of credit availability and a positive function of unemployment risk. A negative shock to wealth leads to a fall in consumption, which triggers a rise in saving. Similarly credit availability reduces the reliance of consumption on a buffer stock of resources, while an increase in unemployment risk lowers the potential for future income, and thus sustainable consumption levels, increasing saving. Using data for 1966Q2 to 2011Q1, this regression was estimated using OLS. The coefficients on wealth, credit conditions and unemployment risk were all statistically significant, and could explain 90% of the variation in the US saving rate. Other variables, such as government saving, tax rates and expected real interest rate, were then added to the baseline specification. The results on the key determinants were unchanged from the baseline specification, and some of these supplementary variables, such as interest rates, had a small but statistically significant impact on savings. Endogeneity bias concerns were addressed through the use of the Instrumental Variable estimator, which produced similar results.

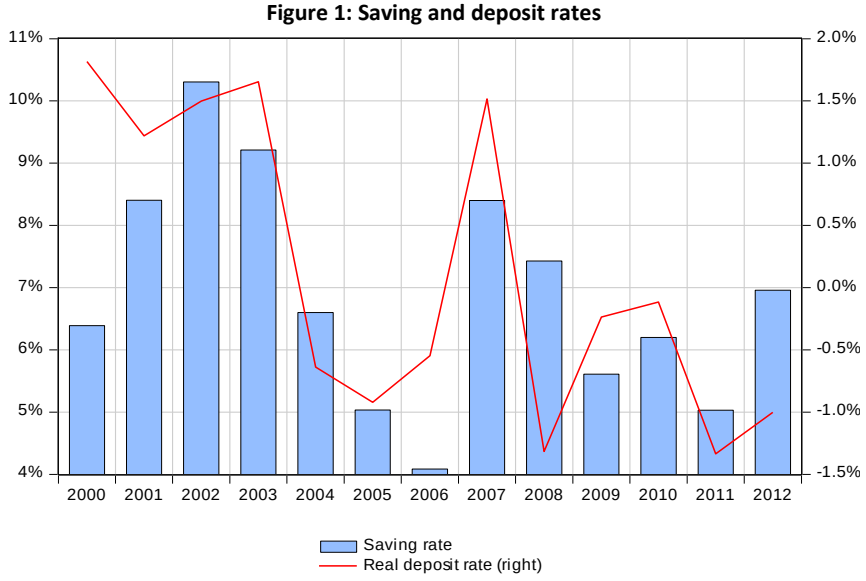
3. Data

While data on consumption is readily available, official national data for disposable income spanning the whole sample period used in this study is not. For this purpose the calculations for disposable income as detailed in Grech (2014) were used. It should be noted that since no official statistics on disposable income are available, the saving rate is based on an in-house estimate of disposable income, and therefore the saving rate may be subject to measurement errors. In fact, analysis of the saving rate, such as the one presented in this paper, offers the opportunity to also assess indirectly the accuracy of the Central Bank's estimate of disposable income.

The quarterly saving rate was estimated after quarterly data for consumption and disposable income were seasonally adjusted using the Census X12 algorithm.

Turning to the determinants, the number of variables listed in section 2 which could theoretically have an impact on saving behaviour is large. This study focuses on a few variables which should cover the main categories of variables. Interest rate data on deposits was obtained from the Central Bank of Malta's MIR database, and is the same as used in Micallef and Gauci (2014). A measure of the real deposit rate was obtained by subtracting year-on-year growth in the Retail Price Index (RPI) from the (nominal) deposit rate. The saving rate and the real deposit rate seem to be strongly correlated, as can be seen in Figure 1. When the real deposit rate fell steeply and into negative territory between 2004 and 2006, household savings also plummeted. The recovery of the real deposit rate, although short-lived, managed to push up the saving rate in 2007 and 2008, although the latter fell again in the following years. Hence in the regressions presented in the following section it is expected that the real deposit rate has high explanatory power.

Figure 1: Saving and deposit rates

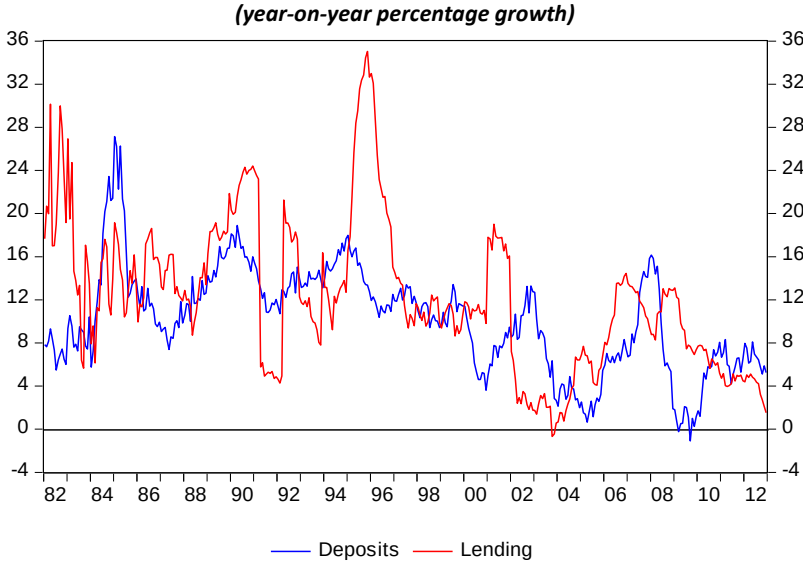


Source: CBM estimates, author's calculations

Data on the stock of wealth was obtained using the same methodology as highlighted in Grech *et al.* (2013), while government budget data and the unemployment rate where obtained from the General Government Statistics and Labour Force Survey respectively, both from the National Statistics Office. Credit growth, which

is the year-on-year growth in consumer credit and other credit, is data from the Central Bank of Malta.[12] It is worth noting that in Malta the boom in credit occurred during the late 1980's and throughout the 1990's, as illustrated in Figure 2. It was also during this period that bank deposits also grew at double digit rates every year, illustrating the tendency of Maltese households to hold a substantial share of their savings in banks. [13,14] This also highlights the strong prior expectation that is placed on the bank deposit rate as an important determinant of saving rate fluctuations.

Figure 2: Bank balance sheet developments (1982-2012)[15]
(year-on-year percentage growth)



Source: Central Bank of Malta

Population data as at January of each year was obtained from Eurostat and was used to calculate the old and young dependency ratios. The ratios are defined as the population over the age of 64 and under the age of 15, respectively, over the working age population (people aged 15-64). Ratios were calculated in annual terms and were then interpolated into quarterly observations using the quadratic match average algorithm in Eviews 8. Figure 3 shows the estimated old and young dependency ratios respectively. While the percentage of young people relative to the working age population is falling, that for old people is increasing. Figure 4 shows the fall in the fertility rate in Malta over the past fifty years, which is a key cause of an ageing population.

[12] The series was spliced using historical growth rates from similar classifications up to 2003 to obtain a consistent series for the full sample.

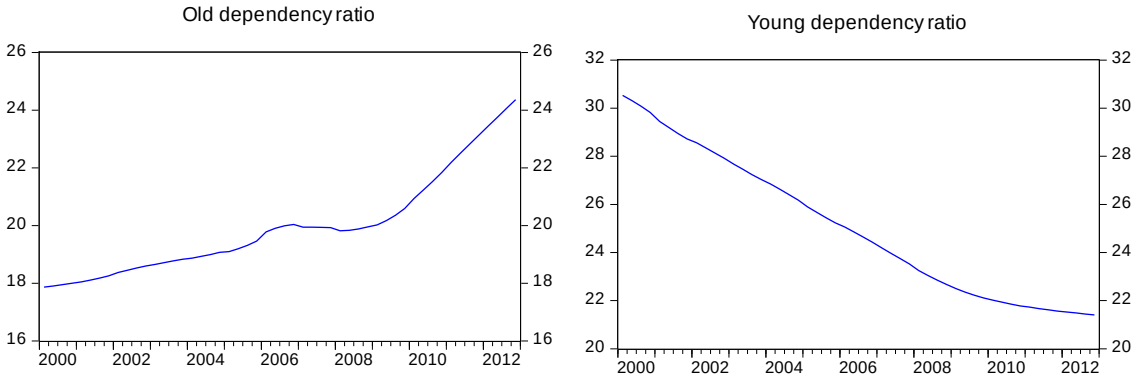
[13] On the basis of this data the average deposits to loans ratio between 1980 and 1990 stood at 1.84:1.

[14] The results of the latest Household Finance and Consumption Survey show that over half of all financial wealth in 2010 was held in interest and non-interest bearing deposits (Caruana and Pace, 2013).

[15] Aggregated Balance Sheet of Deposit Money Banks; Lending is Local Lending and Bills Discounted, Deposits are Total Deposits. The series were extended post September 2003with figures from the Aggregate Balance Sheet of Other Monetary Financial Institutions Based on Statistical Principles, using Claims on Residents of Malta – Loans and Deposits from Residents of Malta – Total, respectively.

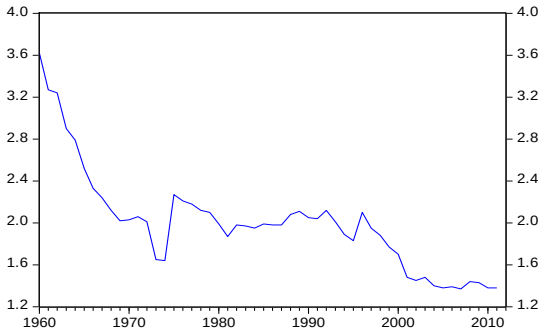
The variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) test, which has a null hypothesis of the presence of a unit root in the variable.[16] Table A in Appendix 2 shows the results for all variables used in this study, using models with a constant and with a constant and a trend. It results that only the saving rate, the real deposit rate, the unemployment rate and credit growth were either stationary or trend stationary during the period of interest. This might be an issue related to the very short sample at hand; it is inconceivable to have variables such as the government budget balance and the wealth-income ratio trending off over a very long period. Hence the non-rejection of the null hypothesis was considered a consequence of the low power of the ADF test given the short time span, and the variables were treated as if they were stationary.

Figure 1: Dependency ratios (% of working age population)



Source: Eurostat, author's calculations

Figure 4: Fertility rate in Malta



Source: World Development Indicators 2013 – World Bank

A correlation matrix, shown in Table B in Appendix 2, reveals some pair-wise correlation between some of the variables. Most notably, the wealth-income ratio correlated strongly with the government balance ratio and the real deposit rate. This is also the case for; *inter alia*, the government balance ratio and credit growth, and the old dependency ratio and government debt ratio. In general medium to high correlation between the regressors can lead to poorly identified parameters. This matter is addressed in the next section.

[16] The lag length of the autoregressive component for each variable was chosen using the Schwarz information criterion.

4. Methodology and results

As discussed above, the determinants to be tested can be split into 4 main categories as follows:

1. Financial (deposit rate, credit growth)
2. Precautionary motives (wealth-income ratio, unemployment rate)
3. Demographics (old dependency ratio)
4. Government intervention (budget balance, debt ratio)

Given the substantial collinearity between some variables, the model that was estimated was kept as parsimonious as possible such that the variables serve as proxies for the underlying driver of saving behaviour.[17] In this regard only one of the variables in each category was used at first, but others were subsequently added to other specifications in order to test for their marginal impact on the saving rate.

The specification that was used to test for the long run determinants of the saving rate is:

$$s_t = c + \beta_r r_t + \beta_{FWIR} FWIR_t + \beta_{ODR} ODR_t + \beta_{GB} GB_t + \beta_{CG} CG_t + \varepsilon_t \qquad [2]$$

where s is the saving rate, r is the real deposit rate, $FWIR$ is the financial wealth-to-income ratio[18], ODR is the old dependency ratio, GB is the government budget balance as a percentage of GDP in terms of a 4-quarter moving average and CG is year-on-year growth in credit to households excluding mortgages.[19] The model was first estimated using Ordinary Least Squares (OLS), however since some of the explanatory variables could be endogenous, these coefficient estimates are prone to endogeneity bias. To correct for such bias the equation was then estimated using the Instrumental Variable estimator through the Two-Stage Least Squares (TSLS) procedure, whereby the first to the fourth lag of each dependent variable was included in the instrument set. This methodology follows standard practice in the literature. Given that the specification [2] can also be thought of as a long run relation to some extent, cointegration methods were also used to estimate the parameters (see Hufner and Koske, 2010). For this purpose the Canonical Cointegrating Regression (CCR) (Park, 1992) and the Fully Modified Ordinary Least Squares (FMOLS) (Phillips and Hansen, 1990) methods were used.[20] In this context,

[17] Multicollinearity is mainly a small sample problem, such that by increasing the sample size over a longer span the partial effect of a determinant on the dependent variable is better identified. Unfortunately most of the data is only available as a consistent series starting from the year 2000.

[18] This was used instead of the net wealth to income ratio as the latter correlated somewhat strongly with the deposit rate and the budget balance ratio, while the financial wealth to income variable correlated much less with these. The results however are qualitatively similar.

[19] The estimation period 2001-2012 covers two exchange rate regimes. This might imply that the relationship between *s* and *r* and possibly between *s* and *GB* can have changed within the sample. However, while it is true that Malta joined ERM2 in 2004, it joined at a fixed peg to the Euro. In fact, before 2004 Malta operated a peg in which the weight of the Euro was high.

[20] Although OLS estimates of a cointegrating vector are said to be super-consistent (Hamilton, 1994), they also "have an asymptotic distribution that is generally non-Gaussian, exhibit asymptotic bias, asymmetry, and are a function of non-scalar

one should note that earlier in the paper, all the variables were assessed as being stationary. Broadly speaking, the strategy led to a battery of estimators that serve as a robustness check across methods and for different versions of specification [2]. The estimates for the preferred specification, which drops the old-age dependency ratio due to a consistently incorrect coefficient sign, are given in Table 1 below.[21] It can be seen that the estimated parameters across columns 1 to 4 have the correct sign, and are consistent across different estimation methods. In particular the extent of endogeneity bias in the OLS estimates appears to be small except for the parameter on the real deposit rate, as the corresponding TSLS estimates are similar in magnitude. The estimates derived using the cointegration estimators are also very similar in magnitude. On the basis of the *t*-test, all parameters except for those for credit growth appear to be statistically significant at conventional levels of significance.

Table 1: Estimation results

Sample period	2001Q1 2012Q4	2002Q1 2012Q4	2001Q2 2012Q4	2001Q2 2012Q4	2001Q2 2012Q4	2002Q1 2012Q4
Method†	**OLS**	**TSLS**	**CCR**	**FMOLS**	**NLS**	**TSNLS**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Real Deposit Rate	0.83 [3.82]	1.14 [3.93]	0.97 [4.37]	0.97 [4.14]	0.71 [2.63]	1.26 [3.07]
F. Wealth-Income Ratio	-1.62 [-3.00]	-1.72 [-2.70]	-1.63 [-2.85]	-1.64 [-2.92]	-1.66 [-2.43]	-1.89 [-2.16]
Budget Balance	-0.32 [-1.95]	-0.36 [-1.88]	-0.34 [-2.00]	-0.34 [-1.95]	-0.33 [-1.55]	-0.40 [-1.49]
Credit Growth	-0.02 [-0.46]	-0.07 [-1.32]	-0.04 [-0.93]	-0.04 [-0.87]	-0.02 [-0.40]	-0.10 [-1.27]
C	22.58 [3.79]	23.92 [3.38]	22.73 [3.60]	22.86 [3.68]	22.99 [3.04]	25.82 [2.64]
AR1 (error)					0.27 [1.79]	0.27 [1.60]
Adjusted R^2	**0.427**	**0.351**			**0.439**	**0.340**
F-statistic p-value	**0.000**	**0.000**			**0.000**	
Durbin Watson Statistic	**1.462**	**1.472**	**1.483**	**1.482**	**1.920**	**1.917**
J-stat p.value		**0.337**				**0.507**

†Estimation method: OLS - Ordinary Least Squares; TSLS - Two-Stage Least Squares; CCR - Canonical Cointegrating Regression; FMOLS - Fully Modified Ordinary Least Squares; NLS – Non-Linear Least Squares; TSNLS – Two-Stage Non-Linear Least Squares

Notes:
1. *t*-statistics are reported in square brackets
2. The *J*-statistic is the test for over-identifying restrictions

nuisance parameters*"* (Eviews 8 User Guide II, 2013, p.232), which creates problems for statistical inference. The CCR and FMOLS estimators attempt to correct this.

[21] Appendix 2 displays three different specifications of equation [2], each estimated using the four estimators listed above. In general the results are unaltered, although it seems that the old-age dependency ratio was influencing the estimate of the parameter on the financial wealth-income ratio.

The results point towards a significant role for the deposit rate in influencing saving, whereby a 1 percentage point increase in the real deposit rate increased the saving rate by between 0.8 and 1.1 percentage points. These estimates are highly statistically significant and a Wald test failed to reject the null hypothesis that this parameter is different than unity across all estimators. These figures are close to those reported by Callen and Thimann (1997) and Mody *et al.* (2012) using panel data. The fall in the real deposit rate over time can be said to be a key contributor to the downward trend in the saving rate over the period of interest.[22]

Fluctuations in the saving rate can also be linked to precautionary motives; the parameter on the financial wealth-income ratio is statistically significant and negative, as posited by theory. This study also finds some evidence of an influence of government behaviour on households, as the saving rate responded positively to a deterioration in the government budget balance. It is estimated that an increase in the budget deficit of 1 percentage point led to an increase in the saving rate of about 0.3 percentage points. Although this response is somewhat weak, it nevertheless hints at an element of Ricardian households in the Maltese economy. This finding is similar to behaviour observed in a number of OECD countries in the 1990s, in which there was "a departure from complete Ricardian equivalence" (de Serres and Pelgrin, 2003).[23,24]

The low Durbin-Watson statistic in the equation estimates reported above might be indicative of positive serial correlation in the error term, which could impact the coefficient estimates.[25] For this purpose both the OLS and TSLS equations were estimated in a model in which the error term follows a first-order autoregressive process and the results are shown in columns 5 and 6. The effect on the parameter estimates is marginal and the main results on the real deposit rate and the wealth-income ratio are unchanged, while the parameter on the budget balance is estimated with less precision in both cases.[26]

[22] In some studies the tested equation is specified in an error-correction form. An error correction model (ECM) estimates the short-run impact along with the degree of adjustment to the long run. The aim of this paper is different. It estimates the long-run relationship between the saving rate and its determinants. In addition, an ECM requires numerous degrees of freedom, which are not available in this case. Despite this, results of an estimation of an ECM by the author found that the conclusions about long-run behaviour reached in this paper are essentially unchanged.

[23] A Wald test confirms that this estimate is indeed statistically different from -1.

[24] In that study 'complete Ricardian equivalence' was said to relate to a coefficient of unity on the government saving, implying a complete offset of government policy.

[25] The DW-statistic falls in the indeterminate region. The Q-statistic test (not shown) was significantly different from 0 at various lags of the error, indicating the presence of serial correlation.

[26] The estimated parameter remains statistically different from 0 on the basis of a one-sided *t*-test at the 10% level of significance.

5. Conclusions

This paper has focused on identifying the determinants of household saving behaviour in Malta during the period 2000-2012. A review of the literature identified several variables which could have an impact on the saving rate, and these can be categorised into four main factors: financial, precautionary, fiscal and demographic. Using a new estimate of the saving rate, a model was estimated using various estimators, which returned consistent estimates. The empirical results imply that financial, precautionary and fiscal determinants all played a role in affecting the saving rate since the start of the new millennium, which is line with economists' prior judgement in the absence of solid econometric estimates.

A key determinant of saving behaviour was the real deposit rate. Both the saving rate and the real deposit rate follow a downward trend over the 13 years analysed in this study. Inflation, measured by the year-on-year increase in the RPI, was by and large stable and averaged about 2.4%. The drop in the real deposit rate thus mirrors a steady drop in the nominal deposit rate, which fell from 4.3% in 2000Q1 to around 1.4% by 2012Q4. To a certain extent higher lending and deposit rates in Malta in the early part of the sample were direct consequences of the premium embedded in the Central Bank of Malta's Central Intervention Rate over the European Central Bank's main policy rate prior to the adoption of the euro (Micallef and Gauci, 2014). However the drop in the real deposit rate also reflects the general trend in the ECB's monetary policy rates, especially in the wake of the financial crisis in 2008. In this respect the monetary policy stance in the euro area had an influence on the household saving rate in Malta.

The saving rate was also affected by a precautionary motive. Households attempted to build and maintain a buffer of financial resources in the order of a multiple of their income, which served as a type of insurance against possible future shocks to income, in line with the predictions of the model derived in Mody *et al.* (2012). The estimated response on the financial wealth-income ratio is far higher in absolute terms than that for the total wealth-income ratio estimated in Grech *et al.* (2013), which is to be expected as the stock of financial assets is smaller than the total stock of wealth and also because the stock of financial resources may on average be more liquid.

Government intervention also appears to have played a role in influencing household behaviour, as households attempted to offset part of the drop in public saving through an increase in private saving. The effect however was small; only around a third of the increase in the budget deficit was offset through an increase in household saving. The results in Grech (2000), who uses just under thirty years of data starting from 1970, do not provide evidence of Ricardian equivalence in the Maltese economy. This result was attributed to liquidity constraints faced by households during that period. In this study, which covers the period after that in Grech (2000), it is found that there is a partial impact. While it is not believed that the majority of households suffered from liquidity constraints in the sample used in this study, it can be argued that the persistent government budget deficits appear not to have been a major concern for households, possibly, as described in Grech (2000): *"in view of the widespread tax evasion and a common perception that government can run deficits for a long*

time".[27] It appears that this hypothesis is still plausible, despite the major restructuring of the economy and the change in economic environment, namely Malta becoming a fully-fledged member of the European Union and the adoption of the euro.

Credit developments did not seem to have any major influence in saving decisions in the period analysed. As discussed above, this could be due to the fact that the boom in credit in Malta occurred in the late 1980's and during the 1990's. It was probably during this time that credit had some impact on saving considerations by households.

Demographic factors do not seem to have played a role in affecting the saving rate over the sample. This is probably due to the short sample that is used in this study. However these are bound to have an impact in the coming years. In the context of a forty year-long fall in the fertility rate and an ageing population, the saving rate can only be expected to fall further unless corrective measures are devised and implemented.

[27] Recent estimates show that the size of the underground economy did not change much over the course of 10 years, from 26.7% of official GDP in 2003 to 25.3% by 2012; while the EU-27 average fell from 22.3% to 18.3% during the same period (Schneider, 2011).

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Appendix 1: The long run consumption and saving functions of the Central Bank of Malta's macro-econometric model

The estimated cointegrating vector in Grech et al. (2013) implies that, excluding the constant, consumption is a Cobb-Douglas function of real disposable income Y and net wealth W:

$$C = Y^{0.85} W^{0.15} \quad [A1]$$

Multiplying (A1) throughout by the inverse of Y:

$$\frac{C}{Y} = \frac{Y^{0.85} W^{0.15}}{Y} \quad [A2]$$

Simplifying, we get:

$$\frac{C}{Y} = \left(\frac{W}{Y}\right)^{0.15} \quad [A3]$$

Multiplying both sides by -1 and adding 1 to each side we get:

$$1 - \frac{C}{Y} = 1 - \left(\frac{W}{Y}\right)^{0.15} \quad [A4]$$

Expressing $\left[1 - \frac{C}{Y}\right]$ as the saving rate s, we get:

$$s = 1 - \left(\frac{W}{Y}\right)^{0.15} \quad [A5]$$

which implies a negative relationship between the wealth-to-income ratio and the saving rate.

Appendix 2: Other tables

Table A: ADF Test statistic

	Constant		Constant & trend	
Saving rate	-4.174	***	-4.325	***
Deposit rate	-2.249		-4.335	***
Unemployment rate	-3.484	**	-3.813	**
Wealth-Income ratio	-1.853		-1.325	
Financial Wealth-Income ratio	-2.342		-2.387	
Budget Balance % of GDP	-2.421		-2.933	
Old Dependency ratio	1.286		-0.513	
Government debt % of GDP	-1.852		-1.786	
Credit growth	-3.763	***	-4.622	***

Notes:

1. Null Hypothesis: variable has a unit root
2. *, **, *** indicate a level of significance of 10%, 5% and 1% respectively, using MacKinnon (1996) one-sided p-values.

Table B: Correlation Matrix

	S.Rate	D.Rate	U.Rate	WIR	FWIR	BB	ODR	GD	CG
S.Rate	1								
D.Rate	0.50	1							
U.Rate	0.05	0.26	1						
WIR	-0.60	-0.45	-0.32	1					
FWIR	-0.39	0.08	0.26	0.41	1				
BB	-0.47	-0.29	-0.44	0.67	0.30	1			
ODR	-0.33	-0.46	-0.44	0.44	-0.08	0.55	1		
GD	-0.46	-0.51	-0.02	0.56	0.22	0.20	0.67	1	
CG	0.28	0.34	0.20	-0.42	-0.28	-0.31	-0.60	-0.67	1

Notes:

1. S.rate - Saving rate; D.rate - Real deposit rate, U.rate - Unemployment rate, WIR - Wealth-Income Ratio, FWIR - Financial Wealth-Income Ratio, BB - Budget Balance (% of GDP), ODR - Old Dependency Ratio, GD - Government Debt (% of GDP), CG - Credit Growth
2. Sample: 2001Q1 – 2012Q4

Table C – Other specifications

Sample period	2001Q1 2012Q4	2001Q4 2012Q4	2001Q1 2012Q4	2001Q1 2012Q4	2001Q1 2012Q4	2001Q4 2012Q4	2001Q1 2012Q4	2001Q4 2012Q4	2001Q1 2012Q4	2001Q1 2012Q4	2001Q1 2012Q4	2001Q4 2012Q4	2001Q1 2012Q4	2002Q1 2012Q4	2001Q2 2012Q4	2001Q2 2012Q4	2001Q2 2012Q4	2002Q1 2012Q4
Method†	**OLS**	**TSLS**	**CCR**	**FMOLS**	**OLS**	**TSLS**	**OLS**	**TSLS**	**CCR**	**FMOLS**	**OLS**	**TSLS**	**OLS**	**TSLS**	**CCR**	**FMOLS**	**OLS**	**TSLS**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**
Deposit Rate	0.78	0.91	0.93	0.96	0.78	0.93	0.78	0.89	0.79	0.80	0.79	0.89	0.83	1.06	0.99	0.97	0.72	1.07
	[3.56]	[3.53]	[3.90]	[3.75]	[3.05]	[2.87]	[3.58]	[3.41]	[7.98]	[8.88]	[3.07]	[2.87]	[3.82]	[3.45]	[4.56]	[4.28]	[2.65]	[3.26]
F. Wealth-Income Ratio	-1.58	-1.77	-1.63	-1.65	-1.67	-1.95	-1.36	-1.30	-1.33	-1.33	-1.58	-1.68	-1.38	-0.27	-0.97	-1.05	-1.59	-0.29
	[-2.93]	[-2.70]	[-2.98]	[-2.62]	[-2.62]	[-2.20]	[-2.30]	[1.55]	[-4.45]	[-5.50]	[-2.33]	[-1.69]	[-2.25]	[-0.30]	[-1.49]	[-1.70]	[-2.13]	[-0.31]
Old Dependency Ratio	-0.04	-0.03	0.06	0.02	-0.06	0.01	-0.07	-0.06	-0.01	-0.06	-0.07	-0.06						
	[-0.21]	[-0.10]	[0.36]	[0.09]	[-0.24]	[0.04]	[-0.33]	[-0.23]	[-0.08]	[-0.71]	[-0.28]	[-0.19]						
Budget Balance	-0.28	-0.29	-0.31	-0.31	-0.25	-0.29	-0.37	-0.48	-0.38	-0.38	-0.28	-0.40	-0.40	-0.90	-0.52	-0.51	-0.35	-0.89
	[-1.50]	[-1.25]	[-1.51]	[-1.39]	[-1.12]	[-0.95]	[-1.75]	[-1.64]	[-3.83]	[-4.39]	[-1.19]	[-1.17]	[-2.10]	[-2.92]	[-2.68]	[-2.58]	[-1.51]	[-2.81]
Unemployment Rate							-0.59	-1.28	-0.60	-0.66	-0.23	-0.95	-0.53	-2.99	-1.25	-1.12	-0.15	-2.97
							[-0.94]	[-1.34]	[-1.50]	[-2.56]	[-0.34]	[-0.92]	[-0.84]	[-2.46]	[-1.81]	[-1.75]	[-0.22]	[-2.37]
Credit Growth													-0.01	-0.07	-0.02	-0.02	-0.02	-0.07
													[-0.30]	[-1.25]	[-0.61]	[-0.59]	[-0.36]	[-1.18]
C	23.08	24.68	21.53	22.37	24.56	25.81	24.94	28.35	23.55	25.02	25.26	30.37	23.31	26.77	23.47	23.48	23.20	26.84
	[2.73]	[2.33]	[3.83]	[2.27]	[2.46]	[1.80]	[2.87]	[2.71]	[4.90]	[7.01]	[2.47]	[2.38]	[3.86]	[3.48]	[3.73]	[3.86]	[3.04]	[3.32]
AR1 (error)					0.21	0.27					0.19	0.20					0.26	0.03
					[1.49]	[1.64]					[1.29]	[1.18]					[1.66]	[0.19]
Adjusted R^2	**0.425**	**0.397**			**0.442**	**0.417**	**0.423**	**0.375**			**0.429**	**0.387**	**0.423**	**0.213**			**0.426**	**0.308**
F-statistic p-value	**0.000**	**0.000**			**0.000**		**0.000**	**0.000**			**0.000**		**0.000**	**0.000**			**0.000**	
Durbin Watson Statistic	**1.446**	**1.454**	**1.446**	**1.456**	**1.813**	**1.905**	**1.547**	**1.633**	**1.542**	**1.559**	**1.810**	**1.910**	**1.552**	**1.945**	**1.687**	**1.669**	**1.920**	**2.250**
J-stat p.value		**0.593**				**0.698**		**0.721**				**0.776**		**0.736**				**0.752**

†Estimation method: OLS – Ordinary Least Squares; TSLS – Two-Stage Least Squares; CCR – Canonical Cointegrating Regression; FMOLS – Fully Modified Ordinary Least Squares; NLS – Non-Linear Least Squares; TSNLS – Two-Stage Non-Linear Least Squares

Notes:
1. *t*-statistics are reported in square brackets
2. The *J*-statistic is the test for over-identifying restriction