

Deregulation and private debt developments in Greece¹

Demosthenes Georgopoulos

Ministry of Economy and Finance
dgeorgopoulos@mneec.gr

Theodore Papadogonas

Technological Institute of Chalkis
tpap@teihal.gr

George Sfakianakis

Council of Economic Advisers
Ministry of Economy and Finance
gsfak@mneec.gr

Abstract

In the paper we examine private (entrepreneurial and household) debt in Greece from 1970 onwards. We find it nearly stationary for about 20 years and expanding afterwards in nearly explosive terms, starting from extremely low values. By disaggregating the time series of private debt into its two components, i.e. entrepreneurial and household (consumer, credit cards and mortgages) debt, we find the latter accounting for the huge increase. We consider demand and supply curves for household debt. Shifts of the curves are to be explained; explanations include, among others, expectations of future incomes from the demand side. Regarding the supply side, the availability of loans (partly attributable to increased bank competition) and overall bank deregulation are proposed. However, behind all the aforementioned explanations is the neoliberal era: increased (but usually not realized) material expectations are coupled with an ever increasing income inequality (which enhances the Duesenberry effect, in an era of extremely materialistic culture), both pushing for acquiring the most conspicuous good: houses. From the other side financial deregulation permitted banks to move promptly and offer to ambitious (but not necessarily solvent) customers whatever they wanted: Mortgages, credit cards, consumer loans etc. Every single step in the process of financial deregulation was accompanied by a higher level of household indebtedness. Moving from the household level, increased debt had been also a solution to stalling effective demand at the macroeconomic level, possibly due to the redistribution of income. Empirical analysis and causality tests are conducted along these lines and we find a two way causal relationship between GDP growth and private debt.

Keywords: private debt, household debt, deregulation, structural break, neoliberal era.

Introduction

This paper aims at investigating aspects of private debt developments in Greece for a time span of more than 30 years (from 1970 onwards). Our research focuses on identifying breaks in the debt series and on investigating causal relationships in order to evaluate the effect of credit market deregulation. For the period data are available (i.e. starting from 1990), we decompose private debt to its two major

¹ The views expressed in this paper are strictly personal and do not reflect the views of the institutions authors are affiliated with.

components: a) entrepreneurial debt, i.e. debt raised by entrepreneurs to expand their business, renew their capital stock, undertake or satisfy obligations etc. and b) private household debt, i.e., debt assumed by households (mainly mortgages and, secondarily, consumer debt and credit cards). Using various statistical and econometric methods we try to find possible explanations underlying the almost explosive increase of private debt and, in particular, the path of its household component. We believe that explaining private debt movements could be crucial for several reasons: a) There is a clear link to the international financial crisis currently underway which was caused (at least *prima facie*) by a combination of increasing subprime loans and new financial techniques allegedly minimizing risk on these risky loans and b) Greece is characterized by heavy indebtedness, with a very large (albeit slightly decreasing public debt²) and a rapidly expanding private debt. This paper aims at providing some insights about the debt mechanism, which are urgently required for the prevention of future recessions or crises through the design and implementation of a more sophisticated regulatory framework.

Literature Review

A vast and expanding international literature exists about private debt, household debt and, especially, the latter's main component, i.e. mortgage debt. Historically, emerging capitalism did not support lending for consumption purposes (Smith, Adam, 1776). This thrifty attitude was altered, mainly in the U.S.A., after the introduction of installment credit at the beginning of the twentieth century and the growth of per capita incomes to levels well above subsistence. This development fostered the idea that incomes and wealth accumulated over a lifetime will permit the repayment of debts contracted earlier. The new attitude in the era of the first globalization and, especially, in the roaring twenties managed to produce, or better to contribute, to the 1929 crash. Joseph Schumpeter believed that the stock-market crash was inferior in significance and secondary to the bursting of a speculative bubble on property bonds in Florida (as is currently the case) which had a strong impact in banks: "Nothing is so likely to produce cumulative depressive processes as such commitments made by a vast number of households to an overhead financed to a considerable extent by commercial banks" (Schumpeter, 1939). According to Daniel Bell, the abolishment of the "protestant" spirit of capitalism and the introduction of a new hedonic-consuming spirit is a major contradiction in the workings of modern capitalism (Bell, 1976). As we can see from this very swiping review of the older literature there was a rather negative stance for household consumer loans. But, except for the aforementioned trends (installment credit and above subsistence incomes), after World War II, following the introduction of the concept of time preference (Ando and Modigliani, 1963) lending for consumption purposes stopped being ostracized. This concept, (somehow similar neoclassical concepts were introduced in M. Friedman's Permanent income hypothesis, 1957) holds that most consumers would prefer a relatively constant flow of consumption over their lifetimes and, as a result, they tend to borrow at the beginning and the end of their lives and save at the middle. In the ensuing years of the 1960's and 1970's some new inventions as the Credit Bureaus and the Standardization of lending Terms in conjunction with the above mentioned developments, manage to increase households debt burden but to only a moderate level (Mote and Nolle,

² Despite privatizations policies, a policy choice which could actually impoverish the state in the long run.

2005). But the earlier developments did not and could not foresee the complete new era after the 1980's. Starting from then, household debt increased enormously, ending in today's subprime crisis and the credit crunch. Which are the main reasons behind these developments? Some point out the recent high-tech financial innovations as credit scoring along with Automated Underwriting (McCorkell, 2002) and the now well known securitization procedure. Some others point at computing developments. But most of the literature points at bank deregulation (Girouard and Blöndal, 2001, DeBelle, 2004) and an era of low nominal (Stevens, 1997, and Wadhvani, 2002) and real interest rates (Barnes and Young, 2003, Gruen and Clenn, 2003). Others make a connection between increased household debt and income inequality (Iacoviello, 2008, Markus and Morgan, 2005), while some connect the debt with the overall workings of the capitalist system and, especially, with problems regarding effective demand (Foster, 2006). Overall, papers on private or household debt tend to be rather descriptive and qualitative and they do not deploy rigorous scientific techniques. More precisely, although bank deregulation is considered to be among the major sources of debt increases, there are no accurate endeavors to quantitatively evaluate the exact impact of this or that measure, or the overall one. Even more to the point, there is a lack of a simultaneous estimation of a bundle of the impacting causes, i.e. real and nominal interest rates, deregulation and lending competition, in a unified context. In any case, the Greek experience has been so far totally ignored, so in this paper we expect to reveal some basic facts about it, in parallel with rigorous econometric and statistical results. However, it must be mentioned, that we do not assert to have uncovered the whole picture: the demand side must be carefully examined. Although lending deregulation and interest rates changes are necessary causes for increased debt, they are not sufficient. Alternative theories of consumer behavior, such as the "permanent income" hypothesis the "life cycle" or the "relative income" (Duesenberry, 1949) one, must be used and checked to shed light on the demand side of the equation.

Basic Data - Facts and the Stages of Banking Deregulation

Our data begin in 1970 with a total private sector's debt at 33% of GDP. Until 2000 (when it reached 43.67%), there was no major variability in the above ratio; only mild ups and downs can be observed with a minimum at 27.67% in 1994 (see the Data Appendix for the complete database). At a first reading, the above observation could lead to the rather erroneous conclusion that something happened around the year 2000 which caused private debt to increase dramatically thereafter so that in 2006 it stood at the historical high of 78.42%. However, nothing particular happened around the turn of the millennium - there were no major changes in the institutional setting or the real economy. For a first insight (and a rather intuitive one), we must take a look at a more disaggregated level. So, we constructed two time series: one consisting of entrepreneurial debt, and another one consisting of household debt. Regrettably, we do not have precise quantitative data for the 1970 to 1989 period at this disaggregated level. We only obtained some qualitative information; more specifically that in the above period, there were no important differentiations (see the Data Appendix). From 1990 onwards, when we have exact data, the two time series follow a rather diverging path. At the beginning, entrepreneurial debt was almost 6 times higher. By the end, household debt slightly overshot it. Looking at it from a different point of view, entrepreneurial debt increased at about two thirds as a percentage of GDP from 1990 to 2006, while household debt exploded, rising almost nine times. These

are strikingly different developments: although entrepreneurial debt does not really change from 1990 to 2000 (from 29.6% of GDP to 31.2%), household debt jumps from 5.2 % to 12.5%. The above facts lead to a rather different conclusion: the real structural break in the time series happened somewhere between 1990 and 2000, probably closer to the beginning than to the end, as a result of a major change in the behaviour of household debt. In section 4 we are obliged to use the aggregate time series of private debt, not because of its inherent analytical superiority, but for purely computational purposes. But, still, we have to bear in mind that the main point of interest is not total private debt, but household debt and especially its basic component, mortgages. This means that we have to investigate mainly for the determinants of mortgages if we want to understand total private debt developments.

Before we move to the technical part of our paper we must present in a compact form the main steps of bank deregulation in Greece during this period. At the beginning of the 1980's, the Greek banking sector was almost publicly owned, completely regulated by the Bank of Greece and the so called Monetary Committee. Banks were not motivated by profit, sales or asset maximization and the degree of competition in the sector was very low. Several steps were undertaken from 1984 to 2003, when the whole process concluded, resulting to a complete liberalization of the banking sector. But we must mention from the beginning that the main steps took place between 1987 and 1994. In 1984 we have the first and hesitant steps, when the responsibility and initiative for financial decisions was transferred to the banks CEOs. In 1985 we have the unification of some categories of centrally administered interest rates and the outset of the abolishment of credit restrictions. In 1986 the Central Bank Governor D. Halikias acknowledged that the whole process was almost at the beginning³. 1987 was a crucial year: steps were undertaken to liberalize bank interest rates and to abolish many quotas and quantitative restrictions. Centrally administered interest rates were retained for only a few banking activities: savings banks accounts, loans to SMEs and social housing programs. But, although the above steps have been important, a central obstacle to the complete liberalization and deregulation remained: the commitment of bank to allocate a significant part of their disposables in order to finance public sector borrowing requirements. So we have to remember year 1987 as a milestone for interest rates deregulation. We will see below how the above policy changes were identified in our econometric chapter. From 1988-1991 the deregulation process accelerated. In 1992, the bank disposables committed to finance public debt were further reduced, while in 1993 the above obligation was abolished altogether. Between 1993 and 1994 the aforementioned process was almost completed, while a few remaining restrictions at consumer credit ceilings were eventually abolished in 2003⁴. So, after 1987, when we had a major deregulation of interest rates, the second important step took place in 1994, when quantity restrictions and compulsory placing of bank funds were abandoned. Below we will find years 1987 and 1994 emerging from the crude data, following neutral econometric and statistical techniques, as important turning points in the behavior of the Greek private debt. It is worth mentioning here that we first pinpointed years 1987 and 1994 following our econometric methods and then

³ This part of our paper draws heavily on the annual reports of the Greek Central Bank from 1984 to 2003. All our references are based on them.

⁴ It is interesting to notice here that after the partial deregulation of credit cards and consumer credit in 1993, and strongly after the completion of the above process in 2003, the part of the private debt that is attributed to them, begun increasing by leaps and bounds.

discovered them as important turning points in the banking literature. This "discovery" follows the steps of a "hard science" like Physics and strongly encouraged us to continue our research. However, it is interesting to mention that the Greek household was the main burden bearer of the deregulation and the liberalization process. There was only a small impact of this process on entrepreneurial debt, so we can tentatively conclude that the well known inefficiencies of the business sector cannot be attributed to banking sector inefficiencies, lack of loan funds and overregulation.

Econometric and Statistical Findings

In this section we will present our preferred formal specifications. Every one of these sheds important light on different aspects of the indebtedness problem. However, we must recognize that our investigation is far away from completion. A unified, integrated model must be the end of our efforts regardless of its difficulty. Currently, our empirical analysis is three-pronged:

1 using time-series methods, we tried to identify whether there is a break in the debt series (using the method of Perron, 1997), implying a diversified socio-economic background.

2 we proceeded to estimate an equation for the determinants of debt as a ratio to GDP (taking into account stationarity and cointegration issues).

3 we investigated the existence of causal relationships between the private debt ratio and other variables (using the notion of Granger causality as implemented by Toda και Yamamoto (1995) and Dolado - Lutkepohl (1996)).

1 Identification of a break in the debt series

The advantage of the methodology described by Perron (1997) is that the break point is not considered known a-priori but is pinned down using the time series properties of the variable at hand. This break point may refer to (a) the intercept, (b) the intercept and the slope, or (c) only the slope, with both segments of the trend function joining at the point of the break.

Also, there are three criteria in order to decide the exact break point (see the Technical Appendix for details). Our results are summarized in Table 1 below.

Table 1: Determining the break point in the private debt series

| | Type of break point | | |
|--|-------------------------|---------------------------------------|---------------------|
| | Change in the intercept | Change in the intercept and the slope | Change in the slope |
| Criteria to determine break point | | | |
| min t-stat for alpha=1 | 1988 | 1995 | 1986 |
| max absolute value of the t-stat | 1993 | 1995 | 1997 |
| min t-stat for parameter change | 1993 | 1995 | 1997 |

With the exception of two sub-cases, our finding is that in the course of the 1990s there was indeed a break in the series of private debt. As the case of a change both in the intercept and the slope is more general, we can conclude that the break is located in 1995 (with

all criteria on the determination of the break point coinciding). Let us not forget that this is the following year after the almost complete deregulation of the banking sector. So, we can observe banking deregulation and a new era for household debt moving side by side.

2 Determinants of private debt

According to economic theory, private debt developments are the result of (a) GDP growth (which is also a proxy for future expectations of economic agents) (b) changes in real interest rates (with a negative sign expected for the estimated parameter) (c) the degree of concentration in the banking sector (as captured, for example, by the Herfindahl index. There is a strong correlation, however, between this index and interest rates), and (d) various institutional factors, which could be represented by a time trend.

We tried several combinations of these variables and our preferred estimation is presented below.

| Linear Regression - Estimation by Least Squares | | | | |
|---|-------------|--------------------------------|-------------|--------------------|
| Dependent Variable: Private debt as a ratio to GDP | | | | |
| Annual Data From 1970:01 To 2006:01 | | | | |
| Usable Observations: 34 (total 37) | | | | |
| Degrees of Freedom: 29 | | | | |
| R ² : 0.98 | | Adjusted R ² : 0.98 | | |
| F-test: F(4,29)= 4489.12 with Significance Level 0.00000000 | | | | |
| LM test for autocorrelation: Chi-Squared(3)= 4.79 with Significance Level 0.19 | | | | |
| Variable | Coefficient | Standard Error | T-statistic | Significance level |
| Constant | -3.18 | 0.97 | -3.27 | 0.00107905 |
| Real GDP growth | -0.098 | 0.11 | -0.88 | 0.38103266 |
| Real interest rate | -0.11 | 0.069 | -1.60 | 0.10959078 |
| D2 | 4.38 | 0.62 | 7.04 | 0.00000000 |
| Debt lagged once | 1.07 | 0.03 | 42.06 | 0.00000000 |

The variation of the dependent variable is largely explained by the explanatory variables (as indicated by the adj. R² and the results of the F-test); however, t-statistics are relatively low, possibly due to high correlation between the explanatory variables (multicollinearity explaining the contradiction between high adj. R² and low t-statistics). The GDP growth variable does not have the expected sign, but this coefficient is not statistically significant anyway⁵. The interest rate variable is significant at the 10% level

⁵ Based on economic theory and our causality tests, however, we consider that omitting this variable would introduce a specification bias.

and has the expected sign, while we decided to drop the concentration index as it was insignificant (we assume that the effect of this variable is eventually captured by the interest rate). We tried dummies for various periods and we obtained a better fit when we used D2 (with a break starting from 1994). We also tried a linear time trend, the dependent variable lagged once (the usual practice to check for persistence) and both of them at the same time. Our finding is that that private debt is not adequately described by a trend function but, on the other hand, displays strong serial correlation (persistence). This could have important policy implications, as it could, under specific circumstances, result to an explosive path of private debt⁶. The inclusion of the lagged variable for debt rendered the trend variable obsolete. The equation was estimated with OLS, with correction for autocorrelation. Using the LM test, we tested for autocorrelation up to three lags and we obtained the result that no serial correlation exists in the residuals.

The last consideration about the estimation is the possibility of a spurious relationship, taking into account the time series properties of economic data. Indeed, by performing ADF tests⁷ we concluded that our variables are integrated - see Table 2.

Table 2: ADF and cointegration tests

| Variable | Test statistic | Significance levels | | |
|--------------------------------|----------------|---------------------|-------|-------|
| | | 1% | 5% | 10% |
| Private debt as a ratio to GDP | 0.22 | -4.24 | -3.54 | -3.20 |
| Real GDP growth rate | -3.18 | -4.23 | -3.54 | -3.20 |
| Real interest rate | -0.53 | -4.27 | -3.56 | -3.21 |

However, by performing an Engle-Granger test on the residuals of the original estimation we concluded that they are also co-integrated (we rejected the hypothesis of non-stationarity of the residuals: the test statistic was -5.55 compared to a critical value of -4.83 for a 5% level of significance). In this case, it has been proved that the estimators are "super-consistent" and can be used for inference.

Being puzzled by the marginal significance of the estimator for the interest rate, we constructed elasticities of the private debt with regard to the real interest rate, only to discover that we have to make a distinction between two different periods: somewhere in the middle of the 1980s, private debt became more "responsive" to changes of the interest rates. This is the product of the first steps of banking deregulation, and more specifically interest rate deregulation in 1987. As we mentioned above, we 'discovered' this turning point with the use of our econometric model and then we observed them in the reports of the Greek central banker. We estimated our original equation with a dummy for the coefficient of the interest rate (trying consecutively 1985, 1986, 1987 and 1988 as

⁶ For example, the time series properties of private debt imply that, at least above some threshold values, debt would keep on increasing even if interest rates and other determining factors remained unchanged.

⁷ We used a time trend in the specification and two lags on the dependent variable. However, we must note that our results are robust to different specifications of the test equation.

candidates for the "break point"). We obtained our best results using 1987 (see below).

| Linear Regression - Estimation by Least Squares | | | | |
|---|-------------|--------------------------------|-------------|--------------------|
| Dependent Variable: Private debt as a ratio to GDP | | | | |
| Annual Data From 1970:01 To 2006:01 | | | | |
| Usable Observations: 34 (total 37) | | | | |
| Degrees of Freedom: 28 | | | | |
| R ² : 0.98 | | Adjusted R ² : 0.98 | | |
| F-test: | | | | |
| F(5,28)= 7113.43 with Significance Level 0.00000000 | | | | |
| LM test for autocorrelation: | | | | |
| Chi-Squared(3)= 4.656240 with Significance Level 0.19877030 | | | | |
| Variable | Coefficient | Standard Error | T-statistic | Significance level |
| Constant | -0.09 | 1.63 | -0.05 | 0.95676346 |
| Real GDP growth | -0.14 | 0.11 | -1.33 | 0.18418559 |
| Real interest ratel | 0.11 | 0.11 | -1.33 | 0.33249386 |
| Real interest ratel | -0.42 | 0.15 | -2.79 | 0.00529775 |
| D2 | 4.47 | 0.62 | 7.27 | 0.00000000 |
| Debt lagged once | 1.02 | 0.03 | 35.34 | 0.00000000 |

The variable interest ratel has zeroes after 1987 (including), while interest rate2 has zeroes before⁸. Using this specification, we verify what we mentioned above, namely that after 1987 the coefficient of the interest rate is statistically significant at the 1% significance level, while totally statistically insignificant before. This sharp variation (significant at 1% vs. totally insignificant!) speaks volumes for a new era in private debt completely disconnected with the past.

3 Causality tests

In this section we proceed to check for causality relationships. The method chosen is that of Toda Yamamoto (1995) as elaborated by Dolado and Lutkepohl (1996). The main advantage of this method is that the results are valid irrespective of whether variables are stationary or not; in addition, the existence of cointegration is also immaterial. The fact that we can draw conclusions about causality regardless of stationarity issues is very important, given that when using alternative tests / specifications for stationarity one can have contradictory results. The only preliminary test that must be conducted is the one concerning the number of lags to be included in the autoregressive scheme: more specifically, the methodology is based on the estimation of a VAR with a number of lags exceeding the one that criteria such Schwarz, Akaike or a log-likelihood test (LR test) would dictate.

If d_{max} is the maximum degree of integration of variables and k the number of lags that we would normally choose (on the basis of Schwarz, Akaike or LR tests), the VAR system must be estimated with a

⁸ This method is equivalent computationally to using a dummy, but results are more readily interpreted.

d_{max+k} number of lags using the Seemingly Unrelated Regressions method (SUR). The causality test consists of testing the statistical significance of the k lags using the Modified Wald test. As is shown in the relevant literature, in this case the tests and conclusions of the asymptotic theory are valid.

In the specific case at hand, the minimization of the Schwarz criterion would dictate the estimation of a VAR with one lag. Using the findings of the previous Section, we know that d_{max} is 2 and, consequently, we proceed to estimate a VAR with 3 lags for the endogenous variables of the model.

Our conclusions are that (a) there is a two-way causal relationship between GDP growth and private debt (b) interest rates weakly affect private debt at the 8% significance level⁹ (c) concentration in the banking sector¹⁰ does not cause private debt. This finding reflects the fact that the Greek banking deregulation process, important as it was, did not alter significantly the bank market shares. This development rather shows that bank competition was somehow restricted, whereas the profit maximizing principle was more directed toward households.

Table 3: Granger Causality tests

| Test | Test value | Significance level |
|--|------------|--------------------|
| Is private debt caused by GDP growth? | 12.31 | 0.002 |
| Is GDP growth caused by private debt? | 7.67 | 0.02 |
| Is caused by interest rates? | 5.05 | 0.08 |
| Is private debt caused by concentration in the banking sector? | 3.16 | 0.21 |

Summary, Conclusions and Policy Recommendations

Summarize our main findings, we must note that (i) GDP growth does not influence private debt, or, if we take it as a proxy of future expectations of economic agents, expectations concerning future financial positions are not reflected in private debt. This is not an entirely intuitive conclusion, but it may well depend on the specific proxy. Other specifications may give better results. For example, house price indices growth could be a better candidate for future research. (ii) real interest rates have a modest impact, if we consider the whole 30-year period. But if we distinguish between the two periods (roughly before and after 1990), their behavior is completely different. During the first period interest rates do not affect private debt, while during the second they strongly do. Future research must focus on whether interest rate outcomes are in line with standard economic theory (i.e. movements in real interest rate cause rational variations in private debt, reflecting rational agent behaviors in a rational institutional environment) or are bubble-like (iii) there are indications of a different era (in social and political science terms): real interest rates are already a major candidate indicator for a "break" in credit institutions and household behavior alike; generalizing, it is also an indicator for a

⁹ This weak causality is probably due to the fact that we cannot distinguish (computationally) between the two periods for the interest rate.

¹⁰ As measured by the Herfindahl index.

social alteration. The statistical significance of the dummy variable indicating a new era around the outset of 1990s is also important. This must be interpreted, somehow loosely, as capturing aspects of the remaining unspecified traits of the new era. Such aspects might include bank competition (through advertisement and "aggressive" loan offering) and a materialist culture which places emphasis on conspicuous spending (big cars, new houses, exotic travels etc.) although the means to finance the above luxuries are in shortage. Speculative behavior, typical of the new era, must also be mentioned, especially after the stock market crisis in 1999. Further research is required if we want to identify each one of them with precision (iv) past private debt is also an important determining factor. The persistence of debt which is statistically detected is alarming, potentially implying future problems. Prospective research must further analyze this factor by breaking down the debt to its main components (v) last but not least, the mutual causal relationship of private debt and GDP growth, implied by the causality tests, is also alarming (in combination with the persistence of debt), unveiling an era where debt is a central constituent - an era with short horizon, if we take the bubble characteristics of debt under consideration. These are also implied by the currently expanding international financial crisis and credit crunch.

Concluding, we must recognize the signs of the future: after the heavy regulation of the 1970's and 1980's and the 'free launch' deregulation and liberalization of the 1990's and the new millennium, something new must be invented surpassing the deficiencies of the above periods. As for this paper, it was mainly restricted in clarifying the main aspects of the above periods. Further research is definitely warranted for more elaborate results.

References

- Ando, A. and F. Modigliani, 1963, "The life cycle hypothesis of savings: aggregate implications and tests", *American Economic Review*, 53.
- Bank of Greece, *Governor's Annual Report*, 1984 - 2006.
- Barnes, S. and G. Young, (2003), "The Rise in US Household Debt: Assessing its Causes and Sustainability", Working Paper 206. Bank of England.
- Bell, D., 1976, *Cultural Contradictions of Capitalism*, Basic Books, 20 Anv. Edition (1996)
- Christen, M. and M. Ruskin, (2005), "Keeping up with the Joneses: Analyzing the Effect of Income Inequality on Consumer Borrowing", *Quantitative Marketing and Economics*, 3, 145-173.
- Debelle, G., 2004, "Household debt and the macroeconomy", *BIS Quarterly Review*.
- Dolado, J. and H. Lutkepohl, 1996, "Making Wald tests work for cointegrated VAR systems," *Econometric Reviews*, 15, 369-386.
- Duesenberry, J., 1949, *Income, Saving and the Theory of Consumer Behavior*, Harvard University Press, Cambridge, Massachusetts.
- Engle, Robert F. and C.W.J. Granger, 1987, "Co-integration and Error Correction: Representation, Estimation, and Testing," *Econometrica* 55, 251-276.
- Foster, J., 2006, "The household Debt Bubble", *Monthly Review*.
- Friedman, M., 1957, *A Theory of the Consumption Function*, Princeton University Press, Princeton.
- Girouard, N., and S. Blöndal, 2001, "House Prices and Economic Activity", Working paper 279. OECD Economic Department.
- Gruen, D. and G. Stevens, 2003, "Household Debt: What the Data Show", *Reserve bank of Australia Bulletin*.

- Hellenic Ministry of Economy and Finance, *Bi-Annual Report*, various issues.
- Iacoviello, M., "Household Debt and Income Inequality 1963-2003", forthcoming in the *Journal of Money, Credit and Banking*.
- McCorkell, P.L., 2002, "The Impact of Credit Scoring and Automated Underwriting on Credit Availability" in T. A. Durkin and M. E. Staten (eds.), *The Impact of Public Policy on Consumer Credit*, Kluwer Academic Publishers, Boston.
- Mote, L. and D. Nolle, 1963, "Special Studies-Rising Household Debt: A Long -Run View", *Quarterly Journal*, 24, 1.
- Perron, P., 1997, "Further evidence on breaking trend functions in macroeconomic variables," *Journal of Econometrics*, 80, 2, 355-385.
- Schumpeter, J., 1939, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, McGraw-Hill, New York.
- Smith, A, 1776, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Random House, 1937, New York.
- Stevens, G., 1997, "Some Observations on low Inflation and Household Finances", *Reserve Bank of Australia Bulletin*.
- Toda, H. Y. and T. Yamamoto, 1995, "Statistical inference in Vector Autoregression with possibly integrated processes," *Journal of Econometrics*, 66, 225-250.
- Wadhvani, S., 2002), "Household Indebtedness, the Exchange Rate and Risks to the UK Economy", *Bank of England Quarterly Bulletin*.

Technical Appendix

When only a change in the slope is considered (innovational outlier model) the following equation is estimated

$$y_t = \mu + \theta DU_t + \beta t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-i} + e_t \quad (A1)$$

Where T_b is the break point, $DU_t=1$ for $t>T_b$ and $D(T_b)_t=1$ for $t=T_b+1$.

If we assume that there is a change in both the intercept and the slope, equation A2 is estimated

$$y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-i} + e_t \quad (A2)$$

Where $DT_t=1*t$ for $t>T_b$ and $DU_t, D(T_b)_t$ as above.

When a change in the slope is considered (additive outlier model), we apply a two-stage process. First, we detrend the series using

$$y_t = \mu + \beta t + \gamma DT_t^* + \tilde{y}_t \quad (A3) \text{ where } DT_t^* = 1(t-T_b) \text{ for } t>T_b.$$

Then we estimate equation A4:

$$\tilde{y}_t = \alpha \tilde{y}_{t-1} + \sum_{i=1}^k c_i \Delta \tilde{y}_{t-1} + e_t \quad (A4)$$

In all three cases, estimation is based on OLS and the null hypothesis tested is $\alpha = 1$. For the choice of the break point there are three alternatives: (a) T_b is the point where the t-statistic for the null hypothesis is minimized (b) T_b is the point where the absolute value of t_θ (equation A1) or t_γ (equations A2 and A3) is maximum (c) T_b is the point where t_θ (equation A1) or t_γ (equations A2 and A3) are minimized.

Data Appendix

| Year | Total Private debt (€ mio) | Loans to Enterprises (€ mio) | Household Debt (€ mio) | Private debt (% GDP) | Share of loans to enterprises (% of total debt) | Household debt (% GDP) | Loans to enterprises (% GDP) | Real interest rates |
|------|----------------------------|------------------------------|------------------------|----------------------|---|------------------------|------------------------------|---------------------|
| 1970 | 359.3 | | | 33.0 | | | | NA |
| 1971 | 439.0 | | | 36.3 | | | | NA |
| 1972 | 543.9 | | | 38.9 | | | | NA |
| 1973 | 641.8 | | | 35.1 | | | | -9.6 |
| 1974 | 770.8 | | | 36.7 | | | | -10.0 |
| 1975 | 959.7 | | | 38.0 | | | | -3.3 |
| 1976 | 1173.7 | | | 37.4 | | | | -5.3 |
| 1977 | 1471.8 | | | 40.0 | | | | -3.8 |
| 1978 | 1830.1 | | | 40.8 | | | | -3.4 |
| 1979 | 2176.0 | | | 39.1 | | | | -7.4 |
| 1980 | 2628.6 | | | 39.3 | | | | -1.8 |
| 1981 | 3438.2 | | | 42.9 | | | | -3.2 |
| 1982 | 4308.1 | | | 42.8 | | | | -9.3 |
| 1983 | 5066.3 | | | 42.2 | | | | -2.0 |
| 1984 | 6155.5 | | | 41.2 | | | | -2.8 |
| 1985 | 7312.8 | | | 40.1 | | | | -2.7 |
| 1986 | 8453.6 | | | 38.8 | | | | -2.6 |
| 1987 | 9282.0 | | | 37.8 | | | | 1.9 |
| 1988 | 10692.9 | | | 35.8 | | | | -0.1 |
| 1989 | 12810.1 | | | 36.1 | | | | 2.0 |

| | | | | | | | | |
|-------------|----------|---------|---------|------|------|------|------|------|
| 1990 | 14949.3 | 12700.9 | 2248.4 | 34.9 | 85.0 | 5.2 | 29.6 | 4.1 |
| 1991 | 16528.4 | 14030.3 | 2498.1 | 31.2 | 84.9 | 4.7 | 26.5 | 6.2 |
| 1992 | 18372.8 | 15569.8 | 2803.0 | 30.0 | 84.7 | 4.6 | 25.5 | 8.3 |
| 1993 | 19094.3 | 15989.6 | 3104.7 | 27.7 | 83.7 | 4.5 | 23.2 | 7.7 |
| 1994 | 21622.2 | 17949.8 | 3672.4 | 27.7 | 83.0 | 4.7 | 23.0 | 8.6 |
| 1995 | 26145.4 | 21326.3 | 4819.1 | 29.9 | 81.6 | 5.5 | 24.4 | 6.5 |
| 1996 | 30201.7 | 23954.1 | 6247.5 | 31.4 | 79.3 | 6.5 | 24.9 | 6.6 |
| 1997 | 34690.4 | 26895.9 | 7794.5 | 32.6 | 77.5 | 7.3 | 25.2 | 2.9 |
| 1998 | 41169.5 | 31333.9 | 9835.6 | 35.5 | 76.1 | 8.5 | 27.0 | 3.1 |
| 1999 | 46583.3 | 34059.7 | 12523.6 | 37.7 | 73.1 | 10.1 | 27.6 | 3.2 |
| 2000 | 59516.6 | 42546.7 | 16969.9 | 43.7 | 71.5 | 12.5 | 31.2 | 0.4 |
| 2001 | 74352.0 | 50523.2 | 23828.8 | 50.4 | 68.0 | 16.2 | 34.3 | 3.4 |
| 2002 | 86510.5 | 55012.2 | 31498.3 | 54.9 | 63.6 | 20.0 | 34.9 | 1.3 |
| 2003 | 101178.1 | 60979.3 | 40198.8 | 59.1 | 60.3 | 23.5 | 35.6 | 0.8 |
| 2004 | 117201.7 | 65566.3 | 51635.4 | 63.3 | 55.9 | 27.9 | 35.4 | 0.8 |
| 2005 | 136981.1 | 71282.9 | 65698.2 | 69.0 | 52.0 | 33.1 | 35.9 | -0.1 |
| 2006 | 156896.4 | 76659.8 | 80236.6 | 73.4 | 48.9 | 37.5 | 35.9 | 0.8 |

Sources: Bank of Greece, European Commission (AMECO Database).