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Determinants of Non-Performing Loans in Cyprus: A Bayesian VAR approach

Nektarios A. Michail* and Christos S. Savva,*****

ABSTRACT

We investigate the macroeconomic determinants of non-performing loans in Cyprus, using a Bayesian VAR methodology, employing a disaggregate approach by using Household and Non-Financial Corporation (NFC) NPLs in order to reach more precise estimates. Overall, the results suggest that the determinants of NPLs vary across the two sectors, with only industrial production having a negative effect on both. Funding conditions, i.e. deposits, have been found to have an effect on both household and NFC NPLs, albeit likely through different channels. Other important factors also exist, although these are different across the two sectors. Forward-looking variables, like the ESI, do not appear to register any important effects on NPLs. The findings bear policy implications, with the most important being that growth has to be persistent if a decrease in the overall level of NPLs is to be observed.

Keywords: Non-performing loans, Bayesian VAR, Households, Non-Financial Corporations.

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ΠΕΡΙΛΗΨΗ

Η παγκόσμια χρηματοπιστωτική κρίση στα τέλη του 2007, ακολουθούμενη από την ευρωπαϊκή κρίση δημόσιου χρέους, έχει αφήσει μια κληρονομιά από υψηλά μη εξυπηρετούμενα δάνεια σε διάφορες ανεπτυγμένες και αναπτυσσόμενες οικονομίες. Όπως είναι γνωστό, τα μη εξυπηρετούμενα δάνεια είναι δάνεια που θεωρούνται κοντά ή ήδη σε χρεωκοπία, με την πιθανότητα αποπληρωμής τους να είναι εξαιρετικά μικρή. Σύμφωνα με την Ευρωπαϊκή Κεντρική Τράπεζα, ένα δάνειο κατατάσσεται ως μη εξυπηρετούμενο, όταν ο οφειλέτης δεν πληρώνει το συμφωνηθέν ποσό για περισσότερες από 90 ημέρες. Τα μη εξυπηρετούμενα δάνεια συνήθως αναφέρονται επίσης ως «επισφαλή» ή «κόκκινα» δάνεια.

Λαμβάνοντας υπόψη τη σημασία των μη εξυπηρετούμενων δανείων για τη βιωσιμότητα του τραπεζικού τομέα αλλά και τη γενικότερη χρηματοοικονομική σταθερότητα, ο σκοπός αυτής της εργασίας είναι η διερεύνηση των μακροοικονομικών παραγόντων που επηρεάζουν τα μη εξυπηρετούμενα δανείων στην Κύπρο, χρησιμοποιώντας τη μεθοδολογία Bayesian VAR. Επιπλέον, υιοθετούμε μια πιο συγκεκριμένη προσέγγιση καθώς χρησιμοποιούμε μη εξυπηρετούμενα δάνεια τόσο των νοικοκυριών όσο και των μη χρηματοπιστωτικών επιχειρήσεων, ώστε να μπορούμε να επιτύχουμε πιο ακριβείς εκτιμήσεις. Στόχος μας είναι να εξετάσουμε τη συμπεριφορά των μη εξυπηρετούμενων δανείων όταν αλλάζουν οι μακροοικονομικές συνθήκες, ελπίζοντας να ρίξουν φως στο πώς θα εξελιχθούν αυτά τα επόμενα χρόνια.

Εν συντομία, τα αποτελέσματα υποδηλώνουν ότι οι καθοριστικοί παράγοντες των μη εξυπηρετούμενων δανείων ποικίλλουν μεταξύ των δύο τομέων, ενώ μόνο η βιομηχανική παραγωγή έχει αρνητική επίδραση και στα δύο. Οι συνθήκες χρηματοδότησης, δηλαδή οι καταθέσεις, έχουν βρεθεί ότι επηρεάζουν τόσο τα νοικοκυριά όσο και τις επιχειρήσεις, αν και πιθανόν μέσω διαφορετικών καναλιών. Υπάρχουν άλλοι σημαντικοί παράγοντες, αν και αυτοί είναι διαφορετικοί μεταξύ των δύο τομέων. Μεταβλητές που συνήθως θεωρούνται ότι είναι καλές για προβλέψεις όπως ο δείκτης οικονομικού κλίματος δεν φαίνεται να καταγράφει σημαντικές επιπτώσεις στα μη εξυπηρετούμενα δάνεια. Τα ευρήματα αυτής της μελέτης προσφέρουν σημαντικές πληροφορίες για την οικονομική πολιτική, με το σημαντικότερο να είναι ότι η οικονομική ανάπτυξη χρειάζεται να είναι σταθερή και μακροχρόνια εάν θέλουμε να παρατηρήσουμε μείωση του συνολικού επιπέδου των μη εξυπηρετούμενων δανείων.

1. Introduction

The global financial crisis in late 2007, followed by the European sovereign debt crisis, has left a legacy of high non-performing loans (NPLs) in a large number of developed and developing countries. As is well known, NPLs are loans which are considered as close or in default, with the probability of being repaid viewed as highly unlikely. According to the European Central Bank, a loan is classified as an NPL when more than 90 days pass without the borrower paying the agreed amount. NPLs are usually also referred to as "bad loans".

As it has been well understood both by domestic as well as international experience (Clerides et al., 2017), the quality of bank loans is a critical measure of the quality of the banking sector. In a broad generalisation, the more "bad loans" exist, the shakier the banking sector. Analysing and monitoring the evolution of NPLs is of major importance, because a deterioration of loan portfolio quality could lead to banking institution solvency risks (Evan, O. et al., 2000). When a large number of non-performing loans and/or a rapid increase of this amount is registered, financial stability could be threatened with severe consequences to the whole economy (Crockett, 1997). Thus, maintaining a low level of NPLs and cleaning-up the banking sector after times of distress represents a major concern for policy makers both at the national and the European levels.

Bearing in mind the importance of NPLs, the purpose of this work is to investigate the macroeconomic determinants of non-performing loans in Cyprus, using a Bayesian VAR methodology. In addition, we employ a disaggregate approach as we employ Household and Non-Financial Corporation (NFC) NPLs to allow us to reach more precise estimates. Our aim is to examine the behaviour of NPLs when macroeconomic conditions change, hoping to shed light as to how these will develop in the course of the coming years.

Overall, the results suggest that the determinants of NPLs vary across the two sectors, with only industrial production having a negative effect on both. Funding conditions, i.e. deposits, have been found to have an effect on both household and NFC NPLs, albeit likely through different channels. Other important factors also exist, although these are different across the two sectors. Forward-looking variables, like the ESI, do not appear to register any important effects on NPLs. The findings bear policy implications, with the most important being that growth has to be persistent if a decrease in the overall level of NPLs is to be observed.

2. Literature Review

Macroeconomic determinants of non-performing loans

Regarding the macroeconomic variables that may affect NPLs, there is significant empirical evidence regarding that macroeconomic factors related to growth may affect the behaviour of

the NPLs. The general explanation is that higher real GDP growth usually translates into more income which improves the debt servicing capacity of borrowers. Conversely, when there is a slowdown in the economy the level of NPLs is likely to increase as unemployment rises and borrowers face greater difficulties to repay their debt (Salas and Suarina, 2002; Rajan and Dhal, 2003; Fofack, 2005; and Jimenez and Saurina, 2005).

Other macroeconomic variables that possibly affect NPLs, include the exchange rate, interest rate, and inflation. In this regard, an exchange rate depreciation might have a negative impact while interest rate hikes affect the ability to service the loans, (Louzis, et al., 2010). The impact of inflation, however, can be ambiguous. On one hand, higher inflation can make debt servicing easier by reducing the real value of outstanding loan, but, on the other hand, it can also reduce the borrowers' real income when wages are sticky. Other studies have also found that NPLs are affected by stock prices where drop-in shares prices might have an impact on wealth and in turn a decline in the value of collaterals. (Klein, 2013).

Similar macroeconomic determinants of non-performing loans are also investigated and found to have an important impact on the non-performing loans by De Bock and Demyanets (2012), which consider a panel of 25 emerging markets, for the period 1996 to 2000. In addition, Messai and Jouini (2013) identify these macroeconomic variables as important determinants of NPLs for a sample of 85 banks in Greece, Italy and Spain, for 2004-2008. Other empirical studies of interest for the euro area countries (Castro, 2013; Makri et al., 2014; Roman and Bilan, 2015) also reveal the existence of significant correlations between the macroeconomic environment and the dynamics of non-performing loans.

Regions and Countries that have been examined

As far as the countries that have been examined so far, the existing literature includes the work of Babouček and Jančar (2005) who empirically investigate (using a VAR methodology) the impact of macroeconomic variables (the real GDP growth rate, exports, imports, the rate of unemployment, inflation, interest rates, aggregate bank loans, the real effective exchange rate) on the quality of bank loans in the Czech Republic, for a period of 11 years. Their study shows that the growth of real GDP reduces the non-performing loans ratio, while rising unemployment and inflation lead to a deterioration of the quality of bank loans portfolio.

Using a dynamic panel data model, Kastrati (2011) examines the determinants of non-performing loans in 15 transition economies (Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Bulgaria, Croatia, Macedonia, Moldova, Montenegro, Kosovo, Romania, Serbia and Ukraine), for the period 1994-2009. The study highlights, on the one hand, the high persistency of non-performing loans from one year to another, and, on the other

hand, that real GDP growth rates, inflation, and competition have a significant impact on the rate of non-performing loans.

On the micro level, Espinoza and Prasad (2010) investigate the main determinants of the ratio of non-performing loans, as well as the macroeconomic consequences its increase, for a sample of 80 banks of the Gulf Cooperation Council (GCC) region. The authors find that non-oil GDP and interest rates have a significant impact on the non-performing loans ratio. Louzis et al. (2010) investigate the determinants of non-performing loans in the Greek banking sector for different types of loans (consumer, business and mortgage loans). The findings of the study reveal that the NPLs of consumer loans are more sensitive to the change of the real growth and real lending rates, the NPLs of business loans are more sensitive to the change of the unemployment rate, while the NPLs of mortgage loans are less sensitive to changing macroeconomic conditions.

Caporale et al. (2014) analyze the macroeconomic and financial determinants of non-performing loans for the Italian banking sector and empirically investigate, for the period 2008-2012, whether the high amount of bad loans during recessions is due to the excessive amount of credit granted during economic growth periods. The results show that the bad loan surplus recorded during economic recessions is due to deteriorating economic conditions and the lending policies promoted by Italian banks in the pre-crisis years.

Using a dynamic panel data approach, Chaibi and Ftiti (2015) examine the key macroeconomic and bank-specific determinants of credit risk, measured by non-performing loans, in a market-based economy (represented by France) compared with a bank-based economy (Germany), for the period 2005 to 2011. The authors find that all considered macroeconomic factors (with the exception of inflation) have a significant impact on non-performing loans in both economies.

Erdiç and Abazi (2014) analyze, for a panel of 20 European emerging market countries, the macroeconomic and bank-specific factors that influenced the dynamics of non-performing loans in the period 2000 to 2011. The results show that the real GDP growth rate, inflation, bank profitability and lending interest rates had a significant impact on the dynamics of non-performing loans. The study also reveals that rapid credit growth, high lending rates and interest rate spreads may signal for subsequent NPL growth, which could be of great interest to the regulators. Overall, the literature review shows that one of the common features of previous studies dealing with the issue of macroeconomic determinants of non-performing

bank loans is that they point to the existence of a relationship between macroeconomic factors and NPLs.

Although this issue is very important for a small open economy, the determinants of non-performing loans dynamics has not been investigated in depth for the case of Cyprus. This case is of particular interest due to the unprecedented measures agreed with the European Stability Mechanism (ESM) and the International Monetary Fund (IMF) in April 2013 to save the country from the rapid worsening of its public finances and the severe conditions of banks' balance sheets.

These measures besides the fiscal consolidation measures and structural reforms in the public sector, include the restructuring and downsizing of the banking sector through the resolution of the second largest bank and the recapitalisation of the largest via a bail-in, i.e. the contribution of bank creditors including uninsured depositors (i.e. with deposits over €100,000). Furthermore, the changing of the NPLs directive by the Central Bank of Cyprus in June 2013 and December 2014 have also added to the further convolute this situation, and in combination with all of the above, had an immediate impact on NPLs. Naturally, such qualitative factors cannot be captured by econometric models, and an attempt to study them quantitatively will be futile.

To this end, this paper employs data from December 2014 to February 2018, which include the years following the large amount of structural reforms observed in Cyprus which would convolute the analysis and potentially lead to erroneous conclusions. The choice of sample also allows us to include the years of growth in the Cyprus economy and hence better examine the determinants which would lead to a reduction in the stock of NPLs. Thus, our study contributes to developing existing literature on the macroeconomic determinants of non-performing loans by providing empirical evidence on the main macroeconomic factors that have an impact on bank loans quality in Cyprus.

3. Methodology

Consider a VAR specification in which y_(i,t) denotes a matrix with i variables relevant to the issue we seek to address. The structural VAR representation, is

$$\boldsymbol{\Delta y_t} = \boldsymbol{a} + \sum_{j=1}^{k} \boldsymbol{\beta_j \Delta y_{t-j}} + \boldsymbol{\varepsilon_t}\,, \boldsymbol{\varepsilon_t} \sim \boldsymbol{N(0, \Sigma)} \quad (1)$$

where $\boldsymbol{y_t}$ is a vector of endogenous macroeconomic variables, $\boldsymbol{\Delta}$ is the first difference operator, j is the appropriate lag length and $\boldsymbol{\varepsilon_t}$ denotes the vector of serially and mutually

uncorrelated structural innovations, with variance-covariance matrix Σ. $\boldsymbol{\beta_j}$ are the appropriate coefficients related with lag *j* of the vector of dependent variables

To elaborate on the determinants of non-performing loans in Cyprus, we first need to correctly identify the potential drivers of their behaviour. To start with, one needs to include the prevailing bank interest rate in order to account for the monetary authority's actions as well as the fact that it defines the cost of lending. For our purposes, we have employed the interest rate on new loans for house purchase, given that this is the prevailing bank lending category. Nonetheless, using another category's interest rate would have made little difference given that the simple correlation between various bank interest rates exceeds 0.90. As the interest rate would increase the level of outstanding loans, we expect it to have a positive impact on non-performing loans.

To capture the effects of lending on non-performing loans we employ the outstanding amount of both household (HH) and non-financial corporation (NFC) loans. This allows us to separate the effects on the two distinct categories of borrowers and thus provide more precise results. In order to capture the availability of funding for the loans, which can have significant effects on lending as Michail et al., (2016) show, we employ the level of total outstanding deposits. The level of funding is especially important for Cyprus, given that in the lead-up to the crisis external funds were employed to fund loans to domestic residents, while the outflow of funds just before the crisis, led to central bank funding to banks, notably in the form of Emergency Liquidity Assistance (Xiouros, 2013). The importance of funding was also evident during the crisis when continued outflows led to a diminished ability to lend by domestic banks. To this end, we expect that deposits would have a negative effect on NPLs.

The last financial variable we have employed in the estimation is the outstanding amount of non-performing loans for the HH and NFC categories. Given that it is possible that different factor are affecting the level of HH and NFC, or at least to a different extent, separating the categories would lead to more precise results, as already discussed. Furthermore, given that the definition of non-performing loans is rather broad and banks may choose to include different items, to the extent of their discretion, in their results, we choose to focus on the level of loans which are 90 days past due (90DPD), in order for the series to bear more relation to macroeconomic developments.

The interest rate, loan, and deposit series were obtained from the Monetary and Financial Statistics publication of the Central Bank of Cyprus, and specifically Tables T8, T6.1, and T2. The outstanding amount of NPLs was obtained by the "Aggregate Cyprus banking sector data" publication of the Central Bank of Cyprus. Due to the lack of available data for the 90DPD

series due to changes in definitions by the European Banking Authority, data ranges from January 2015 to February 2018, with a total of 37 observations.

To capture the extent at which macroeconomic factors affect the economy, we employ a variety of series. Notably, we use the monthly unemployment rate, as calculated by the European Central Bank's Statistical Data Warehouse, to abide by the findings of the quarterly Cyprus Labour Force Survey. Given that a higher unemployment rate during crisis periods should coincide with higher NPLs, we expect to observe a positive relationship.

To further capture macroeconomic conditions, we employ two additional indicators, namely the index of retail trade and the level of industrial production, through the industrial turnover index. Given that GDP estimates are not available on a monthly basis, the former can be viewed as a proxy for consumption during a month, while the latter reflects the level of production in the economy. To capture price effects, the inflation rate is also used, calculated as the annual percentage change in the Consumer Price Index. Inflation, retail trade and industrial turnover we obtained from the Cyprus Statistical Service. Finally, to capture any anticipation effects and to examine its usefulness as a leading indicator, we employ the Economic Sentiment Index (ESI), obtained by the European Commission website.

The variables are ordered such that the interest rate is placed first, followed by deposits, loans to HH and NFCs, industrial production, unemployment, retail trade, inflation, HH and NFC NPLs, and ESI. The order of the variables is such that changes in monetary policy can have a contemporaneous effect on the economy, with deposits (funding) having an impact on loans contemporaneously. Loans are expected to have a contemporaneous impact on the macroeconomy, while finally the whole of the preceding variables is expected to impact NPLs. Given that ESI is an index of expectations, the overall state of the economy should impact it, and hence it is ordered last.

Sample size plays an important role in this formulation, since when the time-series dimension is small, estimates of β_j can be imprecise (Weale and Wieladek, 2016). To alleviate this issue, Bayesian methods have commonly been employed, and notably the Litterman (1986) Minnesota prior. Nonetheless, this prior has the disadvantage of assuming a known variance-covariance matrix and hence it can be too tightly imposed and dominate information from the data. To avoid this issue, models can be estimated using a non-informative Normal-inverse Wishart prior as in Uhlig (2005) and Weale and Wieladek (2016).

Even though the normal-Wishart prior is more flexible than the Minnesota prior, it has its own limitations. More specifically, assuming an unknown variance-covariance matrix comes at the cost of imposing a Kronecker structure on the prior distribution. This structure creates, for each equation, a dependence between the variance of the residual term and the variance of the

VAR coefficients, which may be an undesirable assumption (see Dieppe et al., 2016). To avoid this potential drawback, we employ an Independent Normal-Wishart (INW) prior with unknown Σ and arbitrary variance-covariance matrix, Ω_0, which overcomes the Normal- inverse Wishart prior need for a Kronecker structure. It is then possible to use the Gibbs sampler to obtain random draws from the unconditional posterior distributions of the parameters of interest.

For estimation purposes, standard hyperparameter values were assumed, i.e. an autoregressive coefficient of 0.8, tightness of 0.1, cross-variable weighting of 0.5, lag decay of 1 and 100 for the exogenous variable tightness. Structural identification is achieved through triangular factorisation, which allows for variable-specific structural shocks. A total number of 2,000 iterations are employed for convergence of the algorithm, using a standard Gibbs sampler. As is common practice, the first 1,000 iterations reflect the burn-in sample and are discarded. The lag length was specified to 2 on the basis of data fit, and VAR stability was confirmed as all roots of the characteristic polynomial lie within the unit circle. Results from the estimation can be found in the section which follows.

4. Empirical results

Figure 1 presents the response of HH NPLs to shocks in the variables of the system, while Figure 2 presents the response of NFC NPLs. As already suggested, the drivers of non-performing loans appear to be very different in the two categories. In more detail, interest rate, inflation, ESI, HH loans, and NFC NPL shocks do not appear to have a significant effect on HH NPLs. In contrast, deposits appear to have a significant negative effect.

It appears that funding conditions, captured by total deposits, play an important role in the development of HH NPLs, as a shock in deposits would lower the NPL stock by 2%. This was particularly true during the period prior to the Cyprus crisis, where a large outflow of deposits was registered, creating a tightening in lending conditions and overall decrease in spending. Spending is another avenue of how deposits can potentially affect HH NPLs since, even with a constant propensity to consume out of wealth, higher deposits would indicate higher spending in the economy.

A similar, negative effect is observed for industrial production and retail trade shocks. The largest response is registered in the retail trade shock, where a 1% increase in the index would suggest a decrease in HH NPLs by approximately 0.5%. The effect from a shock in industrial production is much smaller, standing at approximately 0.1%. The impact from these shocks, in conjunction with the shock in unemployment, which causes a delayed response of close to 2% suggest that the real economy also plays an important role in the determination of NPLs. While the first two shocks are not directly related to households, it could be the case that they

are indirectly affecting them since lower production and less trade are an indication of decreased demand in the economy, which could have a corresponding effect on employment and wage conditions.

Interestingly, a shock in NFC loans appears to increase HH NPLs, with the effect lasting for only a few periods. This rather unexpected behaviour could be suggestive of a substitution effect, as the two sectors appear to be competing for available funding. The behaviour also points out that the amount of available funding is rather pre-determined as Koursaros et al., (2018) suggest. Evidence of this behaviour can also be found in the behaviour of NFC NPLs which decrease as HH NPLs increase.

NFC NPLs appear to have more or less the same number of statistically significant determinants as households, albeit with different variables affecting them. In particular, it appears that NFC loans, retail trade, unemployment, and ESI do not have any significant effect on NFC NPLs.

The most important effect on NFC NPLs appears to come from a shock in the interest rate, as it can raise NPLs by more than 20%. Such a behaviour suggests the large sensitivity of NFC NPLs to the interest rate, perhaps also due to the fact that NFCs are usually charged a higher rate than households. This makes the sector much more prone to changes in the rate, as increases could result in diminishing the repayment ability of businesses.

Deposits are also important in the case of NFC NPLs, albeit at a lag, reaching their maximum value in the fourth quarter. As the reader may observe, higher deposits appear to increase NPLs, in contrast to the behaviour observed in the HH case. However, this can be justified given that higher deposits would usually mean higher savings and hence lower consumption in the economy. As in the case of HH NPLs, deposits could indicate the availability of funding as well as the potential for consumption through financial wealth. Interestingly, a shock in HH loans appears to decrease NFC NPLs most likely due to the fact that HH loans would increase consumption and purchases from the business sector of the economy. An increase in industrial production also decreases NFC NPLs, albeit by a small extent (0.03), and only after a few quarters have elapsed.

Interestingly, a higher rate of inflation appears to have a negative effect on NFC NPLs. This could be the result of either of two factors: either higher inflation is indicative of higher growth in the economy result in more volumes sales for the firms, or higher inflation allows businesses to increase prices and hence benefit from a price effect. The effect appears not to be contemporaneous, as a couple of quarters pass by before an effect is registered.

Overall, the results suggest that macroeconomic and financial conditions have a strong effect on the state of NPLs. In particular, industrial production appears to decrease both sectors'

NPLs, albeit at a small extent. Deposits are found to be a significant determinant of both HH and NFC NPLs, albeit positive in the former and negative in the latter. The only similar effect which is registered can be found in the case of ESI, which produces no effect on either of the two sectors, suggesting that perceptions about the future do not have any significant effect on NPLs.

The results have important policy implications: given that the impact of the variables is relatively small, in order to observe a significant decline in the stock of NPLs strong and persistent growth should be observed. In particular, policies aimed at lowering unemployment could have a beneficial impact on both HH NPLs directly, as well as on NFC NPLs indirectly. This should manifest through higher growth and spending, associated with higher inflation rates which should decrease NFC NPLs.

As it appears, boosting morale does not have an impact on the level of NPLs, while higher deposits could be beneficial only if they are associated with increased lending which should lead to more trade. Importantly, the penalising high interest rates charged by banks in the case of delinquent loans also play an important role in perpetuating the NPL problem, as the estimates suggest that an increase in interest rates should mean an increase in NFC NP.

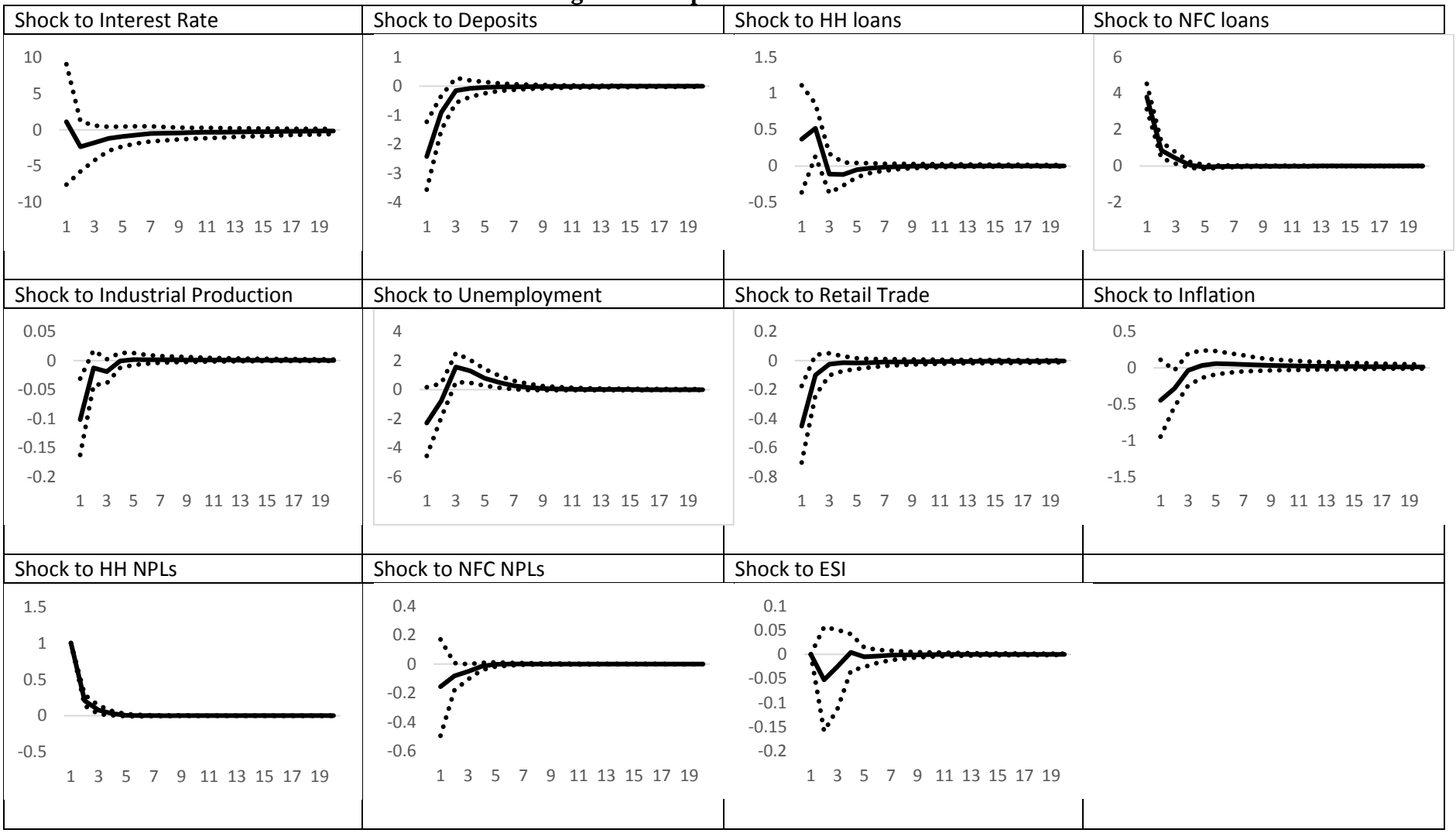
5. Conclusions

This paper has examined, for the first time in the existing literature, the macroeconomic determinants of Household and Non-Financial Corporation NPLs. Given the lack of a long series of available data, we have opted for the use of a Bayesian VAR approach with a loose enough prior to let the data speak. The results, suggest that the determinants of NPLs vary across the two sectors, with only industrial production affecting them both negatively. In contrast, deposits have been found to have a negative effect on household NPLs and a positive one on NFC NPLs.

Other important factors which affect household NPLs include the unemployment rate, NFC loans, retail trade, and household loans, while NFC NPLs are affected by household loans, household NPLs and the interest rate, which registers a very strong effect. Forward-looking variables, like the ESI, do not appear to register any important effects on NPLs. Important policy implications can be reached from the above, notably that persistent growth needs to be observed in order for a continuous decrease in NPLs to take place.

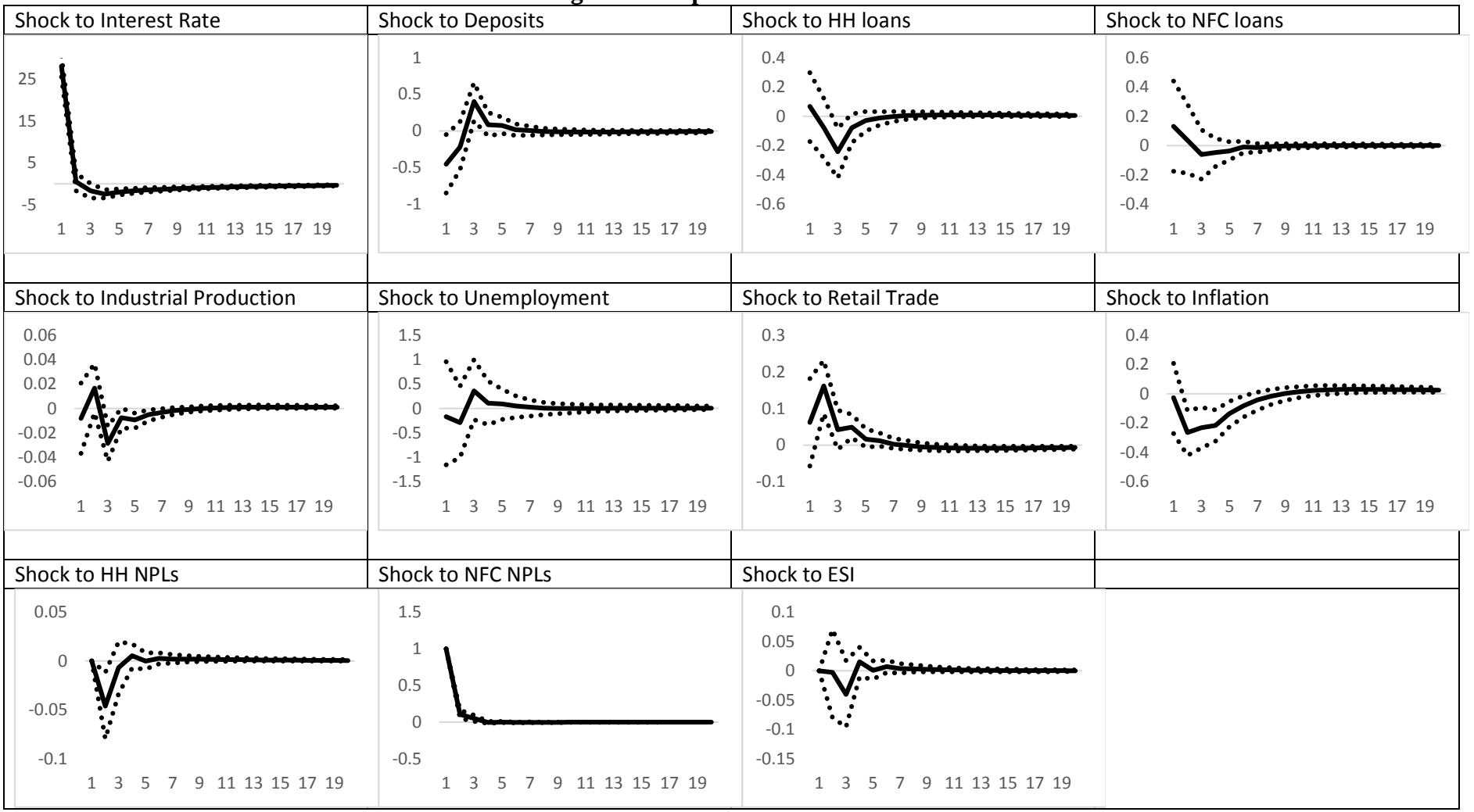
In summary, we have provided an overview of the macroeconomic factors which affect NPLs in Cyprus. Naturally, given the policy importance of the topic, more research should be devoted to it, especially once a longer series of data is made available.

Figure 1: Responses of HH NPLs



Notes: Figure reports the responses of Household NPLs to shocks in the VAR variables. Dashed lines are the 67% credible band.

Figure 2: Responses of NFC NPLs



Notes: Figure reports the responses of Non-Financial Corporation NPLs to shocks in the VAR variables. Dashed lines are the 67% credible band

References

Baboucek, I.; Jancar, M. (2005) A VAR analysis of the effects to macroeconomic shocks to the quality of the aggregate loan portfolio of the Czech banking sector. Working paper series, no. 1, Czech National Bank.

Caporale, G.M.; Di Colli, S.; Lopez, J.S. (2014) Bank lending procyclicality and credit quality during financial crises, Economic Modelling, 43, p. 142–157.

Castro, V. (2013) Macroeconomic determinants of the credit risk in the banking system: The case of the GIPSI, Economic Modelling, 31, p. 672–683.

Chaibi, H.; Ftiti, Z. (2015) Credit risk determinants: Evidence from a cross-country study, Research in International Business and Finance, 33, p. 1–16.

Clerides M., Kammas M., Kyriacou G. (2017) The Cyprus Experience in Dealing with Private Sector NPLs. In: Monokroussos P., Gortsos C. (eds) Non-Performing Loans and Resolving Private Sector Insolvency. Palgrave Macmillan Studies in Banking and Financial Institutions. Palgrave Macmillan, Cham

Crockett, A. (1997). "Why is financial stability a goal of public policy?" Economic Review-Federal Reserve Bank of Kansas City, 82, 5-22.

De Bock, R.; Demyanets, A. (2012) Bank Asset Quality in Emerging Markets: Determinants and Spillovers, IMF Working Paper, 71, March.

Dieppe, A., Legrand, R. and van Roye, B. (2016). The BEAR toolbox. European Central Bank, Working paper No. 1934.

Erdiç D.; Abazi E. (2014) The Determinants of NPLs in Emerging Europe, 2000-2011, Journal of Economics and Political Economy, 1(2), p. 112-125.

Espinoza R.; Prasad, A. (2010) Nonperforming Loans in the GCC Banking System and their Macroeconomic Effects, IMF Working Paper 224.

Evans, O.; Leone, A.M.; Gill, M.; Hilbers P. (2000) Macroprudential Indicators of Financial System Soundness, IMF Occasional Paper, no. 192.

Fofack, H. (2005). Non-performing loans in Sub-Saharan Africa: Causal analysis and macroeconomic implications, Policy Research Working Paper, No. 3769, World Bank, Washington.

Jimenez, G., Saurina J. (2006), Credit cycles, credit risk, and prudential regulation. International Journal of Central Banking, 2(2), 65-98.

Kastrati, A. (2011) The Determinants of Non-Performing Loans in Transition Countries, Financial Stability Report, June, Central Bank of the Repubic of Kosovo.

Klein, N. (2013) Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance, IMF Working Paper, 72, March.

Koursaros, D., Michail, N., Papadopoulou, N., & Savva, C. (2018). To Create or Redistribute? That is the Question. Central Bank of Cyprus Working Paper Series, No. 2018-05.

Litterman, R. (1986). “Forecasting with Bayesian Vector Autoregressions - Five years of experience”, Journal of Business and Economic Statistics, 4(1), 25-38.

Louzis, D.P.; Vouldis, A.T.; Metaxas, V.L. (2010) Macroeconomic and bank-specific determinants of nonperforming loans in Greece: a comparative study of mortgage, business and consumer loan portfolios, Working paper, September, Bank of Greece.

Makri, V.; Tsagkanos, A.; Bellas, A. (2014) Determinants of Non-Performing Loans: The Case of Eurozone. Panoeconomicus, 61 (2), p. 193-206.

Messai, A.S.; Jouini, F. (2013) Micro and Macro Determinants of Non-performing Loans, International Journal of Economics and Financial Issues, 3 (4), p. 852-860.

Michail, N. A., Koursaros, D., & Savva, C. S. (2016). The lack of persistence of interest rate changes on banks’ lending and risk taking behavior, Central Bank of Cyprus Working Paper Series, No. 2016-01.

Nkusu, M. (2011) Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies, IMF Working Paper, 161, July.

Quagliariello M (2007) Banks’ riskiness over the business cycle: a panel analysis on Italian intermediaries. Applied Financial Economics, 17(2):119–138

Rajan, R., Dhal, S.C. (2003), Non-performing loans and terms of credit of public sector banks in India: An empirical assessment. Reserve Bank of India Occasional Papers, 24(3), 81-121.

Roman A.; Bilan, I. (2015) An Empirical Analysis Of The Macroeconomic Determinants Of Non-Performing Loans In Eu28 Banking Sector. Revista Economică 67(2): 108-127.

Salas V.; Saurina J. (2002) Credit risk in two institutional regimes: Spanish commercial and savings banks. Journal of Financial Services Research 22(3):203–224.

Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification procedure. Journal of Monetary Economics, 52(2), 381-419.

Weale, M., & Wieladek, T. (2016). What are the macroeconomic effects of asset purchases?. Journal of Monetary Economics, 79, 81-93.

Xiouros, C. (2013). Handling of the emergency liquidity assistance of Laiki Bank in the bailout package of Cyprus. SSRN.

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