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Effects of bail-in on macroeconomic indicators: the case of Cyprus

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Effects of bail-in on macroeconomic indicators: the case of Cyprus

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Abstract

The unprecedented measures undertaken to address the Cyprus banking crisis generate substantial downside risks to the outlook of the economy. We quantify the impact of the contraction of deposits, associated with the agreed banking crisis management policies in Cyprus, on key macroeconomic variables using a FAVAR model and find evidence of persistent adverse effects on output and unemployment, as well as on economic confidence.

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Επιπτώσεις της διάσωσης με ίδια μέσα (bail-in) στους μακροοικονομικούς δείκτες: η περίπτωση της Κύπρου

Νικολέττα Πασιουρτίδου, Χρήστος Σάββα

Περίληψη

Τα πρωτοφανή μέτρα που πάρθηκαν στα πλαίσια διαχείρισης της Κυπριακής τραπεζικής κρίσης προκάλεσαν σημαντικούς κινδύνους απωλειών στην οικονομία και τις προοπτικές της. Η μελέτη ποσοτικοποιεί τις επιπτώσεις από τη συρρίκνωση των καταθέσεων, όπως προέκυψε από τις πολιτικές που συμφωνήθηκαν, χρησιμοποιώντας ένα FAVAR μοντέλο. Βρίσκουμε ενδείξεις σημαντικών αρνητικών επιπτώσεων στο προϊόν και στην ανεργία, καθώς και στην οικονομική εμπιστοσύνη, οι οποίες φαίνεται να διαρκούν αρκετά τρίμηνα.

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1. INTRODUCTION

The global financial crisis which triggered the deterioration of the macroeconomic conditions in Cyprus in 2009, coupled with the overexposure of the banking sector to the Greek economy, led to the rapid worsening of the public finances and to severe weaknesses in banks' balance sheets. Cyprus, as a euro area member state, requested financial aid from the European Stability Mechanism (ESM) and the International Monetary Fund (IMF) in June 2012, and an economic adjustment programme was agreed in April 2013 with the European authorities and the IMF. Besides the fiscal consolidation measures and structural reforms, the program also includes the restructuring and downsizing of the banking sector, whose size was estimated at about 700% of the country's GDP at the end of 2012. Moreover, the program agreement involved, inter alia, the sale of Greek branches of all Cypriot banks to a Greek bank, the resolution of the second largest bank and the recapitalisation of the biggest bank via the contribution of bank creditors including uninsured depositors (i.e. with deposits over €100,000); the Cypriot banking system was subsequently downsized by approximately 200% of GDP; capital controls have been enforced.

The effects of banking crises on the economy are extensively analysed in the literature, for example, by computing the costs associated with the crises in the form of output gaps, fiscal outlays for the financial sector and increases in the public debt-to-GDP ratio (e.g. Boyd et al. 2005; Laeven and Valencia 2010), or by comparing the evolution of various macroeconomic indicators prior to and during different crises episodes (e.g. Reinhart and Rogoff 2008, 2009). The persistence of output losses due to financial crises is documented in e.g. Benati (2012) and Cerra and Saxena (2008).

In the case of Cyprus the measures undertaken to address the banking crisis and the ensuing transaction restrictions were unprecedented with unpredictable consequences on the economy generating considerable downside risks to the outlook. In this note we attempt to quantify the impact of the contraction of deposits, associated with the agreed banking crisis management policies in Cyprus, on a number of macroeconomic indicators using a FAVAR model. Deposits can be viewed as wealth or income, through earned interest, for households and firms, as well as a form of working capital for businesses. Thus, the effects of loss of possession of or access to deposits can be complex involving the real economy, the financial sector (e.g. credit supply) and economic sentiment. Our main findings suggest that the abrupt downsizing of the banking sector that

results in the loss of uninsured deposits can have persistent adverse effects on output and unemployment, as well as on economic confidence.

The rest of the paper is outlined as follows. Section 2 describes the data and the model, section 3 presents the results, and section 4 offers our conclusions.

2. DATA AND METHODOLOGY

We use seasonally adjusted quarterly data over the period 1995Q1-2012Q4 on about 200 series covering domestic and foreign real economy, trade, prices, exchange rates, interest rates and spreads, stock exchanges indices, economic sentiment indicators and banking sector variables such as deposits, loans and reserves.[1] The non-stationary variables are rendered stationary via an appropriate transformation such as first differences of levels or logarithms.[2] Subsequently, the stationary data are standardized prior to the analysis.

Let X_t denote a $N \times 1$ information matrix that contains hundreds of economic time series; Y_t a $M \times 1$ vector of endogenous economic variables that normally contains a few predictors and constitutes a subset of X_t. The usual approach is to employ a VAR or Structural VAR using data for Y_t alone to estimate various macroeconomic relationships. Nevertheless, in many applications, additional economic information (not fully captured by Y_t) may be relevant to modeling the dynamics of these series. Therefore, let us suppose that F_t, a $K \times 1$ vector of unobserved factors can summarize most of the information contained in X_t. We might think of the unobserved factors as reflecting concepts that cannot easily be represented by specific series but rather are reflected in a wide range of economic variables.[3]

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[1] The data are obtained from the Statistical Services of Cyprus, Central Bank of Cyprus, Eurostat, European Commission (DG-ECFIN) and Datastream.

[2] The complete list of variables in the dataset along with their transformations are available upon request.

[3] For further details we refer to Bernanke et. al. (2005) and Stock and Watson (2005).

The joint dynamics of (F_t', Y_t') and the static representation of a dynamic factor model (X_t, F_t, Y_t) are given by the following equations:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \upsilon_t \qquad (1)$$

$$X_t = \Lambda^f F_t + \Lambda^y Y_t + v_t \qquad (2)$$

where $\Phi(L)$ is a conformable lag polynomial of finite order d, which may contain a priori restrictions as in structural VAR literature.[4] The error term υ_t is mean zero with covariance matrix Q. Λ^f is a $N \times K$ matrix of factor loadings; Λ^y is a $N \times M$ matrix of loading factors; v_t is the vector of error terms which are zero mean and will be assumed to display a small amount of cross-correlation.[5]

The crucial point of this FAVAR model (1-2) is that the amount of information that can be handled by the model changes dramatically $(M + K << N)$. F_t and Y_t, represent pervasive forces that drive the common dynamics of X_t. The main advantage of the static representation of the dynamic factor model described by equation (2) is that factors can be estimated by principal components (see Stock and Watson, 1998, 2002, 2005). The appropriate number of factors is chosen based on the variability in the data set explained by the factors. [6]

Having estimated the factors F_t, it is possible to estimate the dynamic equation (1), which is a FAVAR model, by replacing the true factors F_t with the estimated ones. This model, like standard VARs, requires an identifying assumption for the

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[4] The appropriate lag order given by BIC criterion is one.

[5] As it will become clear in the next few lines, the estimation of the factors is achieved via the principal component method. This method allows for some cross-correlation in v_t that must vanish as N goes to infinity. See Stock and Watson (2002) for a formal discussion of the required restrictions on the cross-correlation of v_t.

[6] We set our threshold at 80%.

policy shock. Following Bernanke et. al. (2005) we assume a Cholesky identification scheme.[7]

3. EMPIRICAL APPLICATION

We investigate the effects of the banking sector downsizing by estimating the dynamic responses of some macroeconomic variables to a negative shock to total deposits.[8] A FAVAR model that describes the dynamic relationships between deposits, CPI, real GDP, unemployment rate and a small number of 'foreign' and 'domestic' factors was estimated using quarterly data for the period 1995Q1-2012Q4.

We estimate foreign and domestic factors using two separate datasets of international/foreign and domestic series. The resulting foreign factors summarize a large number of foreign series such as stock exchange indices, interest rates, economic sentiment and activity indicators; domestic factors represent leading variables of the Cypriot economy such as sales, foreign trade and tourism indicators, stock market and confidence data. For both foreign and domestic datasets two factors are sufficient to explain for more than 80% of the variability in the data.
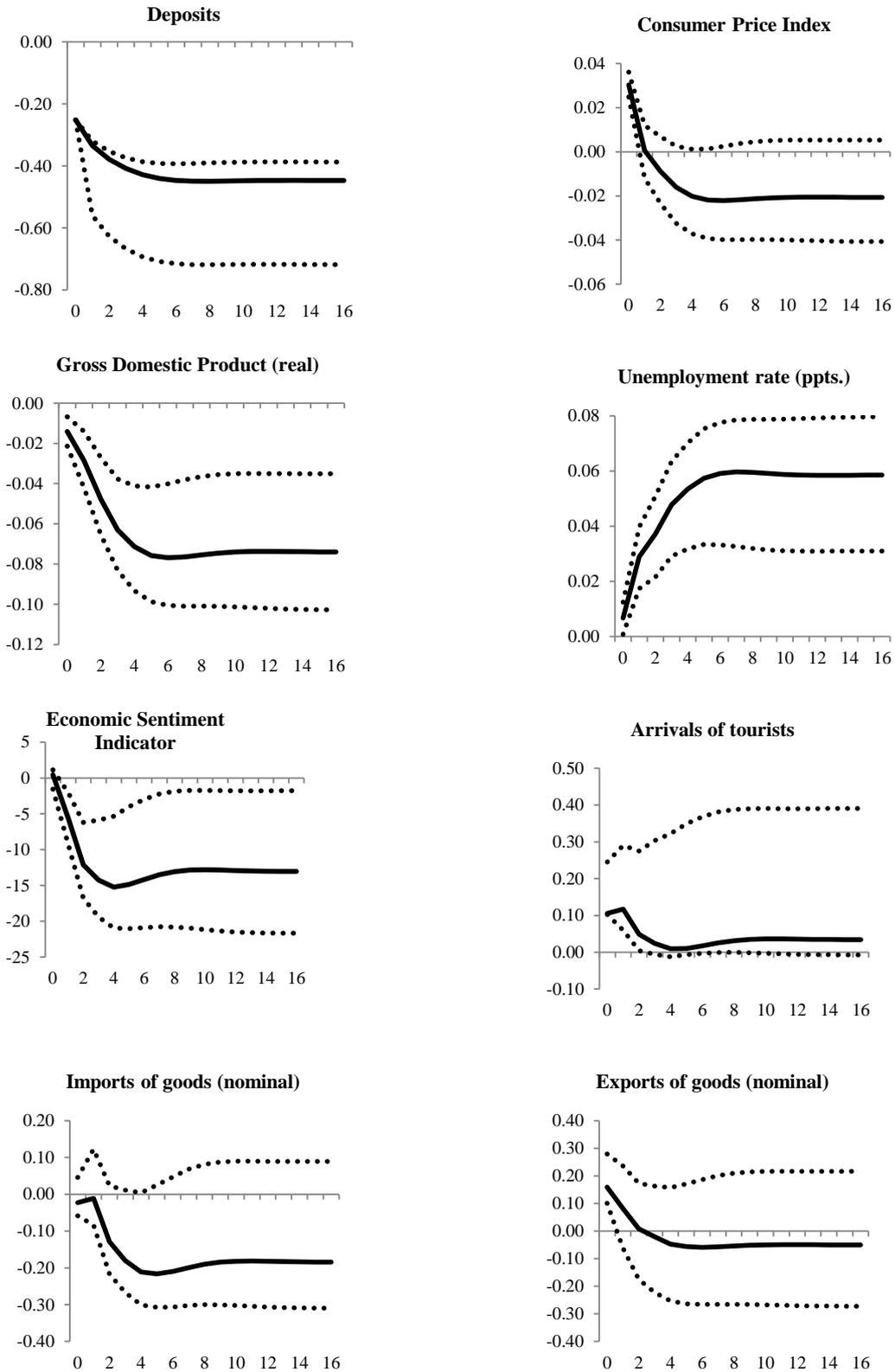
The estimated FAVAR model is used to simulate the effects of a shock in the form of 30% decrease in total deposits.[9] Figure 1 shows the percentage change in deposits, CPI and real GDP, as well as the change, in percentage points, in the unemployment rate, triggered by the negative shocks in deposits at period 0. The responses of the variables are plotted over a horizon of four years in the form of cumulative effects. Deposits react with a continuous decline lasting for about seven quarters after the shock. Prices respond positively on impact but subsequently they drop; after about five quarters the price level is stabilized and CPI inflation is lower by about 2 percentage points.

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[7] Of course, we can also adopt other identification schemes which are available in the VAR literature (see, for example, Leeper et al., 1996; Bernanke and Mihov, 1998; Uhlig, 2005).

[8] The analysis does not consider the sale of Greek operations of the banks.

[9] The outflow of deposits during the run-up to the program agreement (January - March 2013) amounts to about EUR 6.4 bn. (Central Bank of Cyprus, 2013) and the loss of deposits due to the resolution of one bank and to the swap of uninsured deposits for equity is estimated to EUR 8.3 bn. (European Commission, 2013). As the exact magnitude of the reduction in deposits due to recapitalization needs is not yet known we simulate a reduction in total deposits of about 30% compared to 2012Q4 that reflects the total drop in deposits in the banking system.

Figure 1: Effects of deposit shock on macroeconomic indicators

Deposits

Consumer Price Index

Gross Domestic Product (real)

Unemployment rate (ppts.)

Economic Sentiment Indicator

Arrivals of tourists

Imports of goods (nominal)

Exports of goods (nominal)

Note: The impulse responses are given by the solid; the dotted lines indicate the endpoints of a 68% bootstrapped confidence interval (point estimates were obtained using 1500 boostrapped replications).

The adverse effects of the deposit shock on real GDP and unemployment are apparent on impact. Output decline persists for up to six quarters after the shock when real GDP is estimated to fall cumulatively by 8%. The response of the unemployment rate is also quite persistent and fades away about two years after the shock when unemployment is found to rise by 6 percentage points.

The inclusion of domestic factors in the analysis enables us to estimate the response of leading indicators to a shock to deposits. Figure 1 also presents the effects of the negative deposit shock to the Economic Sentiment Indicator (ESI), tourist arrivals and nominal imports and exports of goods. Following the deposit shock, economic confidence weakens severely; ESI drops by 6 units in the first quarter and bottoms out four quarters after the shock. In subsequent years ESI remains well below its pre-shock level.

There is evidence of a positive response of tourist arrivals to the deposit shock, possibly as a result of the decline in the domestic price level resulting in improved competitiveness of Cyprus as a tourist destination. When the response of tourist arrivals to the shock dies out they are higher by about 3.5%. A small negative reaction of imports of goods (in nominal terms) is found on impact, followed by a large reduction up to five quarters after the shock. Exports of goods (in nominal terms) react positively to the deposit shock on impact and during the first two quarters. By the third quarter after the shock exports begin to fall for about three consecutive quarters and afterwards they stabilize at about 5% below their pre-shock level. The responses of imports and tourist arrivals to the deposit shock indicate that the performance of net exports could mitigate to some extent the decline in output.

4. CONCLUSIONS

This study quantifies some of the effects of the abrupt banking sector downsizing via the participation of uninsured depositors, undertaken in Cyprus as part of the April 2013 agreement for financial aid from the ESM and the IMF. We find that the unprecedented measures undertaken to address the Cyprus banking crisis, modeled as a negative shock to total deposits, can result in considerable and persistent adverse effects on output, unemployment and economic confidence.

When more data become available, output losses of the banking crisis can be estimated and compared to those associated with downturns in other countries where different policies(e.g. bailout) were followed to resolve financial crises.

REFERENCES

Bernanke, B., Boivin, J., Eliasz, P.S., 2005. Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach. *The Quarterly Journal of Economics* 120 (1), 387–422.

Bernanke, B., Mihov, I., 1998. Measuring monetary policy. *The Quarterly Journal of Economics* 113 (3), 869–902.

Benati, L. 2012. Estimating the financial crisis' impact on potential output. *Economics Letters* 114 (1), 113-119

Boyd, J. H., Kwak, S., Smith, B., 2005. The real output losses associated with modern banking crises. *Journal of Money, Credit and Banking* 37(6), 977-999.

Central Bank of Cyprus, 2013. Monetary and Financial Statistics April 2013. http://www.centralbank.gov.cy/nqcontent.cfm?a_id=9837&lang=en

Cerra, V., Saxena, S. C., 2008. Growth dynamics: the myth of economic recovery. *American Economic Review* 98 (1), 439-457.

European Commission, 2013. The economic adjustment programme for Cyprus. European Economy - Occasional Papers 149, May 2013, Directorate General – Economic and Financial Affairs.

Leeper, E.M., Walker, T.B., Yang, S.-C.S., 2008. Fiscal foresight: analytics and econometrics. *NBER Working Papers* No. 14028.

Laeven, L., Valencia, F., 2010. Resolution of banking crises: the good, the bad and the ugly. IMF Working Paper WP/10/146.

Reinhart, C. M., Rogoff, K. S. 2008. Is the 2007 US sub-prime financial crisis so different? An international historical comparison. *American Economic Review: Papers & Proceedings* 98(2), 339-344.

Reinhart, C. M., Rogoff, K. S. 2009. The aftermath of financial crises, NBER Working paper No. 14656.

Stock, J.H., Watson, M.W., 1998. Diffusion indexes. *NBER Working Paper* No. 6702.

Stock, J.H., Watson, M.W., 2002. Macroeconomic Forecasting Using Diffusion Indexes. *Journal of Business and Economic Statistics* 20 (2), 147-162.

Stock, J.H., Watson, M.W., 2003. Has the business cycle changed? In: Proceedings of the Symposium on ''Monetary Policy and Uncertainty'', pp. 9–56.

Stock, J.H., Watson, M.W., 2005. Implications of Dynamic Factor Models for VAR Analysis. *NBER Working Papers* No. 11467.

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.

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