MONETARY POLICY EFFECTS ON THE FLOW OF FUNDS OF NON-FINANCIAL CORPORATIONS AND HOUSEHOLDS IN PORTUGAL*

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1. INTRODUCTION

The recent financial crisis triggered a renewed interest in studying the interaction between real and financial factors. Understanding how agents' financial decisions respond to shocks is an important step to ascertain this interaction. This study uses flow of funds data from the national financial accounts compiled by Banco de Portugal to analyze the response of non-financial corporations and households in Portugal to a monetary policy shock. The aim is to obtain results that provide valuable indications for the study of the monetary policy transmission mechanism in Portugal and also for macroprudential analysis.

Similar studies were conducted for the US, Italy and the euro area (see Christiano *et al*., 1996; Bonci and Columba, 2008; and Bonci, 2010). They analyze the effects of a monetary policy shock in a VAR model extended to include a range of flow of funds data from various economic sectors. Our approach is broadly similar. The main contribution is the development of an empirical model suitable for analyzing the transmission of a monetary policy shock to a small economy highly integrated with the euro area. Accordingly, we defined a VAR with two blocks, one for the euro area and one for Portugal and assumed that the euro area variables are exogenous to Portugal. This simple model is then used to assess how a wide range of variables from the flow of funds of the national financial accounts react to a monetary policy shock.

The results broadly confirm that the Portuguese economy reacts to a monetary policy shock in a similar way as found in other studies for other economies. After a contractionary monetary policy shock, net funds raised by non-financial corporations rise, reflecting an increase in the issue of financial liabilities that exceeds the increase in the acquisition of financial assets. As for households, we find that net funds raised also increase after a contractionary monetary policy shock, but in this case as a result of a decline in financial assets that is stronger than that of liabilities. We also find some puzzling effects. In particular, the short-run increase in loans to non-financial corporations and the higher acquisition of equity by non-financial corporations following a contractionary monetary policy shock. These results are also found in similar studies for other countries.

2. BRIEF DESCRIPTION OF THE MODEL

The model used in this study is a VAR model with two blocks: one for the euro area (EA) and one for Portugal (PT). The euro area bloc influences the Portuguese bloc but is exogenous to it. This simplification is justified by the low weight of Portugal in the euro area economy. The structural model is given by the following system (omitting constants):

$$\begin{bmatrix} A_0 & 0 \\ A_1 & A_2 \end{bmatrix} \begin{bmatrix} Y_t^{AE} \\ Y_t^{PT} \end{bmatrix} = \begin{bmatrix} B(L) & 0 \\ C(L) & D(L) \end{bmatrix} \begin{bmatrix} Y_{t-1}^{AE} \\ Y_{t-1}^{PT} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{AE} \\ \varepsilon_t^{PT} \end{bmatrix} \tag{1}$$

Where Y_t is a vector of endogenous variables, A_0 is the matrix of contemporary relations of euro area variables, A_1 is the matrix of contemporary reaction of Portuguese variables to euro area ones, A_2 is the matrix of contemporary relations among Portuguese variables, $B(L)$, $C(L)$ and $D(L)$ are matrix polynomials in the lag operator L and ε_t is a vector of structural shocks. The zero restrictions impose the necessary exogeneity of the euro area bloc relative to Portugal.

The euro area bloc is assumed to be exogenous and therefore can be estimated autonomously, as if it were a single VAR. The VAR for the euro area includes the following endogenous variables: real GDP (y), the GDP deflator (py) and a nominal short-term interest rate which is the three-month Euribor $(r3m)$:[1]

$$Y^{AE} = \left(y_t, py_t, r3m_t \right) \tag{2}$$

The choice of these variables parallels that of other studies on the transmission mechanism of monetary policy in the euro area using VARs (see for instance Monticelli and Tristani, 1999, Peersman and Smets, 2001, Ciccarelli *et al.*, 2009, Weber *et al.*, 2009 and Bonci, 2010). The choice of a restricted set of variables is dictated by the relatively small size of the sample of quarterly flow of funds data, which covers only the period 1998:1-2009:2, and by the need to avoid as much as possible the pre-euro period for which there is more uncertainty in the identification of the monetary policy shock (see Boivin *et al.*, 2008 and Weber *et al.*, 2009).

All variables are seasonally adjusted and expressed in logarithms of the respective levels, except for the interest rate that is in levels. The VAR is estimated with two lags for each variable, whose choice was based on the usual lag selection information criteria and the verification of the absence of auto-correlation of the residuals (see Gameiro and Sousa, 2010).

We assumed that the central bank responds contemporaneously to changes in economic activity and prices in the euro area but monetary policy affects these variables with a certain lag (imposing the necessary restrictions on the matrix A_0).

Chart 1 presents the estimated monetary policy shocks in the euro area in the period under review.

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[1] The real GDP is obtained from the Eurostat, the GDP deflator is obtained from the ECB Area Wide Model database and the three-month Euribor rate is obtained from Thomson Reuters (backdated to 1998 using the ECB Area Wide Model database).

According to the estimates, the monetary policy stance was relatively tight throughout the year 2000, in the second quarter of 2002 and in the third quarter of 2008. The monetary policy shocks were relatively larger at the start of the euro. They became smaller and generally negative from the start of the "pause in growth" in economic activity that took place in 2003 and until the intensification of the financial turbulence in the second half of 2008. The monetary policy shocks became negative again in the second quarter of 2009, suggesting the return to an accommodative stance.

The responses of GDP and prices to the euro area monetary policy shock are in line with expectations (Chart 2). In the euro area, the typical monetary policy shock is around 30 basis points in the short-term interest rate and the effect of the shock vanishes after about 4 quarters. GDP falls in response to a contractionary monetary policy shock, reaching a trough after 5 quarters and returning to the baseline thereafter. The response of prices is more sluggish and more persistent, reaching a trough about 10 quarters after the shock.

The effects of a monetary policy shock in Portugal are obtained by estimating and simulating model (1) as a whole. The VAR bloc for Portugal includes as endogenous variables real GDP and the price level (measured by CPI).[2] We add to each equation the current value of the euro area real GDP and the 3 month-Euribor lagged one period as exogenous variables.[3] The Euribor is lagged one period to mimic the timing implicit in the euro area VAR in the transmission of monetary policy shocks to output and prices. The computation of the impulse responses for Portugal involves the simulation of the monetary policy shock in the euro area bloc (which implies a temporary increase in the short-term interest rate of about 30 basis points) and the analysis of its propagation to the Portuguese bloc. The exercise thus assumes that Portuguese economic agents expect the ECB to follow the monetary policy rule implicit in the euro area VAR.

Chart 1

ESTIMATED MONETARY POLICY SHOCKS IN THE EURO AREA
Three quarter centered moving average
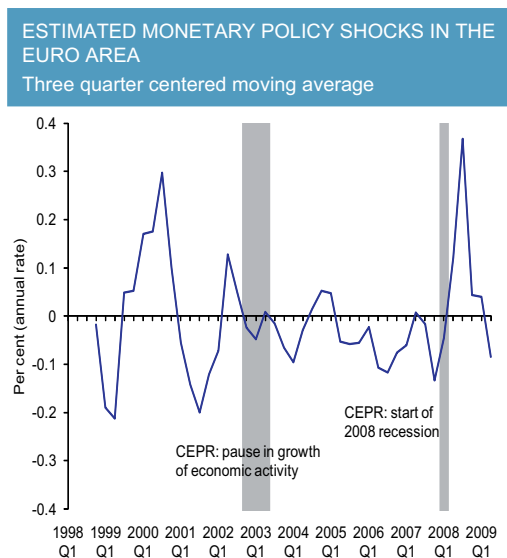
Sources: Gameiro and Sousa (2010) and CEPR.

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(2) Data for Portuguese real GDP and prices are obtained from *Instituto Nacional de Estatística* (Statistics Portugal).

(3) This means that matrix A_t has zeros in all columns except in the first one.

Chart 2

RESPONSES TO A CONTRACTIONARY MONETARY POLICY SHOCK: EURO AREA VARIABLES
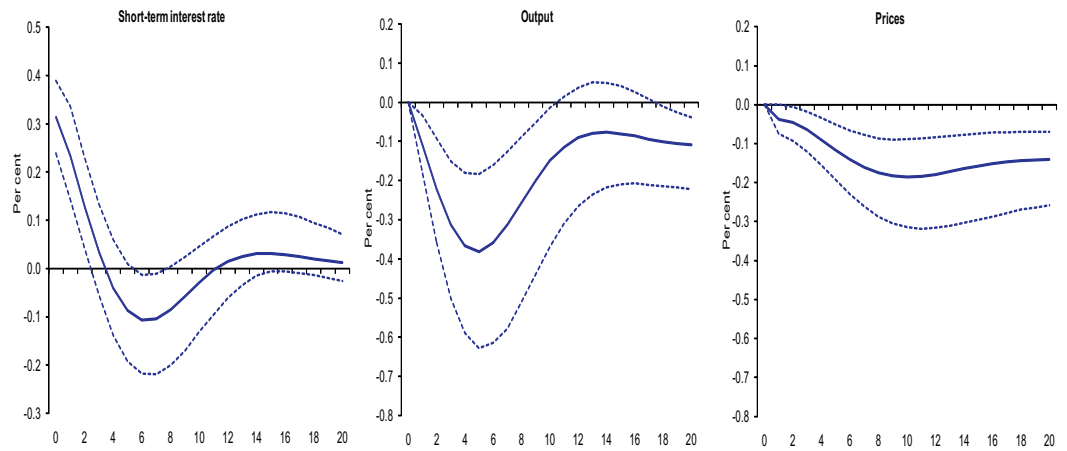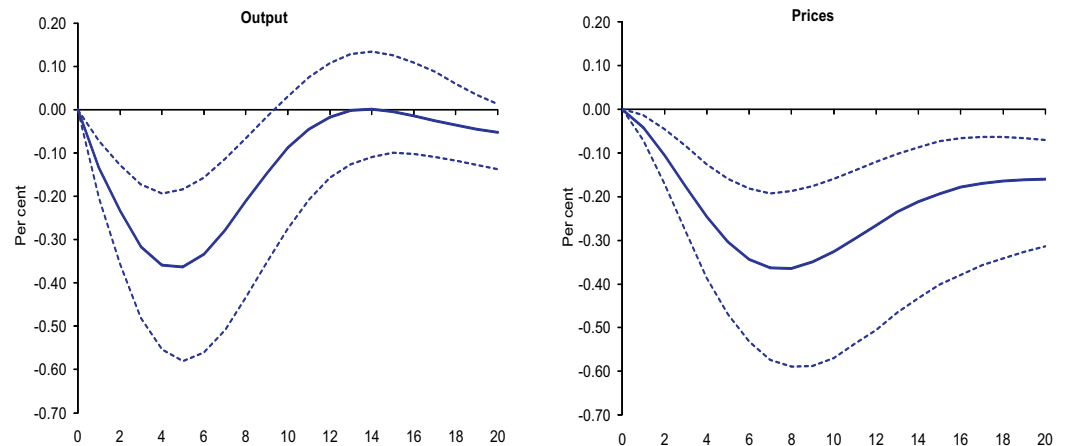

Note: Deviations from baseline. The full line represents the median impulse response using bootstrap (10 000 replications) and the dashed lines represent the 90% confidence band.

The results of the impact of a monetary policy shock on GDP and prices in Portugal are similar to those of the euro area (Chart 3). Real GDP drops with the trough being reached around 5 quarters after the shock, the price level also falls relative to baseline, reaching a minimum around 8 quarters after the shock. Compared to the euro area results, the effect of the monetary policy shock in Portugal is quicker and stronger on prices (a drop of around 0.4 p.p. compared with 0.2 p.p. in the euro area) but similar in the case of real GDP (a drop of around 0.4 p.p. of GDP).

Chart 3

EFFECT OF MONETARY POLICY SHOCK ON MACROECONOMIC VARIABLES IN PORTUGAL

Note: Deviations from baseline. The full line represents the median impulse response using bootstrap (10 000 replications) and the dashed lines represent the 90% confidence band.

3. THE EFFECTS OF A MONETARY POLICY SHOCK ON THE FLOW OF FUNDS OF NON-FINANCIAL CORPORATIONS AND HOUSEHOLDS

The main objective of this study is to determine the responses of Portuguese financial variables to a monetary policy shock. We used the National Financial Accounts compiled by Banco de Portugal, which provide a consistent statistical system of financial transactions and outstanding amounts in the Portuguese economy.

To analyze the effect of a monetary policy shock in the euro area on the borrowing and lending activities of the non-financial corporations and households in Portugal we resorted to the so-called "marginal approach". According to this approach, financial variables are individually added to the set of endogenous variables in the VAR for Portugal, implicitly admitting that they do not influence monetary policy in the euro area, but react contemporaneously to a monetary policy shock.

In line with Christiano *et al*. (1996), Bonci and Columba (2008) and Bonci (2010), we pay particular attention to the variable "net funds raised" by the different sectors, which corresponds to the difference between the issuance of financial liabilities and the acquisition of financial assets in a given period. This concept is linked to the Non-financial Accounts since for each sector the difference between fixed investment and gross savings gives rise to a net financial position towards the rest of the economy (i.e. borrowing requirements if positive or lending capacity if negative). It follows that the balance of Financial Accounts and Non-financial Accounts tends to be the same, except for possible statistical discrepancies. For any given sector:

$$I - S = \Delta FL - \Delta FA = Net\ funds\ raised$$

Where I represents the investment, S is saving, ΔFL the issuing of financial liabilities and ΔFA the acquisition of financial assets.

The original series have been seasonally adjusted and deflated using the GDP deflator (the base year is 1998).[4] The financial accounts are consolidated, so intra-sectoral transactions are netted out. According to the data, households have been in general net lenders, whereas non-financial corporations have been, with few exceptions, net borrowers. In the more recent period, with the turmoil in financial markets and the deteriorating economic activity, the net lending of households increased significantly, while the net borrowing by non-financial corporations declined, resulting in an increase in net savings of the domestic private non-financial sector.

Non-financial corporations

Starting with non-financial corporations, the impulse responses to a contractionary monetary policy shock of 30 basis points show an increase in net funds raised for two to three quarters after the shock (Chart 4). The maximum response corresponds to 6 percent of the average quarterly flows of this variable in the sample period. The increase in net funds raised by this sector after a contractionary

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(4) The series were seasonally adjusted using the U.S. Census Bureau X12 seasonal adjustment program.

Chart 4

FINANCIAL FLOWS OF NON-FINANCIAL CORPORATIONS

Response to a contractionary monetary policy shock
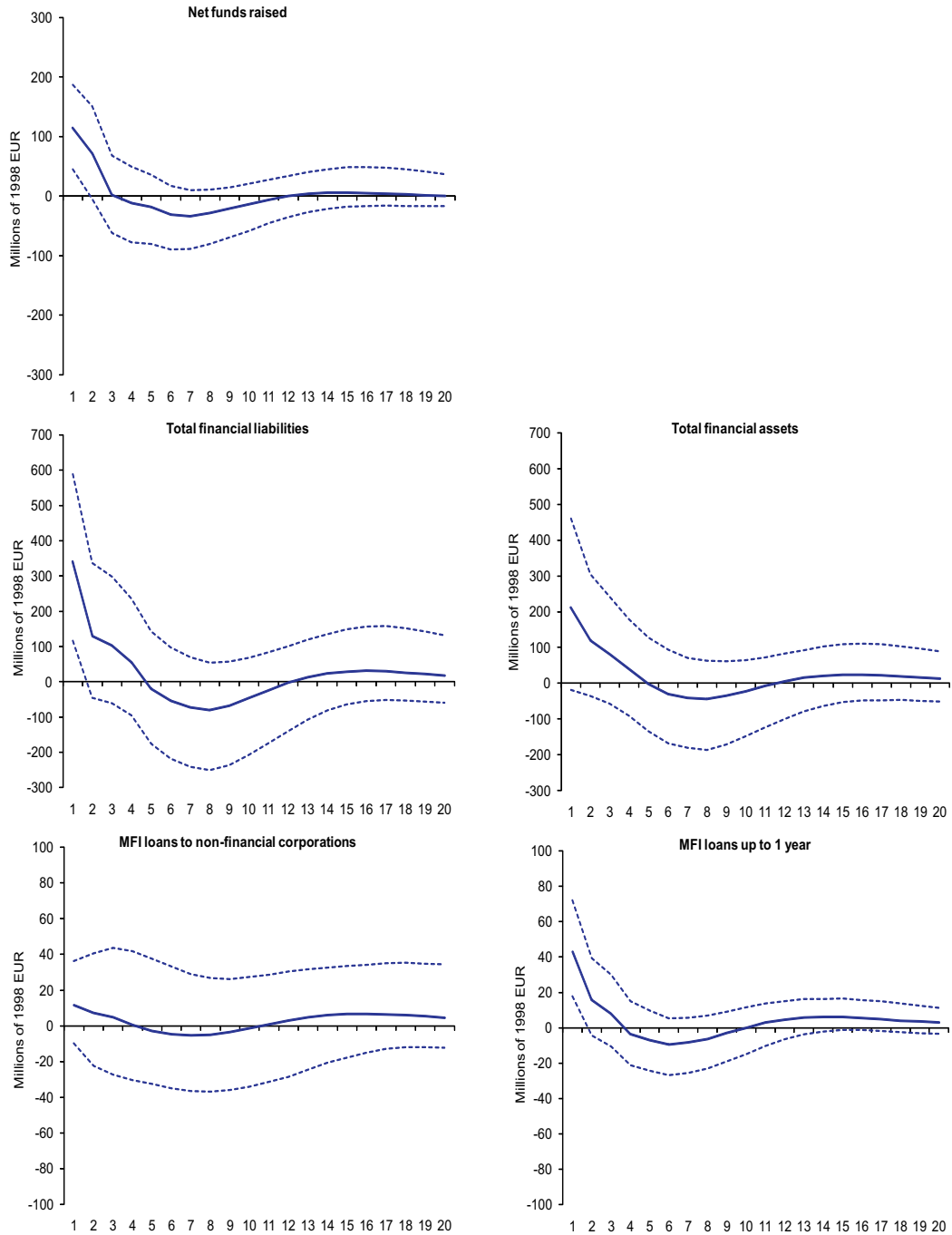
Note: Deviations from baseline. The full line represents the median impulse response using bootstrap (10 000 replications) and the dashed lines represent the 90% confidence band. The flows on MFI loans are obtained from the relation between the outstanding amounts of bank loans, adjusted for securitisation operations, and the monthly transactions, which are calculated from the outstanding amounts corrected of reclassifications, write-offs/write-downs, exchange rate changes and price revaluations.

shock seems to be counter-intuitive. However, a similar result is found for the United States by Christiano *et al.* (1996) and for the euro area as a whole by Bonci (2010) (Table 1).[5] Note that the confidence level used to evaluate the statistical significance of impulse response in this study is higher than the one used in the studies mentioned, which use a confidence interval of one standard deviation.

Christiano *et al.* (1996) suggest that this result points to the existence of frictions that prevent firms from adjusting their nominal expenditures quickly after the shock. In particular, there are contracts in place that prevent firms from adapting their level of inventories immediately to the lower level of demand brought about by the monetary policy shock. Given that the possibility of financing through the use of internal funds is reduced after the shock – due to the negative impact on profits of a contractionary monetary policy shock - firms need to resort to external funds to finance their working capital.

The impulse response functions of the components of net funds raised by non-financial corporations show that they increase both the acquisition of financial assets and the issuance of liabilities, but with a much stronger impact on liabilities (Chart 4).

Looking further into the details of the breakdown of the liability side, it can be seen that after the monetary policy shock non-financial corporations increase their financing both through loans and via trade credit. One should, however, keep in mind that these loans include not only Monetary Financial Institutions (MFI) loans but also loans provided by other sectors, including households. Thus the increase in total loans after the shock could also reflect operations involving households, for instance loans provided by shareholders to corporations which have been found to be relevant in Portugal.

To better understand the response of loans to non-financial corporations after a monetary policy shock, we examined the data of MFI loans stemming from the monetary statistics.[6] The results su-

Table 1

IMPACT OF A CONTRACTIONARY MONETARY POLICY SHOCK				
	US	**Euro area**	**Italy**	**Portugal**
	Christiano, Eichenbaum and Evans (1996)	**Bonci (2010)**	**Bonci and Columba (2008)**	**Gameiro and Sousa (2010)**
	Sample 1961:1992	**Sample 1999Q1: 2009Q2**	**Sample 1980:2002**	**Sample 1998Q1: 2009Q2**
	Response	**Response**	**Response**	**Response**
Non-financial corporations				
Net funds raised	Increase	Increase	Small increase	Increase
Financial liabilities	Increase	Increase	Decrease	Increase
Financial assets	Increase	Increase	Decrease	Increase
Households				
Net funds raised	Unchanged	Increase	Decrease	Increase
Financial liabilities	Small decrease	Decrease	Decrease	Decrease
Financial assets	Not significant	Decrease	Increase	Decrease

(5) It should be noted that the differences aross studies in Table 1 refflect not only differences across countries but also different sample periods. In fact, only Bonci (2010) uses a sample similar to the one of the current study.

(6) The flows on MFI loans are obtained from the relation between the outstanding amounts of bank loans, adjusted for securitisation operations, and the monthly transactions, which are calculated from the outstanding amounts corrected of reclassifications, write-offs/write-downs, exchange rate changes and price revaluations.

ggest that the response to a monetary policy shock of loans granted by MFIs to non-financial corporations is not statistically significant (Chart 4). This result contrasts with that obtained in Bonci (2010) for the euro area, according to which MFI loans to non-financial corporations decrease after a contractionary monetary policy shock. However, using data by maturity, we see that the statistically insignificant response of MFI loans masks different behaviours of short-term and long-term loans. In fact, very short-term MFI loans (with maturities up to one year) rise, but the response of longer maturity loans is statistically insignificant. This reaction of short-term financing is in line with the existence of frictions, as short-term loans are typically more associated with the financing of inventories and working capital (see Christiano *et al.*, 1996).

Giannone *et al*. (2009) put forward explanations for the increase in euro area MFIs loans to firms in response to monetary policy tightening, namely that this may be associated with the use of credit lines previously agreed and still available. Once committed, the conditions on funds from these credit lines can not generally be immediatly changed. Therefore, even after the monetary policy shock, corporations with pre-committed loan facilities might still be able to obtain funds on cheaper terms and be less subject to any quantitative restrictions on credit than other firms.

Turning now to the financial assets side, non-financial firms buy more equity after a contractionary monetary policy shock and, to a lesser extent, also grant more loans to other sectors. The higher accumulation of equity is a puzzling result. Bonci (2010) finds a similar result for the euro area, and tentatively argues that it might reflect augmented M&A activity, reflecting firms' willingness to re-organize themselves in view of the decreased profitability associated with the expected slowdown of economic activity. This kind of argument is more difficult to apply to the case of Portugal given that, contrary to the euro area data, the Portuguese flow of funds data used in this study are consolidated. Thus, shares and other equity acquired by non-financial corporations can only have been issued by the financial sector or by non-residents. A tentative explanation of this result is that it may reflect financial operations between firms located in Portugal and firms located abroad and belonging to the same economic group.

Households

Chart 5 shows the impulse response of the financial assets and liabilities of households to a contractionary monetary policy shock. As non-financial corporations, households also significantly increase net funds raised. This behaviour could be related to consumption smoothing given that, typically, disposable income is negatively affected by the shock. The maximum effect is reached in the first quarter, corresponding to about 9 per cent of average quarterly flows in the sample period, and the impact vanishes from the third quarter onwards. In terms of components, the increase in net funds raised by households is the result of a decrease in the purchase of assets that exceeds the decrease in liabilities.

With respect to financial liabilities, households reduce the funds borrowed through loans in response to a monetary policy shock. A more detailed analysis of the loans, based on MFI data, shows a significant decrease in loans for house purchase, which lasts about a year after the shock (Chart 5). The

Chart 5

FINANCIAL FLOWS OF HOUSEHOLDS

Response to a contractionary monetary policy shock
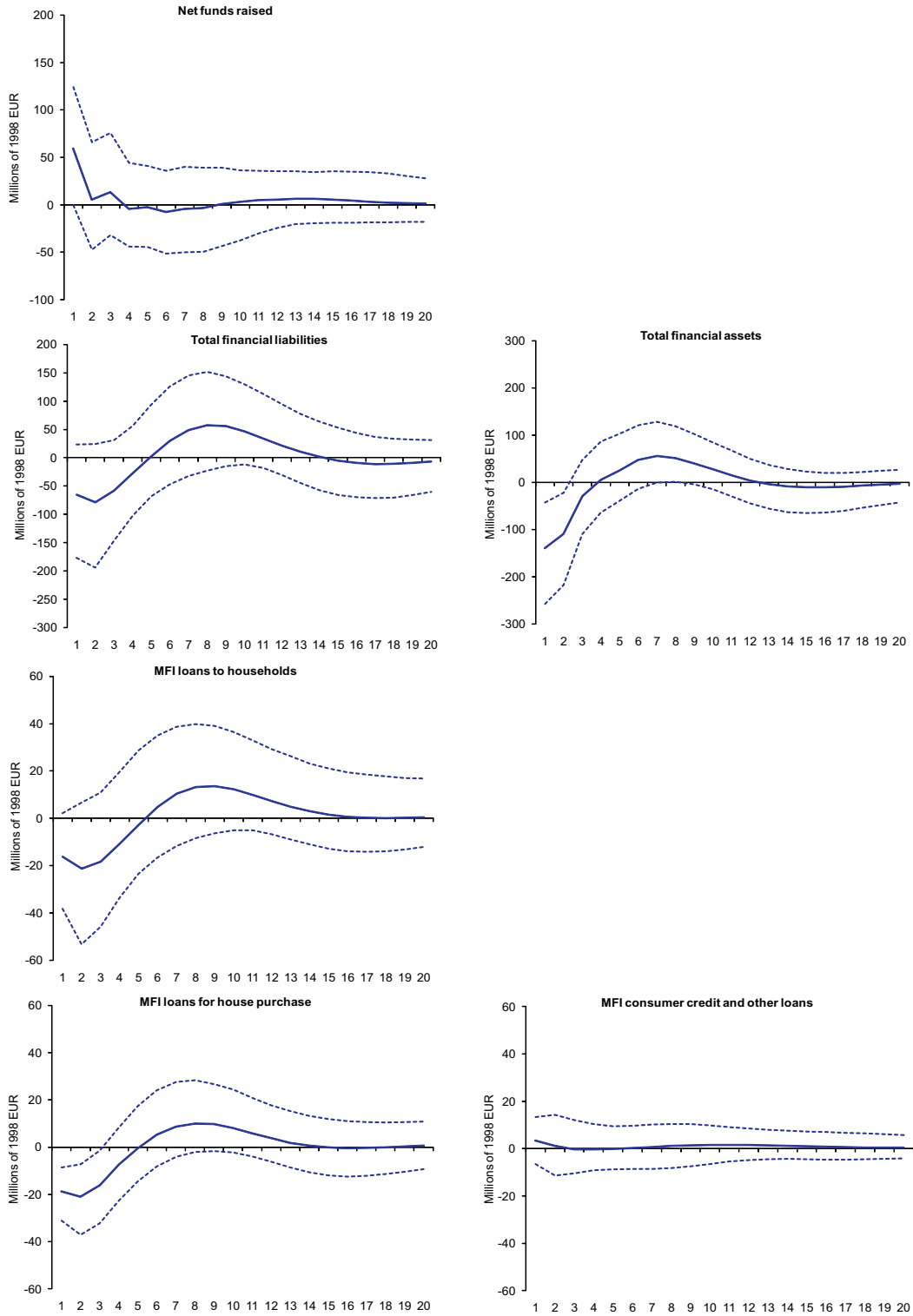
Note: Deviations from baseline. The full line represents the median impulse response using bootstrap (10 000 replications) and the dashed lines represent the 90% confidence band. The flows on MFI loans are obtained from the relation between the outstanding amounts of bank loans, adjusted for securitisation operations, and the monthly transactions, which are calculated from the outstanding amounts corrected of reclassifications, write-offs/write-downs, exchange rate changes and price revaluations.

decrease in MFI loans to households for house purchase is probably a result of declining demand, but may also reflect tighter supply conditions, as credit institutions adjust credit conditions in response to a deteriorating macroeconomic outlook. The observed decrease in loans for house purchase in Portugal is consistent with the results for the euro area of Bonci (2010) and Giannone *et al.* (2009). In contrast, the response of consumer loans is not statistically significant, similar to the results found by Giannone *et al.* (2009) for the euro area. One explanation for this result is that bank interest rates on consumer loans contain a significant risk premium and, as shown in Castro and Santos (2010), seem to be less reactive and do not adjust fully to changes in money market interest rates.

Overall, in response to a contractionary monetary policy shock, households not only reduce the accumulation of financial assets but also carry out an adjustment in the composition of their asset portfolio. In particular, in the context of a deterioration of economic perspectives, households tend to reduce investment in financial assets with higher market risk in favour of financial assets with lower risk.

Evidence from other studies on the response of households is heterogeneous. The results of Bonci (2010) for the euro area are qualitatively similar to those obtained for Portugal. After a monetary policy shock households initially increase the net funds raised, reducing the acquisition of financial assets by more than they decrease their liabilities (Table 1). These results contrast with those of Bonci and Columba (2008) for Italy who conclude that a contractionary monetary policy shock reduces the net funds raised by households as a result of opposite movements in financial liabilities and financial assets (i.e., liabilities decrease and assets increase). On the other hand, Christiano *et al.* (1996) find a small or insignificant effect of the shock on US households' acquisition of financial assets or issuance of financial liabilities. Christiano *et al.* (1996) attribute this result to the limited participation of households in capital markets which prevents them from adjusting their financial assets and liabilities or net funds raised immediately after the monetary policy shock.

The contrast between the insignificant reaction of households in Christiano *et al.* (1996) and the results of other studies (including our study in Portugal) may in part be related to underlying differences in sample periods. In fact, over the last fifteen years the proportion of financial assets in the total wealth of households has significantly increased in several countries, including the United States, which suggests an increasing participation of households in capital markets. In Portugal, several studies provide evidence of an increased participation of households in the capital markets over time (see, for example, Cardoso *et al.*, 2008). Therefore, the rising share of these assets in household's portfolio may have increased their importance in the adjustment of this sector to shocks.

The responses of sub-components of the financial assets of households show that the reduction of financial assets is driven primarily by a significant decrease in the purchase of shares and other equity (including investment funds units) amounting to around 15 per cent of the average quarterly flows of this item in the sample period. This may reflect expectations of a deterioration of firms' profits following the shock. Note that shares (quoted and unquoted) and other equity are an important component of the financial portfolio of households in Portugal, with a weight similar to the deposits (nearly 34 percent before the recent financial crisis). The purchases of life insurance and pension

funds also decrease, which may partly reflect the fact that this type of insurance is required by credit institutions for loans for house purchase, which also decreases in response to monetary policy shock, as seen above.[7] On the other hand, households increase the holdings of deposits as well as the loans granted to other sectors.

4. CONCLUSIONS

This article examines the response of the flow of funds of firms and households in Portugal to a monetary policy shock. In the case of a contractionary shock, non-financial corporations and households initially increase net fund raised. In the case of non-financial corporations this reflects both a greater accumulation of assets and financial liabilities, but with a stronger impact on the liability side. This result is also found for the United States and the euro area and points to the existence of a degree of frictions that prevent firms from adjusting their costs quickly after the shock. In particular, this may reflect constraints imposed by existing contracts that prevent firms from adjusting immediately their level of inventories to a lower level of demand and which compels them to resort to external finance.

After a contractionary monetary policy shock, the net funds raised by households increase, reflecting a drop in the acquisition of financial assets that exceeds the decrease in liabilities. This is possibly related with consumption smoothing behaviour. Households also adjust the composition of their portfolios of financial assets, reducing investment in financial assets with greater market risk and increasing investment in less risky financial assets as is the case of deposits. The behaviour of households in Portugal is qualitatively similar to that found for the euro area, while for the United States the evidence points to a small effect or no significant impact of a monetary policy shock in the financial transactions of households.

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(7) It should be noted that changes in households' pension funds assets result not only from changes in households contributions to pension funds but also from firms contributions, given that in the national financial accounts the contributions from firms are also assigned to the households sector.

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