NEW PARADIGMS IN MONETARY THEORY AND POLICY?

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SUERF – The European Money and Finance Forum
Vienna 2012

SUERF Study 2012/1

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Keywords: Monetary policy, financial stability, economic governance, micro-prudential supervision, macro-prudential supervision; Euro Area; Short-termism, risk premia, public policy, governance, taxation; Inflation Targeting, Exchange Rate Pass-Through, panel VAR; Monetary policy transmission mechanism, South Africa; Interest rate forecasting, policy intentions, Norway; China, Renmimbi, exchange rate, global imbalances; Macro-finance, United States, business cycle; SDR, global financial infrastructure; risk-taking channel, competition, concentration, bank soundness, European banking; EU fiscal framework, fiscal sustainability, government debt

JEL Codes: E31, E43, E44, E5, E52, E55, E58, E63, F41; G01, G28

Vienna: SUERF (SUERF Studies: 2012/1) – January 2012

ISBN: 978-3-902109-61-3

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9. Macro-Finance Interactions in the US: A Global Perspective

Fabio C. Bagliano & Claudio Morana

9.1. Introduction

Considering the recent US business cycle history, two severe recession episodes stand out, namely the double dip 1980-1981 recession and the 1990 Savings and Loan (S&L) crisis. Looking further back in the past, several periods of deep contraction in economic activity can be found, such as the 1918-21 World War I/ Spanish flu pandemic crisis and, most importantly, the 1929-1933 Great Depression. Both the S&L crisis and the Great Depression do seem to be informative for an understanding of recent US macroeconomic and financial developments. In fact, while the initial epicenter of the 2007 financial crisis, *i.e.* the US subprime mortgage market, was indeed peculiar to the current crisis, its real consequences unfolded through mechanisms already at work in previous episodes: likewise the S&L crisis and the Great Depression, a boom-bust credit cycle, extended also to the housing and stock markets, and reinforced by pro-cyclical credit and leverage by banks, well summarizes the major features of the crisis[1].

While the crisis was triggered by developments in the US subprime mortgage market, other factors should however be taken into account: first, following the 2000 stock market crash and 2001 recession, monetary policy adopted an extremely accommodative stance (with low short- and long-term rates and rapid money growth), while the deepening of the 'originate to distribute' banking model and financial engineering allowed for over stretching of credit. Likewise in the S&L crisis, both a benign price stability environment and deregulated financial markets then worked as amplifying mechanisms for the subprime mortgage market shock. Second, in addition to the above domestic factors, also foreign macroeconomic developments contributed to asset prices misalignments, particularly in the housing and stock markets, and ultimately to the size of the 'subprime' shock. In fact, since the late 1990s, large capital inflows were financing a growing current account deficit in the US, widening the savings-corporate investment imbalance[2]. As capital inflows were progressively redirected from US stock and bond markets to the housing market, increasingly risky investments were underwritten and bad

1 See Bernanke (1983) and Eichengreen and Mitchener (2003) for a boom-bust interpretation of the Great Depression and the 1990 S&L crisis. See also Borio (2008), Almunia *et al.* (2010), Temin (2010) and Grossman and Meissner (2010) for a comparative view.

2 Inadequate financial markets, preventing higher levels of domestic consumption and investment in emerging economies, as well as currency controls, motivated by export led growth objectives in key emerging economies, *i.e.* China, might have also contributed to the ballooning of the US trade deficit. See Jagannathan *et al.* (2009) on the contributions of globalization and technological innovation to the recent crisis.

loans generated: then, again similarly to what happened in the S&L crisis, the bust phase of the credit cycle followed expected, but not materialized, housing price appreciation, leading to the breakdown of the predatory lending mechanism and to a generalized decline in asset prices and a tightening of credit conditions.

From a domestic financial phenomenon the crisis then quickly spread to the real side of the US economy and spilled over to other countries: the year-on-year US GDP contraction in Q2-2009 (which marked the end of the contraction phase of the cycle, according to the official NBER business cycle dating) reached -3.9%, similarly to other advanced OECD countries (-2.6% in France, -5.5% in the UK, -5.9% in Germany, -6.0% in Italy, -7.2% in Japan). According to the metric of Claessens *et al.* (2009), this episode can be classified as a severe recession for OECD standards: it is actually the most severe downturn since the Great Depression of the 1930s, justifying the label of 'Great Recession'.

Against this background, the present paper aims at understanding the main channels of macro-finance interaction that have featured during the US 'Great Recession'. The domestic interactions of US macro and financial shocks is investigated within a global framework, allowing for spillover effects of the US financial/economic crisis to other OECD countries, as well as to major emerging economies, and controlling for further feedback effects on the US economy. A total of 50 countries is investigated by means of a large-scale open economy macroeconometric model, set in the factor vector autoregressive (F-VAR) framework, over the period 1980:1-2009:1.

To preview some of the results, we find that demand side shocks are more relevant for real activity than supply side (productivity) disturbances in the short-term, with the latter gaining importance over a medium-term horizon, and financial shocks being more relevant for real activity fluctuations in the medium-term than in the short-term. Moreover, financial variables respond to both fundamentals and purely speculative shocks, with stock prices showing a larger speculative component than bond and housing prices. Close interrelationships among financial assets are also detected, with the short-term interest rate being relevant for financial fragility and house price fluctuations, as well as excess liquidity dynamics. The overall picture appears to be consistent with a boom-bust credit cycle mechanism, whereby financial factors are the triggering force of the downturn in real activity and worsened economic conditions feed back to asset prices, starting a cumulative process.

While Keynesian macroeconomics originated from the Great Depression, the 'Great Recession' will not probably lead to any comparable revolution in Macroeconomic theory; yet, it has made mandatory an in-depth exploration of the interrelationships between macroeconomics and finance. Our contribution provides insights on both the econometric methodology which may be useful for the accurate modeling of the macro-finance interface, as well as on the main macro-finance linkages relevant for the US economy.

The rest of the paper is organized as follows. In the next section the economics of the macro-finance interface is discussed, while the econometric methodology is introduced in section 9.3.; in section 9.4. the data are presented, while the empirical results are reported in section 9.5. Finally, conclusions are drawn in section 9.6.

9.2. The Economics of the Macro-Finance Interface

Recent empirical evidence points to significant interactions between real and financial variables at the business cycle horizon. According to the metric of Claessens *et al.* (2009), severe recessions tend to be deeper (-5%, rather than -2%, GDP contraction) and last longer (5 quarters rather than 4 quarters) than average recessions, particularly when the housing market is involved; recovery to pre-recession credit growth rates and upswing in housing prices require, as for corporate investment, about three years. Moreover, differently from stock prices, housing price boom-bust cycles affect the entire distribution of the output gap, lowering its level and increasing its volatility and negative skewness (Cecchetti, 2006; see also Basurto *et al.*, 2006). Severe financial crises are likely to turn into quasi-depressions, with GDP falling 9% over two years; real house and stock prices declining 35% (over six years) and 55% (over three years), respectively, and the real value of government debt raising to over 80% (Reinhart and Rogoff, 2009). Finally, according to Barro and Ursua (2009), depression (-10% GDP growth or less) cum stock market crash (-25% or less) would tend to last even longer, *i.e.* about 4 years.

Different mechanisms can be assumed to relate financial assets, credit conditions and macroeconomic performance. For instance, asset prices and credit conditions are interrelated in various ways, as the former may influence the credit market through both demand and supply effects. On the demand side, falling asset prices lead to a reduction in the value of collateral that households and firms can post, impairing their borrowing ability; on the supply side, falling asset prices lead to a worsening of financial institutions' balance sheets, forcing tightening of credit standards, deleveraging and recapitalization. The effect on balance sheets may be direct, as bank's property wealth is directly affected, as well as indirect, through the value of the loans secured by real estate. Similarly, non-performing loans and uncertainty on the value of collateralizable assets may negatively affect credit supply. Financial accelerator and debt-deflation (Fisher, 1933) mechanisms may finally amplify the above effects, fuelling a negative asset price-balance sheets-credit spiral, with potentially deep consequences for real activity. In particular, a credit crunch may be expected to negatively affect both investment and private consumption, reducing the availability of funds needed to finance aggregate expenditures; expected deflation may also affect negatively investment spending by increasing the expected real interest rate. The latter channel may become increasingly relevant as liquidity-trap conditions set in and the nominal interest rate cannot be further reduced. Moreover, expected falling prices (which also increase the real return on savings) may induce agents to postpone consumption to the future. Finally, by transferring purchasing power from borrowers (with a relatively high propensity to consume) to lenders (with a lower propensity to spend), both current and future consumption may be negatively affected.

Recent empirical evidence does point to a significant contractionary impact of tight credit conditions on private consumption, residential investment and GDP growth (Gauger and Snyder, 2003; Leamer, 2007; Greenlaw *et al.*, 2008; Dell'Ariccia *et al.*, 2008; Bayoumi and Mellander, 2008; Shularick and Taylor, 2009; Goodhart and Hoffman, 2008). For instance, Bayoumi and Mellander (2008) find that a 1% contraction in banks capital/asset ratio would yield a gradual contraction in US GDP of about 1.4% within three years; Cihak and Brooks (2009) similarly find that a 10% contraction in bank loans would lead to a 1% contraction in GDP for the euro area. As subdued capital accumulation shifts downwards the potential output growth path, the effects of a negative credit shocks may then be long-lasting. Bordo and Haubrich (2009) do find a close association between tight money and recessions for the US, with deeper GDP contraction having occurred during financial crises episodes. Indeed impaired credit conditions would seem to have contributed to the depth of the Great Depression (Bernanke, 1983; Eichengreen and Mitchener, 2003). Only for the most recent recession the linkage between tight money and economic contraction seems to have broken down, possibly due to the lower sensitivity of the money multiplier to financial turmoil, and a larger role for the credit channel. Finally, evidence from the Japanese deflation seems to suggest that a moderate deflation may not have deep real consequences on the economy (Morana, 2005).

Moreover, falling asset prices may affect the real economy also through wealth effects on consumption and Tobin's Q effects on investment. According to the life-cycle model, a permanent increase in housing wealth leads in fact to an increase in spending and borrowing by homeowners, as they try to smooth consumption over their life cycle. The increase in property value actually enables them to borrow more out of the increased value of collateral. Additional effects can be expected through the Tobin's Q channel, as a surge in house prices determines an increase in property value over construction costs, stimulating residential investment. Overall, the available empirical evidence points to an inelastic, yet significant, impact of house and stock prices on real activity, which is in general stronger for investment than for GDP and consumption, and for the US than for the other countries. Moreover, the effects on aggregate demand are stronger for housing prices than for stock prices, with the latter affecting private investment in particular (Beltratti and Morana, 2010; Bagliano and Morana, 2010, 2011; Case *et al.*, 2005; Chirinko *et al.*, 2004; Carroll *et al.*, 2006). Yet, less supportive results have been found by Calomiris *et al.* (2009).

9.3. Econometric Methodology

To investigate the dynamic linkages between US macroeconomic and financial variables, allowing for international spillovers and feedback effects, we use a large-scale econometric model composed of two sets of equations. The first one refers to the US economy (with variables collected in vector X_t), while the second to other $m-1$ non-US countries (collected in vector Y_t). The joint dynamics of q macroeconomic variables for each of the m countries of interest (in vector $Z_t = [X_t \quad Y_t]$) are modeled by means of the following F-VAR system:

$$F_t = \mathbf{\Phi}(L)F_{t-1} + \eta_t \tag{1}$$

$$G_t = \mathbf{\Psi}(L)G_{t-1} + \zeta_t \tag{2}$$

$$Z_t - \mu_t = \mathbf{\Lambda}F_t + \mathbf{\Xi}G_t + \mathbf{D}(L)(Z_{t-1} - \mu_{t-1}) + \nu_t \tag{3}$$

In (3) $Z_t \sim I(0)$ is the $n \times 1$ stationary vector of variables of interest, with $n = m \times q$, and $\mu_t = [\mu_t^X \quad \mu_t^Y]$ is a $n \times 1$ vector of deterministic components, including an intercept term, and linear or non-linear trend components. F_t is a $r \times 1$ vector of observed or unobserved common factors, generated by the autoregressive process in (1), where $\mathbf{\Phi}(L)$ is a $r \times r$ finite order matrix lag polynomial, and η_t is a vector of i.i.d shocks driving the F_t factors. G_t is a $s \times 1$ vector of non-US factors, generated by the autoregressive process in (2), where $\mathbf{\Psi}(L)$ is a $s \times s$ finite order matrix lag polynomial, and ζ_t is a vector of i.i.d. shocks driving the G_t factors. The effects of both sets of factors on the US and non-US variables in Z_t is captured by the loading coefficients collected in the matrices $\mathbf{\Lambda} = [\mathbf{\Lambda}^X \quad \mathbf{\Lambda}^Y]'$ and $\mathbf{\Xi} = [\mathbf{\Xi}^Y \quad \mathbf{\Xi}^Y]'$ (of dimension $n \times r$ and $n \times s$, respectively). Finally, $\mathbf{D}(L)$ is a $n \times n$ finite order matrix lag polynomial, partitioned as

$$\mathbf{D}(L) = \begin{bmatrix} \underset{q\text{x}q}{\mathbf{D}_{XX}(L)} & \underset{q\text{x}(m-1)q}{\mathbf{0}} \\ \underset{(m-1)q\text{x}q}{\mathbf{D}_{YX}(L)} & \underset{(m-1)q\text{x}(m-1)q}{\mathbf{D}_{YY}(L)} \end{bmatrix}$$

with

$$\mathbf{D}_{YY}(L) = \begin{bmatrix} \underset{q\times q}{\mathbf{d}_{11}(L)} & 0 & \dots & 0 \\ 0 & \underset{q\times q}{\mathbf{d}_{22}(L)} & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \underset{q\times q}{\mathbf{d}_{m-1,m-1}(L)} \end{bmatrix}$$

and $\nu_t = [\nu_t^X \quad \nu_t^Y]'$ is the $n \times 1$ vector of reduced-form idiosyncratic (*i.e.* country-specific) i.i.d. disturbances. It is assumed that all polynomial matrices $\mathbf{\Phi}(L)$, $\mathbf{\Psi}(L)$, and $\mathbf{D}(L)$ have all roots outside the unit circle. Moreover, $E(\eta_{jt}\nu_{is}) = E(\eta_{jt}\zeta_{is}) = E(\zeta_{jt}\nu_{is}) = 0$ for all i, j, t and s.

The specification of the model has important implications for cross-country linkages: firstly, US idiosyncratic shocks (ν_t^X) do not only affect the US (through $\mathbf{D}_{XX}(L)$), but also the other countries (through $\mathbf{D}_{YX}(L)$). Differently, non-US idiosyncratic disturbances (ν_t^Y) do not affect US variables, while only own-country linkages are relevant for the other countries ($\mathbf{D}_{YY}(L)$ is block diagonal). The specification selected is then consistent with the view that the US play a leading role in the transmission of macroeconomic shocks, interpreting US macroeconomic dynamics in terms of global dynamics (see for instance Beltratti and Morana, 2010; Bagliano and Morana, 2009). This however does not rule out a role for linkages between the US and the other countries, which are parsimoniously described by means of the non-US factors G_t.

By substituting (1) and (2) into (3), the dynamic factor model can be written in standard vector autoregressive form as

$$\begin{pmatrix} F_t \\ G_t \\ Z_t - \mu_t \end{pmatrix} = \begin{pmatrix} \mathbf{\Phi}(L) & 0 & 0 \\ 0 & \mathbf{\Psi}(L) & 0 \\ \mathbf{\Lambda\Phi}(L) & \mathbf{\Xi\Psi}(L) & \mathbf{D}(L) \end{pmatrix} \begin{pmatrix} F_{t-1} \\ G_{t-1} \\ Z_{t-1} - \mu_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^F \\ \varepsilon_t^G \\ \varepsilon_t^Z \end{pmatrix} \tag{4}$$

where

$$\begin{pmatrix} \varepsilon_t^F \\ \varepsilon_t^G \\ \varepsilon_t^Z \end{pmatrix} = \begin{pmatrix} \mathbf{I}_r \\ 0 \\ \mathbf{\Lambda} \end{pmatrix} \eta_t + \begin{pmatrix} 0 \\ \mathbf{I}_s \\ \mathbf{\Xi} \end{pmatrix} \zeta_t + \begin{pmatrix} 0 \\ 0 \\ \nu_t \end{pmatrix},$$

or $Z_t^* = \mathbf{H}^*(L) Z_{t-1}^* + \varepsilon_t$ (5)

with $Z_t^* = [F_t \quad G_t \quad Z_t - \mu_t]'$, and variance-covariance matrices

$$E(\varepsilon_t\varepsilon_t') = \boldsymbol{\Sigma}_\varepsilon = \begin{pmatrix} \boldsymbol{\Sigma}_\eta & 0 & \boldsymbol{\Sigma}_\eta\boldsymbol{\Lambda}' \\ 0 & \boldsymbol{\Sigma}_\zeta & \boldsymbol{\Sigma}_\zeta\boldsymbol{\Xi}' \\ \boldsymbol{\Lambda}\boldsymbol{\Sigma}_\eta & \boldsymbol{\Xi}\boldsymbol{\Sigma}_\zeta & \boldsymbol{\Lambda}\boldsymbol{\Sigma}_\eta\boldsymbol{\Lambda}' + \boldsymbol{\Xi}\boldsymbol{\Sigma}_\zeta\boldsymbol{\Xi}' + \boldsymbol{\Sigma}_\nu \end{pmatrix}$$

and $\boldsymbol{\Sigma}_\eta = E(\eta_t\eta_t')$, $\boldsymbol{\Sigma}_\nu = E(\nu_t\nu_t')$, and $\boldsymbol{\Sigma}_\zeta = E(\zeta_t\zeta_t')$.

The F-VAR model is estimated by means of a consistent and efficient iterative procedure, featuring the Granger and Jeon (2004) robust approach, yielding median estimates for all the parameters of interest, obtained through simulation with 1000 replications. The inversion of the F-VAR form to obtain the reduced vector moving average (VMA) form for the Z_t^* process, as well as the identification of the structural shocks, is discussed in detail in Bagliano and Morana (2011).

9.4. The Data

We use seasonally adjusted quarterly macroeconomic time series data, over the period 1980:1 through 2009:1, for the US, 14 euro area member states (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovakia, Slovenia and Spain), and 16 additional advanced economies (Australia, Canada, the Czech Republic, Denmark, Hong Kong, Iceland, Israel, Japan, New Zealand, Norway, Singapore, South Korea, Sweden, Switzerland, Taiwan, United Kingdom), 5 additional advanced emerging economies (Brazil, Hungary, Mexico, Poland, South Africa), and 14 secondary emerging economies (Argentina, Chile, China, Colombia, India, Indonesia, Malaysia, Morocco, Pakistan, Peru, Philippines, Russia, Thailand, Turkey), for a total of 50 countries[3].

The set of US variables, included in vector X_t, is composed of real GDP, civilian employment, real private consumption, real private investment, fiscal deficit to GDP, current account deficit to GDP, CPI all-items index, three-month Treasury Bills real rate, 10-year Federal government securities real rate, real house prices, the real effective exchange rate, real share prices (S&P500). Moreover, in order to monitor the impact of the financial crisis, 'financial fragility' and 'excess liquidity' indices have been constructed and included in vector X_t alongside macroeconomic and financial variables. In particular, the financial fragility index is computed as the first principal component extracted from the TED spread, the

[3] US data are from FRED2; OECD countries data are from OECD Main Economic Indicators, integrated with IMF International Financial Statistics (bank loans series); data for the other countries are from IMF International Financial Statistics; house price series for OECD countries are taken from a non-official OECD database.

AGENCY spread, and the BAA-AAA corporate spread, providing an overall measure of credit/liquidity risk, stress in the mortgage market and risk appetite. Figure 1(a) portrays the behavior of the three spreads and the constructed index over the estimation sample, showing two major peaks at the beginning of the 1980s and in 2008. The excess liquidity index is computed as the first principal component extracted from the M2 to GDP ratio and the total loans and leases at commercial banks to GDP ratio; this index, displayed in Figure 1(b), captures the gradual build-up of liquidity that started around 1995 and accelerated over the period 2006-2008.

The data set for the other countries is smaller and consists of real GDP, the CPI all-items index, real bank loans to the private sector relative to GDP, the real short-term interest rate (either a 3-month interbank rate or a 3-month Treasury Bills rate), and real house (depending on availability) and stock prices. All these variables are included in the Y_t vector.

Crude oil price and primary commodities price shocks (excluding energy), computed following Hamilton (1996), have been considered and included in the vector F_t of common factors affecting both the US and the non-US economies. In order to account for feedback effects from the world economy to the US economy, a single common non-US GDP growth factor, accounting for about 20% of total variance, has been extracted from the GDP growth series of the 37 countries for which data are available since 1980:1[4]. This factor is included as the only element in the G_t vector.

As the econometric model is set in a stationary representation, data have been transformed according to the results of the KPSS test (Kwiatkowski *et al.*, 1992; Becker *et al.*, 2006).

In particular, weak stationarity, in deviation or not from a non-linear deterministic trend component, modeled by means of the Gallant (1984) flexible functional form, *i.e.* $\mu_t = \mu_0 + \mu_1 t + \mu_2 \sin(2\pi t/T) + \mu_3 \cos(2\pi t/T)$, was assumed for the levels of the long-term and short-term real interest rates, the US current account to GDP ratio, the US public deficit to GDP ratio, and for the growth rates of all the remaining series. These deterministic terms are included in vector μ_t[5].

[4] That is, the largest 18 OECD countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK, Australia, Canada, Japan and New Zealand), and a selection of the Latin American countries (Argentina, Brazil, Chile, Mexico, Peru), Asian countries (China, Hong Kong, Korea, Taiwan, Indonesia, Malaysia, Philippines, Singapore, Thailand, India, Pakistan, Turkey) and African countries (South Africa).

[5] Details are not included for reasons of space, but are available upon request from the authors.

9.5. Empirical Evidence

In order to investigate the transmission within the US economy of several structural disturbances it is necessary to impose an identification scheme on the reduced-form disturbances in (5). To this aim, we impose a set of exclusion restrictions on the contemporaneous responses of the US and non-US variables to the structural disturbances, implying a precise ‘ordering’ for the elements in the Z_t vector, based on plausible assumptions on the relative speed of adjustment to shocks. In particular, the ordering of the variables is country-by-country and, within each country, from relatively ‘slow-’ to relatively ‘fast-moving’ variables. Then, the X_t vector for the US is ordered as follows: employment growth, real GDP growth, the Federal Deficit/GDP ratio, real private consumption growth, real private investment growth, the current account/GDP ratio, the CPI inflation rate, the excess liquidity index, the real three-month Treasury bills rate, the real ten-year Government Bonds rate, real house price returns, real effective exchange rate returns, real stock price returns, the financial fragility index. Concerning the slow-moving variables, the economic rationale behind the assumed recursive structure lies on the assumption that, over the business cycle, real activity is contemporaneously determined by employment (through a short-run production function), with the latter adjusting to the phase of the cycle only with a one-quarter delay. Moreover, output contemporaneously determines private consumption (through the consumption function), investment (investment function) and net imports, while the fiscal stance is adjusted according to output dynamics; private consumption and investment contemporaneously adjust to changes in the fiscal stance (either anticipating future output growth or due to Barro-Ricardo and/or crowding out effects), and net imports are contemporaneously determined by the state of domestic demand; aggregate demand then feeds back, with a one-quarter delay, to aggregate supply, and prices adjust according to aggregate demand and supply interactions. On the other hand, concerning the fast-moving variables, the assumed ordering (from excess liquidity to real short- and long-run interest rates, real house prices, the real exchange rate, real stock prices, and the financial fragility index) implies that liquidity conditions contemporaneously determine interest rates and asset prices, while liquidity may respond to asset prices developments only with a (one-quarter) delay. This is consistent with asset prices rapidly adjusting to the stance of monetary policy, with the Fed at most implementing a leaning-against-the-wind strategy, relatively to asset price dynamics; hence, the real short-term rate is contemporaneously determined by liquidity conditions, while the real long-term rate is contemporaneously determined by the real short-term rate. Real house prices and the real effective exchange rate are contemporaneously determined by liquidity conditions and interest rates, while real stock prices contemporaneously react to any change in the economy. Finally, the financial fragility index embeds all contemporaneous information on the state of the business cycle. Note also that the slow- to fast-moving ordering implies that monetary policy, the key determinant of liquidity and interest rates in the economy, is set according to the state of the business cycle. The robustness of the adopted identification strategy is discussed at the end of this section.

The dynamic specification of the econometric model has been selected by means of the BIC information criterion, supporting the choice of a first-order F-VAR system. Assuming an own-variable diagonal structure for the corresponding elements of the $\mathbf{D}(L)$ matrix for the non-US countries (*i.e.* a diagonal $\mathrm{D}_{YY}(L)$), the euro area block then counts 77 equations, each containing 13 parameters, of which 1 for the lagged own variable, 5 are for the lagged US series, 3 for the lagged F_t and G_t series, and 4 for the deterministic component (including a constant, a linear trend and two non-linear components, as described in the data section). The same applies to the remaining elements in vector Y_t. Differently, the 14 equations corresponding to the US block in X_t contain 21 parameters each, of which 14 are for the lagged US series, 3 for the lagged F_t and G_t series, and 4 are for the deterministic component. The full system therefore counts 278 equations.

Operationally, the identification of the structural shocks for the US has been achieved by means of a Choleski decomposition approach, capturing the recursive structure described above. Then, a forecast error variance decomposition exercise (whereby the forecast error for each variable at various horizons is attributed to the identified structural disturbances) has been performed up to a horizon of three years, in order to investigate the macro-finance interactions featuring the US economy.

9.5.1. Forecast Error Variance Decomposition

Table 1 (p. 158) shows the results of the forecast error variance decomposition analysis over short- (2- quarter) to medium-term (4-quarter and 12-quarter) horizons. The overall picture is fairly consistent with standard macroeconomic theory. In particular, demand side (output) shocks are more relevant for real activity than supply side (productivity) disturbances (identified as shocks to the inflation rate) in the short-term, with the latter gaining importance over a medium-term horizon. Private consumption shows quicker adjustments than investment; financial shocks are more relevant for real activity fluctuations in the medium-term than in the short-term. Moreover, fluctuations in financial variables may be determined by both fundamentals (ultimately driven by consumption and productivity shocks) and purely speculative factors, with stock prices showing a larger speculative component than bond and house prices. Close interrelationships among financial assets are also detected, with the short-term interest rate being relevant for financial fragility and house price fluctuations, as well as excess liquidity dynamics. The detected interactions appear then to be consistent with a scenario in which financial shocks trigger a misalignment in asset prices, then spilling over to real activity, and worsened economic conditions feeding back to asset prices, starting a cumulative process, *i.e.* with boom-bust financial cycle mechanics. A selection of the most relevant results is presented in detail below.

9.5.2. Real Side Fluctuations in the US

Fluctuations in US real activity are mostly determined by real side shocks in the short-term, while financial factors may have some role in the medium-term. In fact, in the short-term, real output responds only to the own shock (to which we attribute the structural interpretation of as aggregate demand disturbance, accounting for 68% of the forecast error variance at the 2-quarter horizon), and to disturbances to employment (23%) and inflation (aggregate supply/productivity shock, 5%); rather, in the medium-term (12-quarter horizon) the aggregate demand (44%) and employment (11%) disturbances loose somewhat importance, while the aggregate supply (12%) and the short-term real interest rate shock (18%) become more relevant.

A coherent pattern can be detected for consumption and investment as well, with the employment and aggregate demand shocks having sizable effects at all forecasting horizons for both variables (13% to 30%), while the house price (7% to 8%), the current account deficit (13%), the financial fragility index (on consumption, 7%) and the real short-term rate (on investment, 21%) disturbances play a larger role in the medium-term. Finally, employment is strongly idiosyncratic, with the aggregate supply, aggregate demand and real short-term rate shocks contributing somewhat to fluctuations only at the three-year horizon (8%, 13% and 17%, respectively).

9.5.3. Financial Fluctuations in the US

Concerning asset price volatility, a relevant role is played by consumption and productivity shocks, at all horizons. For instance, the contribution of the consumption shock to fluctuations of real short- and long-term rates is always sizable (15% to 21%), while the productivity shock is actually dominant (40% to 54%); similarly for house prices (12% to 29%) and financial fragility conditions (productivity, 14% to 22%; consumption, 7% in the medium-term); for stock prices, as well as excess liquidity, somewhat less (productivity, 5% to 9%; consumption, 4% to 11%); for the latter variable also the aggregate demand shock plays an important role (14% to 38%).

Yet, other disturbances also matter, albeit to a lower extent: the public deficit shock is relevant for interest rates (4% to 7%), stock prices (6% in the very short-term), and economic and financial fragility conditions (4% in the medium-term);

the current account deficit shock matters for stock prices (11% to 20%) and excess liquidity (20% in the medium-term); employment disturbances are relevant for the short-term rate (7%), as well as for economic/financial fragility in the medium-term (7%); finally, the short-term interest rate is important for financial fragility conditions (9% to 17%), house prices (11% in the medium-term), and the long-term rate (medium-term, 5%).

9.5.4. Fluctuations in US Domestic and Foreign Debt

Both the fiscal deficit/GDP ratio and the current account deficit/GDP ratio are strongly idiosyncratic at the two-quarter horizon (their own shock accounting for 80% and 88%, respectively, of the forecast error variance), but somewhat less in the medium-term, as employment, house prices, productivity and interest rate shocks all play some role. For instance, figures for medium-term fluctuations in the fiscal deficit/GDP ratio are 5% to 7% for employment, house price and real short-term rate shocks; similar figures are found for the current account deficit/GDP ratio, *i.e.* about 5% for the aggregate demand, house price and productivity shocks, while short- and long-term rates disturbances have a more sizable effect (13% to 16%). Hence, our results point to a much weaker role of stock and house prices in determining US current account deficit fluctuations than that found by Fratzscher *et al.* (2009).

9.5.5. Robustness Issues

The chosen ordering of the US variables is based on two main assumptions: (i) supply-side disturbances have a contemporaneous effect on aggregate demand components, while demand feeds back to supply with a one-quarter delay; (ii) liquidity conditions determine contemporaneously the short-term real interest rate, while the latter feeds back to liquidity conditions only with a one-quarter delay. In order to assess the robustness of the forecast error variance decomposition results to the above assumptions, the analysis has been repeated with a different ordering of the variables, inverting the contemporaneous role of supply and demand, and liquidity and the short-term rate. In particular, for the slow-moving variables the following alternative ordering is considered: consumption, investment, public deficit to GDP ratio, current account deficit to GDP ratio, output, employment and inflation; on the other hand, for the fast-moving variables the alternative ordering is: real short-term interest rate, excess liquidity, real long-term interest rate, real house prices, real effective exchange rate, real stock prices and the financial fragility index. Thus, in this alternative ordering: (i) demand-side disturbances have a contemporaneous effect on the supply side of the economy, while aggregate supply feeds back to aggregate demand with a one-quarter delay; (ii) the short-term rate determines contemporaneously liquidity conditions, while the latter feeds back to interest rates only with a one-quarter delay.

As shown in Table 2 (p. 160), the results of the forecast variance decomposition are robust to the ordering reversal considered, as no major differences can in general be noted concerning macro-finance interactions. There are however few important differences between the results reported in Table 2 and in Table 1, with reference to some macroeconomic shocks. First, the employment shock is much less idiosyncratic (its own disturbance accounting for 57% of the employment forecast error variance at the two-quarter horizon), also having a smaller effect on real activity (1% to 3%) and fiscal/trade deficits (0% to 5%) fluctuations at all horizons. Second, with the modified ordering, it is the consumption shock which should probably bear the interpretation of aggregate demand shock. In fact, the consumption disturbance is more idiosyncratic (accounting for as much as 92% of the consumption forecast error variance at the two-quarter horizon), and explains a larger proportion of fluctuations for GDP (17% to 38%), employment (14% to 19%), and excess liquidity (11% to 34%), but a smaller fraction of real short- and long-term interest rate fluctuations (6% to 11%); finally, a more important role for the consumption shock in accounting for the volatility of the financial fragility conditions index is also detected (5% to 13%). A similar pattern of results is found for the private investment shock (accounting for 53% of the investment forecast error variance at the two-quarter horizon), which also explains a larger proportion of fluctuations for GDP (5% to 11%), employment (9% to 13%), and real short- and long-term interest rates (5% to 7%). Finally, real GDP is found to be less idiosyncratic (43% of the output forecast error variance at the two-quarter horizon), exercising a smaller impact on consumption and investment (0%-3%) and excess liquidity (5% to 18%) at all horizons.

9.6. Conclusions

While the origin of the 2007 financial crisis, *i.e.* the US subprime mortgage market breakdown, was indeed peculiar to the current episode, its consequences on the whole financial system and on the real economy unfolded through mechanisms which were already at work at least during the 1990 Savings and Loan (S&L) crisis, and the Great Depression of the 1930s: a boom-bust credit cycle, involving also the housing and stock markets, strengthened by pro-cyclical credit and leverage by banks. Additional factors, such as the growing US current account deficit, and consequent foreign capital inflows since the 1990s, contributed to the size of the 'subprime' shock, while both a benign price stability environment and the deregulation of financial markets in the 2000s, worked as amplifying mechanisms. From a domestic financial phenomenon, the crisis then rapidly extended to the real sector of the US economy and gained an international (indeed, global) dimension. Overall, this crisis episode can be classified not only as a severe recession by OECD standards (Claessens *et al.* 2009), so as to deserve the label of 'Great Recession', but as the deepest contraction since the Great Depression in the 1930s.

In this context, the paper aimed at detecting empirically the main features of the macro-finance interactions operative during the US 'Great Recession'. In particular, the domestic interactions of US macro and financial shocks have been investigated within a global framework, allowing for spillovers from the US to other OECD and emerging countries, and for feedback effects to the US economy.

On the whole, our empirical evidence is consistent with the view that macro-finance interactions in the US can be understood within a relatively standard macroeconomic theory framework. We found that demand side shocks are more relevant for real activity than supply side (productivity) disturbances in the short-term, with the latter gaining importance over a medium-term horizon; financial shocks are more relevant for real activity fluctuations in the medium-term than in the short-term. Moreover, fluctuations in financial variables are determined by both fundamentals (ultimately driven by consumption and productivity shocks) and purely speculative factors, with stock prices showing a larger speculative component than bond and house prices. Our results are also consistent with a boom-bust credit cycle mechanism, in which a prominent role is played also by the housing and the stock markets, whereby financial factors trigger the downturn in real activity, and worsened economic conditions feed back to asset prices, starting a cumulative process. The latter mechanism does seem to be particularly important for the understanding of the real side consequences of the US subprime financial crisis.

From a history of economic thought perspective, Keynesian macroeconomics was born out of the inability of prevailing 'Classical' macroeconomics to explain the depth and endurance of the Great Depression in the 1930s. The 'Great Recession' will not probably lead to any revolution in Macroeconomic theory of a comparable importance; however, it has made mandatory an in-depth exploration of the macro-finance interface. Macroeconomists have become increasingly aware of the task, at both the theoretical (for example by extending DSGE models to properly account for financial factors) and the empirical level. Our contribution provides useful insights on the econometric methodology appropriate for the accurate empirical modeling of the macro-finance interface, as well as the main relationships linking macroeconomic and financial variables for the US economy.

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Table 1: Forecast error variance decomposition for US variables

	Panel A: 2-quarter horizon													
resp\sh	*e*	*g*	*pd*	*c*	*i*	*cad*	*π*	*exl*	*S*	*l*	*h*	*er*	*f*	*fr*
e	90.7	6.8	0.16	0.03	0.25	0.20	0.30	0.22	0.21	0.30	0.09	0.14	0.09	0.51
g	23.1	68.3	0.11	1.33	0.06	0.00	5.28	0.00	0.61	0.01	0.31	0.18	0.24	0.47
pd	4.81	1.18	79.5	0.42	0.53	1.86	0.93	1.79	1.30	0.25	4.59	0.77	1.75	0.33
c	19.0	18.4	2.02	54.6	0.22	0.93	0.75	0.00	0.71	0.12	2.08	0.00	0.08	1.06
i	26.7	27.4	0.11	6.57	32.4	0.10	0.49	0.34	3.01	0.17	0.48	0.13	0.91	1.00
cad	1.28	1.23	1.57	0.03	0.24	88.0	0.73	0.01	2.27	0.23	0.18	0.06	3.84	0.31
π	0.41	0.44	1.02	27.7	0.10	3.14	64.2	0.25	1.45	0.04	0.71	0.28	0.16	0.07
exl	2.17	37.7	0.19	10.8	4.50	1.07	3.69	37.7	0.10	0.86	0.27	0.43	0.43	0.02
s	6.56	0.66	4.14	16.7	0.61	2.03	47.4	1.19	19.2	0.09	1.14	0.25	0.02	0.02
l	2.39	1.07	6.11	21.4	0.59	0.43	53.8	0.77	4.01	7.14	1.69	0.20	0.25	0.17
h	1.13	1.13	1.66	14.9	1.21	1.60	29.2	0.33	1.42	0.17	46.9	0.00	0.04	0.28
er	1.66	1.47	0.60	1.46	1.66	0.64	0.20	0.09	2.92	3.13	0.66	84.7	0.80	0.01
f	0.17	1.32	5.63	4.38	0.92	11.1	6.22	1.62	1.80	13.7	2.20	2.95	47.8	0.21
fr	3.56	0.08	2.04	3.70	1.66	1.58	14.1	2.55	9.05	2.22	1.91	1.06	4.83	51.7

	Panel B: 4-quarter horizon													
resp\sh	*e*	*g*	*pd*	*c*	*i*	*cad*	*π*	*exl*	*s*	*l*	*h*	*er*	*f*	*fr*
e	77.1	11.3	0.20	0.02	0.44	0.14	3.84	0.46	3.63	0.32	2.06	0.08	0.17	0.23
g	22.5	54.9	0.46	0.81	1.00	0.23	9.88	0.15	7.96	0.01	1.10	0.07	0.58	0.43
pd	6.81	1.02	68.1	0.98	0.54	4.37	0.89	1.51	5.16	1.61	5.82	0.83	2.14	0.28
c	18.2	16.0	2.75	45.5	0.63	4.72	0.51	0.24	0.68	0.06	7.00	0.00	0.06	3.75
i	30.2	26. 8	0.06	5.33	18.3	1.78	1.25	0.20	8.96	0.15	5.84	0.08	0.60	0.53
cad	2.46	2.30	1.08	0.23	0.47	70.2	3.18	0.02	8.30	1.26	3.69	0.12	5.23	1.46
π	1.65	0.16	2.24	25.8	0.45	6.25	53.4	0.62	4.86	0.71	1.97	0.63	1.06	0.22
exl	1.63	31.4	0.42	11.7	4.82	6.08	1.65	33.6	5.66	0.57	1.89	0.29	0.29	0.03
s	7.29	2.14	4.46	15.3	0.61	1.98	42.8	1.45	19.4	0.72	1.49	0.52	0.81	1.09
l	2.43	2.58	7.40	18.6	0.66	0.41	47.0	0.89	3.48	12.1	2.36	0.35	1.31	0.50
h	0.83	0.48	0.65	14.5	0.56	1.46	22.0	0.87	2.31	0.59	52.7	0.09	1.30	1.73
er	3.79	0.87	0.41	2.30	2.27	1.31	0.14	0.30	4.11	2.51	1.53	79.7	0.74	0.02
f	0.17	0.67	4.04	2.71	0.58	15.5	7.62	0.83	1.51	14.7	4.13	4.22	43.1	0.36
fr	3.09	0.24	3.18	5.79	2.52	1.15	22.2	2.17	12.8	1.52	2.05	1.96	3.69	37.7

	Panel C: 12-quarter horizon													
resp\sh	***e***	***g***	***pd***	***c***	***i***	***cad***	***π***	***exl***	***s***	***l***	***h***	***er***	***f***	***fr***
e	47.7	13.7	2.27	0.81	1.37	1.10	7.59	0.43	17.1	3.26	2.57	0.20	1.57	0.26
g	11.0	44.8	3.09	0.35	1.62	2.76	11.5	0.26	18.3	3.68	0.76	0.05	1.45	0.35
pd	6.68	1.18	64.7	0.96	0.57	5.64	0.94	1.52	5.06	2.71	6.52	0.82	2.06	0.61
c	13.3	13.4	2.80	38.3	0.22	12.8	1.19	0.38	0.30	1.39	8.22	0.01	0.27	7.38
i	15.2	24.2	0.53	2.81	11.9	12.9	1.76	0.06	21.2	1.87	6.08	0.04	1.00	0.43
cad	1.39	4.65	1.08	0.78	0.45	44.0	4.03	0.03	15.5	12.6	6.51	0.40	6.07	2.51
π	2.74	0.21	4.80	22.7	0.79	8.61	41.2	0.28	9.04	3.65	3.71	0.74	1.45	0.07
exl	3.74	13.7	1.33	6.64	5.25	20.3	0.59	32.9	9.34	1.52	1.26	0.36	0.14	2.98
s	7.41	2.32	4.07	14.5	0.91	2.58	40.3	1.68	19.9	0.67	1.42	0.50	1.09	2.68
l	2.61	2.91	7.00	17.3	0.84	1.12	44.9	1.21	4.88	11.8	2.60	0.36	1.56	0.91
h	2.05	0.64	1.12	12.4	0.12	0.36	15.1	0.84	11.1	8.96	41.8	0.47	3.14	1.98
er	4.83	0.56	0.94	4.36	3.28	8.85	1.92	0.17	8.63	1.12	1.20	61.7	2.11	0.35
f	0.20	0.80	1.62	1.51	0.55	19.5	9.81	0.29	1.37	8.42	2.62	3.53	49.6	0.20
fr	6.82	0.18	5.41	7.11	2.97	0.87	21.1	2.10	16.7	1.98	2.89	1.26	3.21	27.4

The Table reports the results of the forecast error variance decomposition analysis for the US variables (rows), relative to the US shocks (columns). For instance element (1,2) in Panel A, i.e. 6.8, is the percentage of forecast error variance of US employment explained by the US output shock. The variables are real GDP (*g*), civilian employment (*e*), real private consumption (*c*), real private investment (*i*), fiscal deficit to GDP (*pd*), current account deficit to GDP (*cad*), CPI all items index (*π*), three-month Treasury Bills real rate (*s*), 10-year Federal government securities real rate (*l*), real house prices (*h*), the real effective exchange rate (*er*), real share prices (*f*), the economic/financial fragility indexed (*fr*), and the excess liquidity index (*exl*).

Table 2: Forecast error variance decomposition for US variables (Robustness analysis)

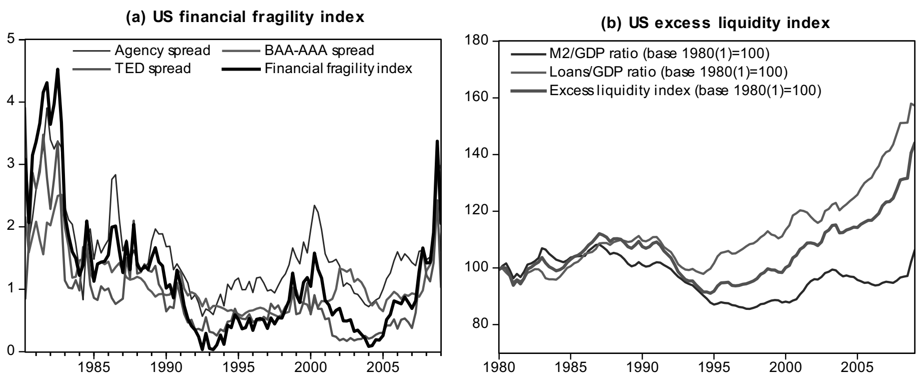
	Panel A: 2-quarter horizon													
resp\sh	*e*	*g*	*pd*	*c*	*i*	*cad*	*π*	*exl*	*s*	*l*	*h*	*er*	*f*	*fr*
e	57.5	7.75	0.27	18.50	14.2	0.16	0.27	0.26	0.12	0.21	0.11	0.10	0.10	0.45
g	2.05	42.69	0.34	35.75	11.9	0.13	5.28	0.02	0.57	0.01	0.30	0.23	0.27	0.47
pd	2.49	1.99	75.1	3.76	1.06	4.01	0.73	1.12	1.86	0.24	4.60	0.88	1.84	0.31
c	1.22	0.75	0.14	91.9	0.12	1.13	0.71	0.01	0.63	0.09	2.32	0.00	0.05	0.98
i	0.39	1.86	0.05	38.3	52.9	0.18	0.48	0.10	3.11	0.14	0.57	0.14	0.93	0.87
cad	0.41	2.12	1.69	0.61	0.07	87.4	0.84	0.03	2.15	0.25	0.20	0.07	3.73	0.41
π	1.09	3.32	0.68	23.7	1.46	2.88	63.9	0.12	1.55	0.07	0.73	0.28	0.12	0.08
exl	0.37	18.25	1.89	33.6	0.50	1.35	3.55	36.9	1.68	0.68	0.28	0.45	0.42	0.02
s	7.23	1.40	5.85	6.04	7.21	2.95	47.2	1.26	19.2	0.03	1.28	0.27	0.01	0.07
l	3.75	4.12	7.07	10.6	4.82	0.99	53.6	0.69	4.41	7.41	1.96	0.22	0.21	0.15
h	1.46	0.03	2.73	10.6	3.65	1.94	29.6	0.31	1.72	0.12	47.5	0.00	0.03	0.28
er	0.88	3.80	0.48	0.60	1.25	0.48	0.15	0.00	3.15	2.91	0.65	84.9	0.76	0.01
f	1.23	0.51	2.14	6.19	0.15	12.7	6.53	0.96	2.25	14.2	2.17	2.98	47.8	0.19
fr	0.99	1.68	1.58	4.53	1.00	1.31	15.3	1.16	10.2	2.48	2.16	1.24	5.07	51.3

	Panel B: 4-quarter horizon													
resp\sh	*e*	*g*	*pd*	*c*	*i*	*cad*	*π*	*exl*	*s*	*l*	*h*	*er*	*f*	*fr*
e	44.0	11.4	0.12	21.21	13.4	0.10	3.46	0.76	3.04	0.17	1.90	0.07	0.18	0.21
g	2.98	37.3	1.13	31.22	7.32	0.41	9.51	0.60	7.29	0.01	1.15	0.08	0.63	0.39
pd	4.59	1.72	64.7	3.23	1.18	6.76	0.73	1.13	5.03	1.57	5.91	0.97	2.27	0.27
c	1.48	0.65	0.14	80.6	0.11	5.25	0.47	0.25	0.53	0.04	6.96	0.01	0.03	3.49
i	1.92	3.29	0.07	37.7	37.3	2.14	1.14	0.50	8.60	0.11	6.06	0.08	0.63	0.49
cad	0.94	4.21	2.46	0.84	0.19	68.5	3.21	0.13	7.38	1.38	3.93	0.13	5.00	1.65
π	0.38	4.98	0.64	23.8	0.55	6.33	53.5	0.19	5.00	0.85	1.98	0.62	1.00	0.20
exl	0.35	13.4	3.19	30.7	1.10	5.87	1.58	30.5	10.1	0.48	2.02	0.30	0.33	0.03
s	6.77	1.97	6.10	7.38	6.79	2.74	42.8	1.46	19.4	0.56	1.66	0.50	0.84	1.05
l	3.55	4.76	8.30	9.48	4.52	0.92	46.9	0.87	3.84	12.3	2.64	0.36	1.16	0.42
h	0.57	0.60	1.08	11.5	1.92	1.27	22.4	0.79	3.31	0.51	53.3	0.10	1.26	1.49
er	1.28	2.85	0.29	2.73	2.40	1.24	0.14	0.38	4.20	2.25	1.65	79.9	0.69	0.02
f	0.59	0.45	1.27	3.97	0.39	16.2	7.69	0.64	1.61	15.2	3.97	4.20	43.5	0.34
fr	1.11	1.62	2.54	7.77	1.23	0.82	22.9	0.96	14.1	1.69	2.29	2.00	3.92	37.1

	Panel C: 12-quarter horizon													
resp\sh	*e*	*g*	*pd*	*c*	*i*	*cad*	*π*	*exl*	*s*	*l*	*h*	*er*	*f*	*fr*
e	27.2	14.6	1.72	13.5	9.33	0.80	7.77	1.33	16.1	3.26	2.48	0.17	1.56	0.23
g	0.99	33.0	5.13	16.8	4.45	2.97	11.7	1.30	17.4	3.67	0.78	0.05	1.44	0.31
pd	4.43	1.82	61.4	3.24	1.17	7.95	0.80	1.20	4.84	2.82	6.64	0.95	2.17	0.56
c	0.54	0.21	0.04	66.3	0.15	14.9	1.26	0.23	0.23	1.43	8.04	0.03	0.29	6.33
i	0.65	3.19	1.62	24.4	25.8	11.7	1.77	0.52	20.9	1.93	6.01	0.06	0.96	0.43
cad	0.66	6.24	1.68	0.50	0.16	43.5	3.64	0.17	14.5	13.2	6.71	0.38	5.93	2.76
π	0.15	7.60	1.36	21.9	0.12	9.12	41.5	0.04	8.88	3.59	3.43	0.74	1.51	0.05
exl	2.76	5.26	5.71	11.4	5.22	17.8	0.69	27.9	16.4	1.67	1.32	0.40	0.17	3.38
s	5.98	1.86	5.38	9.05	6.40	3.40	40.2	1.42	20.1	0.52	1.52	0.51	1.08	2.56
l	3.26	4.45	7.87	9.73	4.46	1.86	44.6	0.99	5.34	12.1	2.93	0.36	1.44	0.71
h	0.68	2.74	0.59	10.2	0.70	0.40	15.8	0.37	12.3	9.01	41.9	0.52	3.03	1.84
er	1.44	4.71	0.20	5.30	2.48	8.60	2.22	0.12	8.96	0.97	1.55	61.4	1.75	0.29
f	0.36	0.20	0.83	2.01	0.60	18.7	10.2	0.28	1.42	9.25	2.70	3.60	49.7	0.23
fr	1.48	2.14	3.93	12.5	2.14	1.19	21.1	0.77	18.3	2.26	2.67	1.26	3.59	26.7

The Table reports the results of the forecast error variance decomposition analysis for the US variables (rows), relative to the US shocks (columns). For instance element (1,2) in Panel A, i.e. 7.8, is the percentage of forecast error variance of US employment explained by the US output shock. The variables are real GDP (*g*), civilian employment (*e*), real private consumption (*c*), real private investment (*i*), fiscal deficit to GDP (*pd*), current account deficit to GDP (*cad*), CPI all items index (*π*), three-month Treasury Bills real rate (*s*), 10-year Federal government securities real rate (*l*), real house prices (*h*), the real effective exchange rate (*er*), real share prices (*f*), the economic/financial fragility indexed (*fr*), and the excess liquidity index (*exl*).

Fig. 1. US financial fragility and excess liquidity indices.



Panel (a) shows the US financial fragility index and the three spread series (Agency, BAA-AAA, and TED); panel (b) plots the US M2 to GDP ratio, Bank loans to GDP ratio (both in index form) and the extracted US excess liquidity index. The sample is: 1980:1-2009:1.