Private sector balance, financial markets, and U.S. cycle: A SVAR analysis

Casadio, Paolo and Paradiso, Antonio

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Paolo Casadio[†] and Antonio Paradiso[⊥]

† Intesa Sanpaolo Bank, Risk Management, Rome, Italy.
⊥ Corresponding author. University of Rome La Sapienza, e-mail: anto_paradiso@hotmail.com; a.paradiso@isae.it.

Purpose – *Considering the sectoral balance approach of Godley, and focusing only on the two main components of the private sector balance for the U.S. economy (household and non-financial corporate balance), we investigate the relationship between these two sectors, the financial variables, and economic cycle. In particular, we consider all these relationships endogenously.*

Design/methodology/approach – *We estimate a structural VAR model between household and (non-financial) corporate financial balances, financial markets, and economic cycle and we perform an impulse response analysis. All the variables are expressed as cyclical components applying the Hodrick-Prescott filter.*

Findings - *The main result is that: (1) household and corporate balances react to financial markets in the way we expected and discussed; (2) the economic cycle influences the two financial balances; (3) the corporate balance has a positive impact on the cycle; (4) the economic cycle and financial balances influence the financial variables. In particular, point (3) shows that the corporate balance is a leading component of the cycle as suggested by Casadio and Paradiso (2009) and accords* with Minsky's theory of financial instability.

Research limitations/implications – *The analysis does not include the foreign sector (current-account balance).*

Originality/value – *Our contribution is an important step forward with respect to the two main contributions in literature which use this approach: the Levy Institute macroeconomic team and Goldman Sachs. Methodologically their models are based on some assumptions (such as exogeneity or market clearing price mechanism for the financial markets) which we overcome considering all the relationships studied in an endogenous manner.*

Keywords*:* Household financial balance, Corporate financial balance, Business cycle, Financial markets, SVAR

JEL Classifications*:* C32, E12, E20

Paper type: Research paper

1. Introduction

One of the most interesting approaches, outside the mainstream context, used to make economic projections is the sectoral balances approach pioneered by Godley (1999) at Levy Institute of Economics. This starts from the well known macroeconomic accounting identity that income must equal spending in the overall economy, because one person's spending is always another person's income. This implies that

the differences between income and spending in the economy's major sectors – the private sector, the public sector, and the foreign sector – must add up to zero[1]. Although all the balances must equal zero, each variable has a "life of its own" and it is the change of output that brings them into equivalence (Godley *et al*., 2007). Zezza (2009) explains this point very well: "If any of the sectors changes its balance, this will have consequences on the growth rate, as well as being reflected on other balances. For instance, an improvement in the foreign balance – generated, say, by a devaluation – will increase GDP, reduce government deficit, and increase saving against investment. An increase in private expenditure over income will also increase GDP and reduce government deficit, but will make the current account balance worse. Analysis of movements in the balances can thus help understanding the trajectory of the economy".

Goldmans Sachs (Hatzius, 2003) and the macroeconomic team at Levy Institute of Bard College (Zezza, 2009) make use of financial balances for prediction purposes developing a different theoretical framework[2].

The Levy model is developed along the lines of stock flow consistent models (Godley and Lavoie, 2006). The stock of net financial assets of each sector increases with net saving, and stocks feed back into flows through interest payment or whenever flows adjust towards a stock flow norm (Zezza, 2009)[3]. Two drawbacks are present with this framework. Usually, these models are based on a market clearing price mechanism, implying a smooth feed back to the economy. The actual financial crisis revealed, instead, that financial markets show a persistent deviation from market clearing conditions. The private sector balance is modelled as a whole aggregate, with no distinction between households and corporate business. Since these two sectors showed a very different pattern over time (as we will see in section 2), this simplification implies the loss of important information. In particular, it hides the important contribution played by private firms' balances during the economic cycle according to Minsky's insights (1982, 1993), whose results are very important in an explanation of the cycle, as we will see in our analysis.

Hatzius, at Goldman Sachs, has modelled the financial balances dynamics through an error correction mechanism towards a long run equilibrium determined by financial variables. The movements of the balances around the equilibrium cause an effect on output growth. An important aspect of this model is that it considers household and corporate balances separately in the analysis. Also this model has some drawbacks. The first is that the sectors are modelled separately (independently of each other) and GDP does not enter into their explanation. This is contrary to the logic of the sectoral balances approach. The second is that the financial markets are exogenous in the analysis, implying only a one-way effect from financial markets to economy.

Our contribution is as follows: We focus our analysis on the private sector balances distinguishing household and (non-financial) corporate sector and endogenizing the relationship between the two sectors, output, and financial markets through a VAR approach. The decision to concentrate our analysis only on

1 For details on this point see, for example, the technical appendix in Papadimitriou *et al*., 2009.

[2] The actual crisis has raised the interest of economists toward this approach. Krugman (2009), from the pages of his blog, presented an explanation of the U.S. economy's business cycles in the form of an IS-LM scheme obtained depicting the private and public balances in a diagram where the vertical axis is the state of the balance (surplus/deficit) and the horizontal axis is the GDP.
Parenteau (2010) and Wilder (2010), on the pages of Roubini Global Economics, used the sectoral balances accounting identity to discuss the policy of fiscal deficit reduction adopted by various countries in order to reduce the government debt ratio.

[3] Financial balances imply an accumulation of net financial assets. Whenever a balance is in negative territory, for example, it can thus be interpreted as net increase in debt, which may be unsustainable above a given threshold level. These norms are well known in the case of government, where political discussions often centre on sustainable public debt to GDP ratio.

these balances stems from the fact that households and firms are the two agents which through their decisions on saving and investment can heavily influence the output dynamic.

Methodologically, all the variables are expressed as deviations from their trend. The trend acts as the normal path historically observed in the data. The idea (taking Hatzius's intuition) is that financial balances have an impact on output growth when they gravitate around their normal level.

Through an impulse response function (IRF) – obtained from SVAR estimation with appropriate restrictions on the matrix *A* of contemporaneous relationships – we find that both corporate financial balances have a strong positive impact on GDP growth and that financial and economic variables have an effect on each other, confirming our view that the mechanism studied is endogenous. In particular, the result that the economic cycle reacts positively to corporate financial balance is fully in accordance with a Minskyan view of the economy.

The paper is organized as follows: In section 2 we explain our approach and the methodological issues. In section 3, after having described the data, we present the results of our VAR estimation and the IRF. Section 4 concludes.

2. The approach and methodological issues

In this section we discuss the main characteristics of the approach followed and the methodological aspects.

In our analysis we focus on the private sector balance only to study its impact on GDP cycle. The reason is twofold. Firstly, the private sector balance, PSB, (also known in literature as private net saving) has historically shown a very close relationship with GDP growth. Figure 1 depicts this relationship.

(Figure 1 here)

The cyclical pattern of private sector balance has a significant and positive correlation with GDP with an average lead of four quarters (but the leading time, as we can see in the figure, varies across the years). The explanation is as follows: since the private sector cyclical pattern historically shows a tendency towards mean reversion, the large deficit/surplus today raises the probability of an imminent reversion in the near future. This cyclical behaviour can have a significant impact on future GDP growth. For example, when the private sector is running at a financial deficit (total spending larger than income) this implies a future reversion (reduction of total spending) with a negative impact on the economic cycle. In particular we can see that the 2001 and 2008 crises were explained very well by a huge unbalancing of the private sector which anticipates economic recession.

Secondly, the private sector comprises the two agents, household and corporate which, with their decisions on consumption and investment spending, can have a huge impact on output. Since consumption and investment are two different decisions taken from two different agents, it is better to distinguish them in the analysis. For this reason we split the private sector balance into households and corporate balances. In particular, we select households and non-financial corporate balances as suggested by Hatzius (2003). Figure 2 shows the importance of this distinction: household and non-financial corporate balances have different patterns over time (in particular they diverge heavily during the 2000s).

(Figure 2 here)

But this distinction is important from another aspect. The non-financial corporate balance[4] – corporate profits minus business investments, known as the financing gap with the reversed sign – is a key variable of choice for firms: other than investments, they decide on the financial imbalance. This variable summarizes Minsky's theory of financial instability and financial cycles (Minsky, 1993). Here we explain briefly the main characteristics of this theory since many economists may be unfamiliar with this non-neoclassical theory of economic cycle[5].

In Minsky's model, the level of investment by a firm is constrained by the cash flows generated by its assets and liabilities, and its ability or willingness to borrow to finance investment. In the early stages of recovery from a recession phase, memories of previous financial calamity increase the perception of risk by borrowers and lenders. Firms reduce their debt (accumulated in a previous phase of the cycle) and finance most of their investment internally. In this phase of the cycle, the corporate financial balance is positive. As recovery persists and leads to expansion, perceptions of risk are reduced and firms begin to increase the amount of debt to finance investment. In this phase borrowing takes the form of "speculative financing" and the corporate balance reduces, starting to become negative. As the expansion continues, perceptions of risk fall further and firms become "Ponzi -borrowing". The corporate balance continues to fall further. At some point during the expansion phase, some events (such as an expected default by a big corporate) will lower the realized profits under the expectations, causing an increase in the perception of risks by firms, with a consequent pull back from investment spending. The result is a cumulative process in which profits fall, perceptions of risk increase, firms try to pay back their debt, asset prices fall, and the economy enters into a deep recession. In this phase the corporate balance increases and reverts to positive territory.

Combining the financial instability hypothesis with the sectoral balance approach, it is evident that the corporate financial balance plays an important role in explaining the cycle in a dynamic way: a widening positive gap (profits larger than investment) preludes a boom economic phase because the firms, attracted by huge profits, will invest more.

Concerning the methodological issues, we consider these aspects:

1) The impact of the financial balances on the economy depends not on the sector's actual financial balance, but whether the sector is above/below its 'normal' path over time. The 'normal' path is identified as the trend pattern historically observable in the data. The trend is a sort of ideal or desirable level of financial balance. When a sector's balance diverges from its normal level, this implies an impulse on GDP growth.
2) The cyclical patterns of household and corporate balances are determined by cyclical patterns of financial markets. Stock prices, 10-year Treasury-Note (T-N) yields, and the spread between BAA-corporate bond yields and 10-year T-N yields (BAA-spread) are the financial variables used in our empirical study. For example, a rise in stock prices implies that households feel richer (the equity wealth effect) and corporate bodies are more optimistic about their future returns on capital. The effect is a rise in their spending. When long term interest rates reduce, households will refinance their mortgages and corporate bodies will be more willing to borrow capital. Also in this case, the effect is a rise in their spending. BAA-spread is a measure of the cost of external finance for corporate bodies. Higher BAA-spread discourages debt-financed spending by firms discouraging investment spending.

[4] Hereafter in the paper we refer indifferently to corporate balance and non-financial corporate balance, with the specification, however, that we are always referring to non-financial corporate balance.
[5] For a complete explanation see Minsky, 1982.

3) As all aspects in this comparison are inter-dependent (financial markets depend on fundamentals and influence households and corporate financial balances; a deviation of one of the two private sectors implies an effect on output, but at the same time GDP brings all the sectors into equivalence), the proper instrument to analyse these aspects is the VAR (vector autoregression). We first estimate an unrestricted VAR, and then we identify the structural shocks imposing restrictions on the matrix *A* of contemporaneous relationships.

The impulse response function (IRF) points out that households and non-financial corporate balances react to financial markets in a correct way (in a way consistent with our theoretical expectations), the economic variables (GDP and financial balances) influence the financial variables, and that economic cycles react positively to the non-financial corporate balance according to Minsky's insights which we embraced.

3. The empirical VAR model

3.1 The data

The variables used in the empirical VAR analysis are Standard and Poor's 500 index *sp500*, the BAA-spread (the spread between BAA corporate bond yields and 10-year T-N yields) *baas*, the 10-year T-N yields *long10*, the log of real GDP *gdp*, the household balance *hbal*, the (non-financial) corporate balance *nfcbal*. Standard and Poor's 500 index, the household balance, and the corporate balance are measured as a share of GDP. All the variables are expressed as cyclical components with the Hodrick-Prescott filter. The sample uses observations from 1980q1 to 2010q2. Time series are plotted in Figure 3. Details on data source and construction are in the Data Appendix.

(Figure 3 here)

3.2 Reduced form model

Given that, by construction, all the variables are stationary, we proceed to estimate the unrestricted VAR model that forms the basis of our analysis. We employ information criteria to select the lag length of the VAR specification, including only a constant. With a maximum lag order of $\rho_{\max} = 8$, Akaike info criteria and Final prediction error suggest a lag of two, whereas the Hannan-Quinn and Schwartz criterion suggest only a lag of one. After having estimated the model for the suggested lag lengths – and having excluded the insignificant parameters according to the Top-Down algorithm (with respect to the AIC criteria) – we conduct the usual diagnostic tests. The results are reported in Table 1 below.

(Table 1 here)

The results are satisfactory, except for some traces of non-normality. Because the VAR estimates are more sensitive to deviations from normality due to skewness than to excess kurtosis (Juselius, 2006), we check these measures for each variable. An absolute value of unity or less for skewness is considered acceptable in the literature (Juselius, 2006). Since that for $\rho = 1$ we find a skewness very close to one for the stock price equation, we prefer to select a VAR with two lags. Table 2 reports specification tests for the single variables for the case $\rho = 2$. Since the skewness values are below the values suggested by the literature, we conclude that non-normality is not a serious problem in our case.

(Table 2 here)

3.3 Structural identification and impulse response analysis

Having specified the reduced form model, we now proceed to the structural analysis. A structural VAR has the following general form:

$$A_0 Y_t = A_1(L) Y_t + B\varepsilon_t \qquad [1]$$

Here Y_t represents *K*-vector relevant variables; A_0 and *B* are *K x K* matrices; and $A_1(L) = \sum_{i=1}^{q} A_{i1} L^i$ represents matrices polynomial in the lag operator with A_{i1} being *K x K* matrix. ε_t is a *K*-vector of serially uncorrelated, zero-mean structural shocks with an identity contemporaneous covariance matrix ($\Sigma_\varepsilon = E[\varepsilon_t \varepsilon_t'] = I$).

Provided that A_0 is non-singular, solving for Y_t yields the reduced form of VAR representation:

$$Y_t = A_0^{-1} A_1(L) Y_t + A_0^{-1} B\varepsilon_t \qquad [2]$$

or $$Y_t = C(L) Y_t + u_t \qquad [3]$$

where $$C(L) = A_0^{-1} A_1(L) \qquad [4]$$

and $$u_t = A_0^{-1} B\varepsilon_t \qquad [5]$$

or $$A_0 u_t = B\varepsilon_t \qquad [6]$$

Equation [1] is the structural model of the VAR, whereas [2] is the reduced form. The technique involved consists of estimate equation [2] and recovers the parameters and the structural shocks ε_t in [1] from these estimates. Equation [6] relates the reduced form disturbances u_t to the underlying structural shocks ε_t . To identify the structural form parameters, we must place $2K^2 - K(K+1)/2$ restrictions on the *A* and *B* matrices. In our case, where K = 6, the number of necessary restrictions is 51. We impose the following restrictions:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ * & 1 & * & * & * & * \\ * & 0 & 1 & * & 0 & 0 \\ * & * & 0 & 1 & 0 & 0 \\ * & * & 0 & * & 1 & 0 \\ * & * & * & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^{gdp} \\ u_t^{sp500} \\ u_t^{baas} \\ u_t^{long10} \\ u_t^{hbal} \\ u_t^{nfcbal} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{gdp} \\ \varepsilon_t^{sp500} \\ \varepsilon_t^{baas} \\ \varepsilon_t^{long10} \\ \varepsilon_t^{hbal} \\ \varepsilon_t^{nfcbal} \end{bmatrix}$$

where * indicates a parameter that is freely estimated in the system. *gdp* is presumed to adjust slowly to shocks of other variables in the system as assumed by Rotemberg and Woodford (1999), for example. Equity price, instead, is allowed to react instantaneously to all types of shock according to the theory that financial markets reflect all the information in the system. BAA-spread is supposed to react immediately to

shocks in output and long term interest rates, whereas long term interest rates are supposed to react instantaneously to *gdp* and *sp500*. Household financial balance and corporate balance are assumed to respond without delay to the assumed mainly dependent variables (*gdp*, *sp500*, *long10* for *hbal*; *gdp*, *sp500*, *baas* for *nfcbal*).

The results of IRF are reported in Figure 4 in the Appendix. We focus here on the key results:

1) Household and corporate balance react to financial markets as we expected: *hbal* and *nfcbal* respond negatively to a rise in stock price: a rise in equity pushes consumers and firms to increase their unbalances; *nfcbal* goes up after a rise in BAA-spread: *hbal* rises in the presence of an increase in the cost of external finance.
2) Economic cycle influences the financial balances: a rise in the *gdp* does raise the household balance positively, but causes a fall in the corporate balance. This occurs because higher income means higher savings (for households), whereas higher *gdp* means higher business investments (for corporate).
3) Corporate balance has a positive impact on GDP cycle as we expected. This result confirms that corporate balance is a leading component of the cycle as suggested by Casadio and Paradiso (2009) and according to Minsky's theory of financial instability.
4) Economic cycle and financial balances influence the financial variables. A positive shock in the economic cycle makes future expectations of economic activity more optimistic and reduces the risk premia tightening the spread. A positive shock in *gdp* raises long term interest rates (as long term interest rates are the average of expected future short term rates, and a rise in *gdp* implies that there will be expectations of an increase in short term interest rates). A rise in *hbal* implies that households are saving more and this implies higher demand of assets that push up the stock price. A positive shock on *nfcbal* implies higher profits and this translates into higher stock prices.

4. Conclusions

We reconsidered the sectoral balances approach of Godley, focusing our attention on the two main components of the private sector balance and on their interactions: household and (non-financial) corporate balances. Through a structural VAR estimation, obtained imposing restriction on the contemporaneous effects matrix, and the relative IRF, we find that: (1) household and corporate balances react to financial markets in the way we discussed; (2) the economic cycle influences the two financial balances; (3) the corporate balance has a positive impact on the cycle; (4) the economic cycle and financial balances influence the financial variables. In particular, point (3) shows that the corporate balance is a leading component of the cycle as suggested by Casadio and Paradiso (2009) and accords with Minsky's theory of financial instability. Our contribution – which aims to endogenize all the mechanisms behind the sectoral balances approach – is an important improvement with respect to Levy Institute and Goldman Sachs' contributions.

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Data Appendix

Standard and Poor's 500 index, BAA-spread, 10-year T-N yields, and GDP are from FRED (Federal Reserve Economic Data). BAA-spread is obtained as the difference between corporate bond yields and 10-year T-N yields.

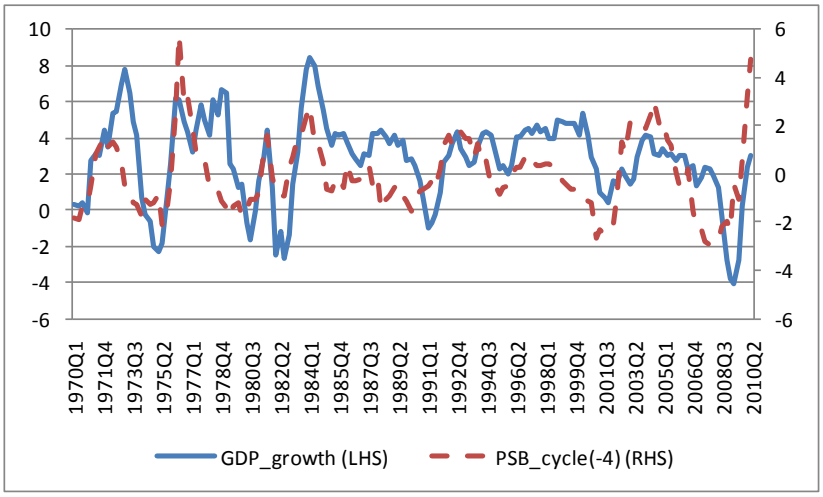
Household and corporate balances are obtained from Flow-of-Funds (FoF) accounts of the Boards of Governors of the Federal Reserve System.

Household balance = gross saving (line 10 of Table F.100 in the FoF) minus capital expenditures (line 12 of Table F.100 in the FoF).

(Non-financial) corporate balance = internal funds with IVA minus total capital expenditures (line 54 of Table F.102 with sign reversed in the FoF).

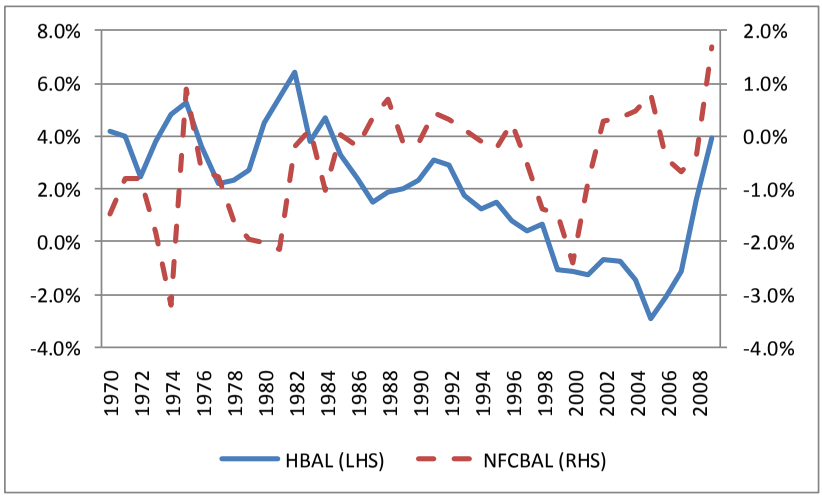
Appendix: Tables and figures

Figure 1: Cyclical component of the private sector balance vs GDP growth



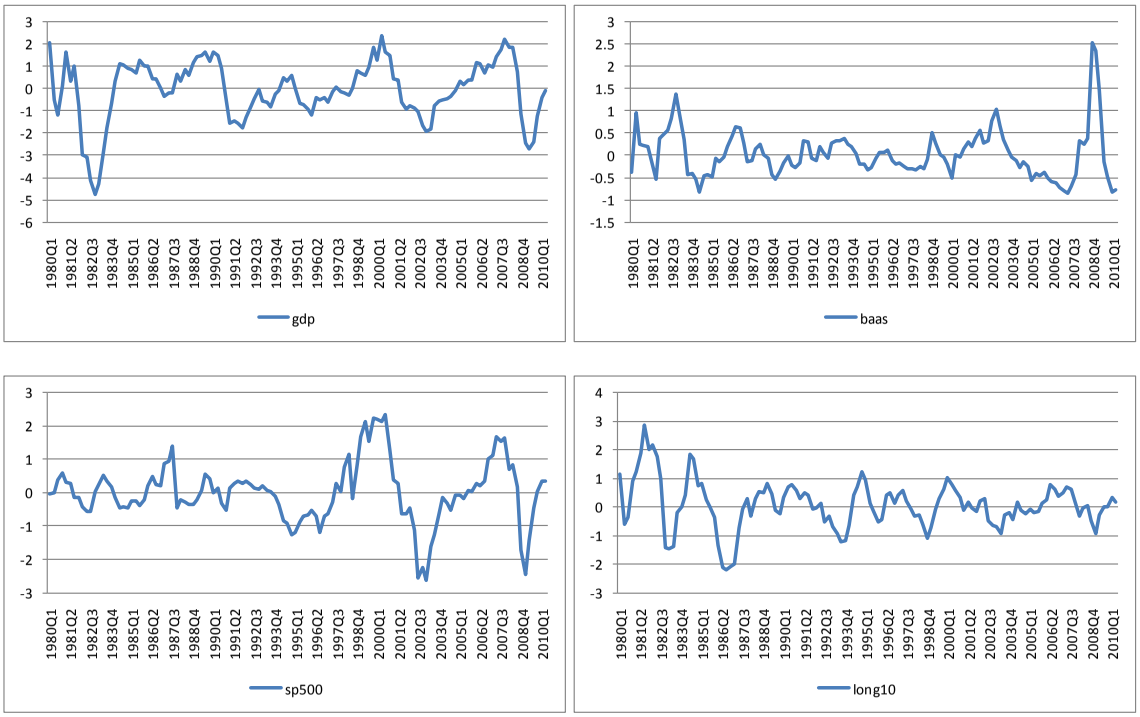
Source: BEA. Note: Quarterly data. The cycle component of the private sector balance (PSB_cycle) is obtained through the Hodrick-Prescott filter applied to the ratio of private sector balance to GDP. GDP_growth is the GDP year-on-year growth rate (the level of GDP in one quarter is compared to the level of GDP in the same quarter of the previous year).

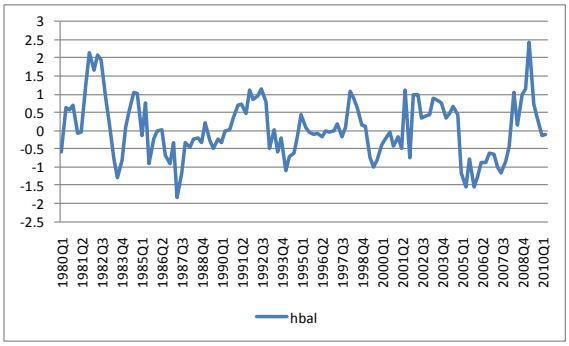
Figure 2: Household balance vs non-financial corporate balance



Source: BEA. Note: Annual data. All the series are expressed as percentage of GDP. HBAL is household balance, whereas NFCBAL is the non-financial corporate balance.

Figure 3: Time series used in VAR estimation, 1980q1-2010q2





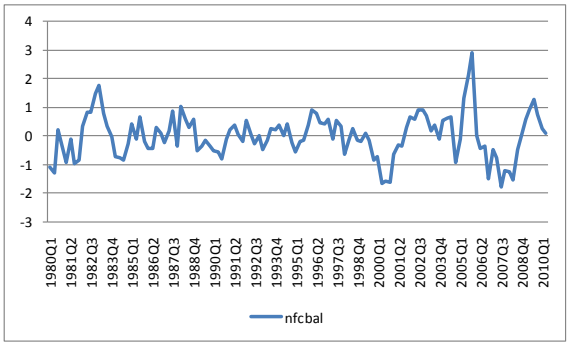


Table 1: Diagnostic tests for VAR(p) specifications

	Q_{16}	Q^*_{16}	LM_5	LJB^L_6	$MARCH_{LM}(5)$
ρ = 2	507.73 [0.84]	550.81 [0.36]	196.02 [0.19]	67.93 [0.00]	2285.45 [0.11]
ρ = 1	523.57 [0.83]	564.86 [0.39]	191.74 [0.26]	129.49 [0.00]	2278.62 [0.13]

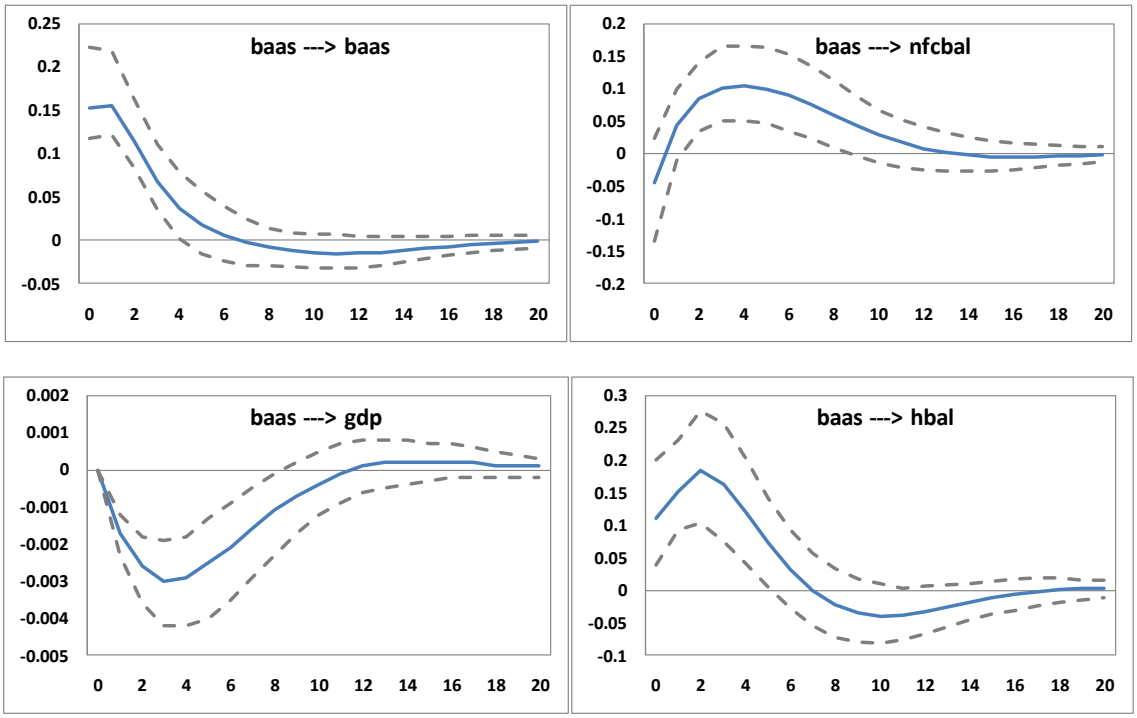
Note: p-values in brackets. Q_ρ = multivariate Ljiung-Box portmanteau test tested up to the ρth lag; LM_ρ = LM (Breusch-Godfrey) test for autocorrelation up to the ρth lag; LJB^L_p = multivariate Lomnicki-Jarque-Bera test for non-normality from Lutkepohl and Kratzig (2004) with *p* variables in the system; $MARCH_{LM}(\rho)$ = multivariate LM test for ARCH up to the ρth lag. An impulse dummy variable for period 2008q4 is considered because of a strong outlier in baa-spread series.

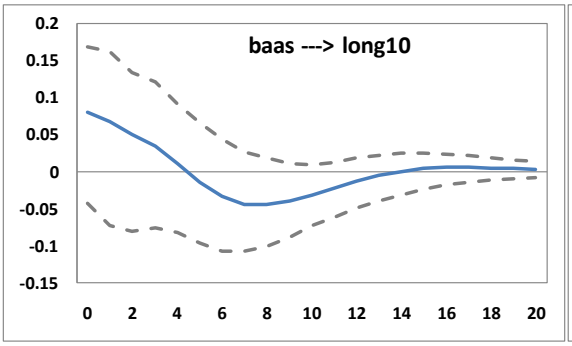
Table 2: Specification tests for VAR(2) model

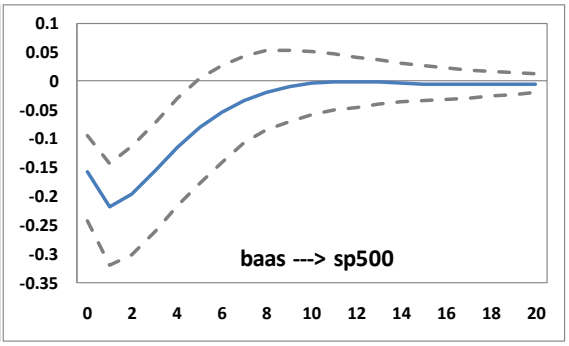
Univariate normality test for	*gdp*	*sp500*	*baas*	*long10*	*hbal*	*nfcbal*
Norm(2)	9.93 [0.01]	23.25 [0.00]	4.98 [0.08]	20.21 [0.00]	0.62 [0.73]	35.67 [0.00]
Skewness	0.39	-0.57	0.08	0.04	-0.09	0.62
Excess kurtosis	4.16	4.83	3.98	5.00	3.30	5.36

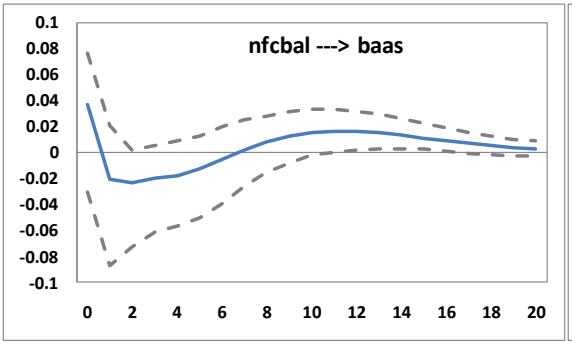
Note: p-values in brackets.

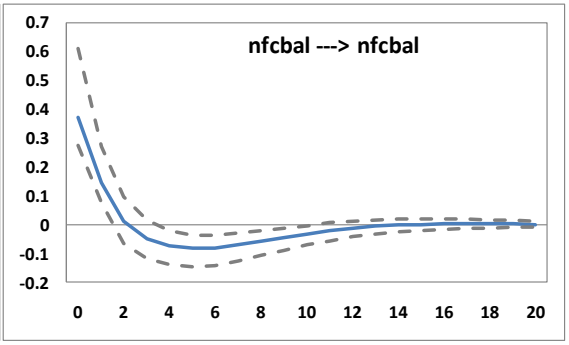
Figure 4: Impulse response, structural VAR

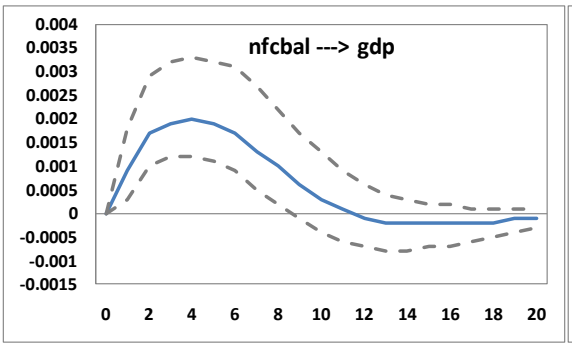


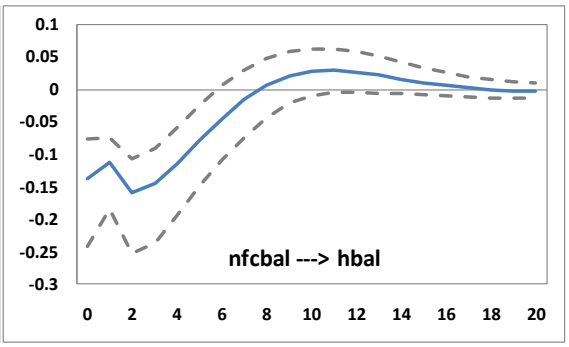

baas ---> long10
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0 2 4 6 8 10 12 14 16 18 20

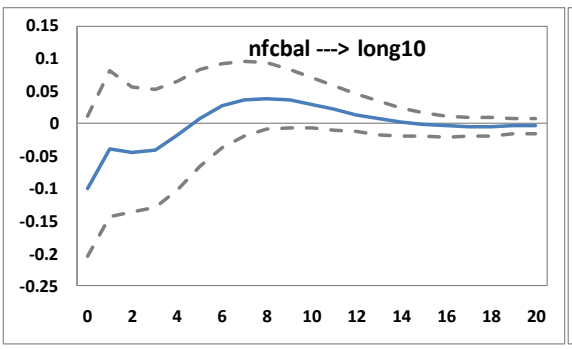

baas ---> sp500
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
0 2 4 6 8 10 12 14 16 18 20

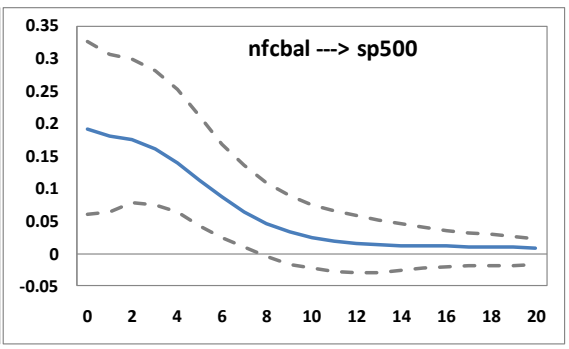

nfcbal ---> baas
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0 2 4 6 8 10 12 14 16 18 20

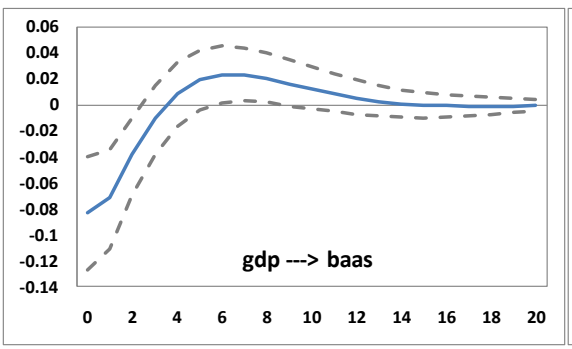

nfcbal ---> nfcbal
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0 2 4 6 8 10 12 14 16 18 20

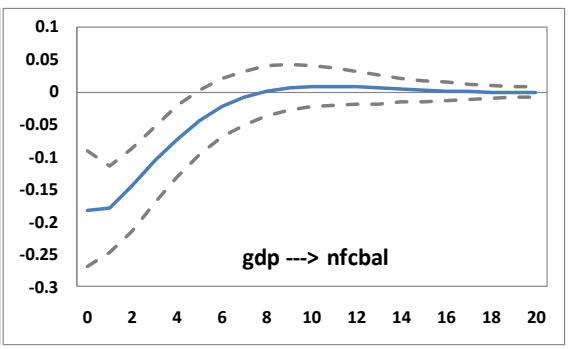

nfcbal ---> gdp
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
-0.0005
-0.001
-0.0015
0 2 4 6 8 10 12 14 16 18 20

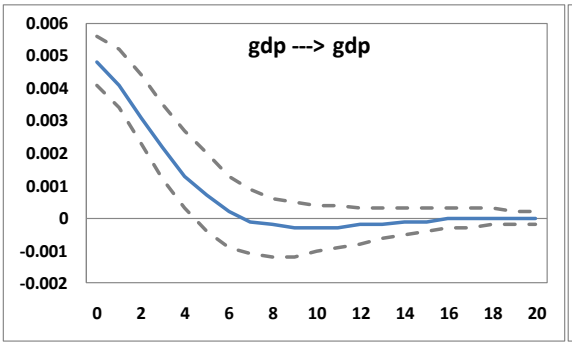

nfcbal ---> hbal
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
0 2 4 6 8 10 12 14 16 18 20

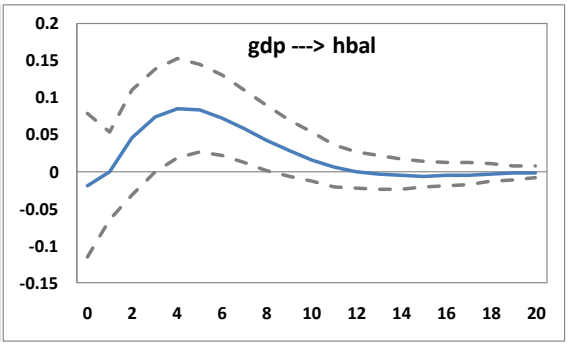

nfcbal ---> long10
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
0 2 4 6 8 10 12 14 16 18 20

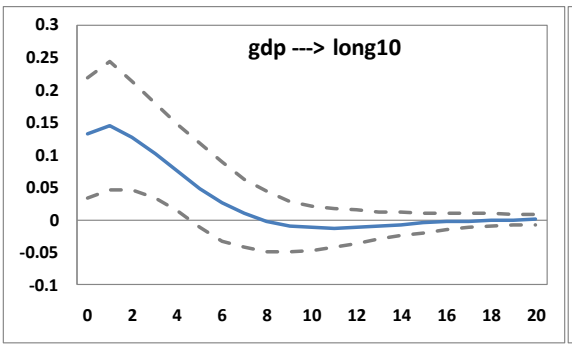

nfcbal ---> sp500
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
0 2 4 6 8 10 12 14 16 18 20

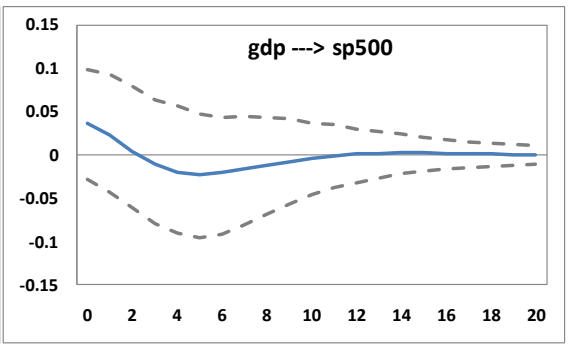

gdp ---> baas
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-0.14
0 2 4 6 8 10 12 14 16 18 20

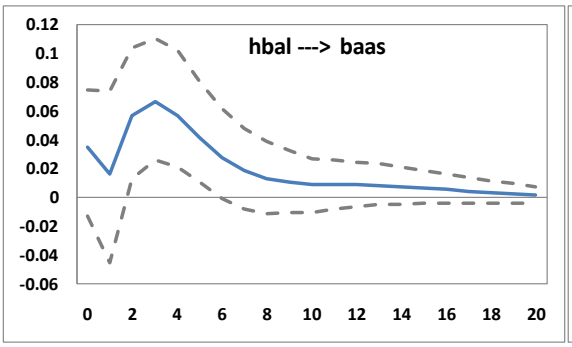

gdp ---> nfcbal
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
0 2 4 6 8 10 12 14 16 18 20

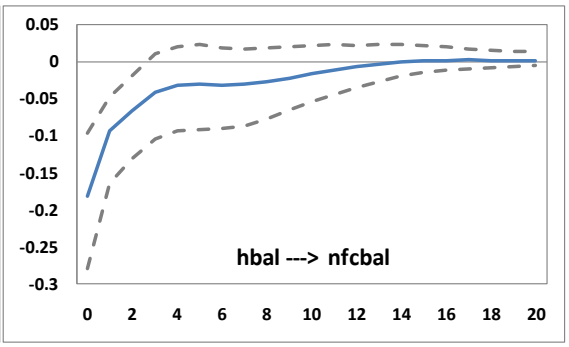

gdp ---> gdp
0.006
0.005
0.004
0.003
0.002
0.001
0
-0.001
-0.002
0 2 4 6 8 10 12 14 16 18 20

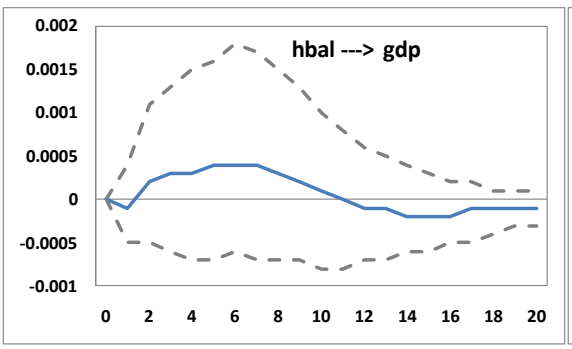

gdp ---> hbal
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0 2 4 6 8 10 12 14 16 18 20

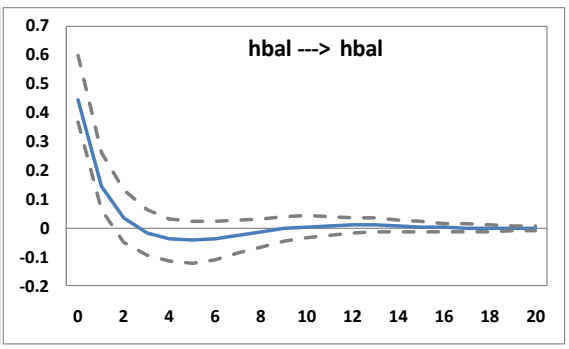

gdp ---> long10
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
0 2 4 6 8 10 12 14 16 18 20

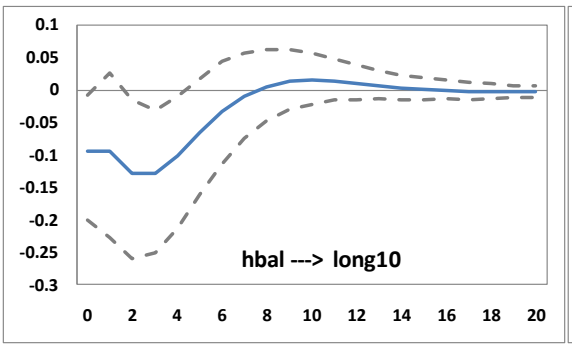

gdp ---> sp500
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0 2 4 6 8 10 12 14 16 18 20

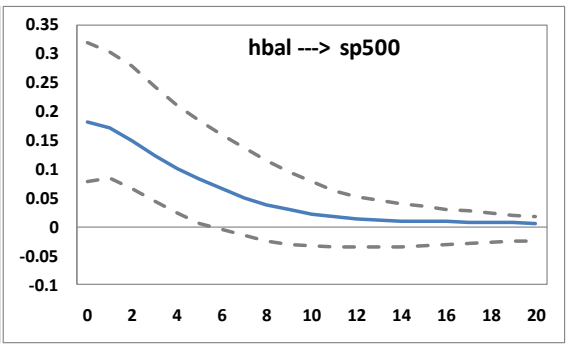

hbal ---> baas
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
0 2 4 6 8 10 12 14 16 18 20

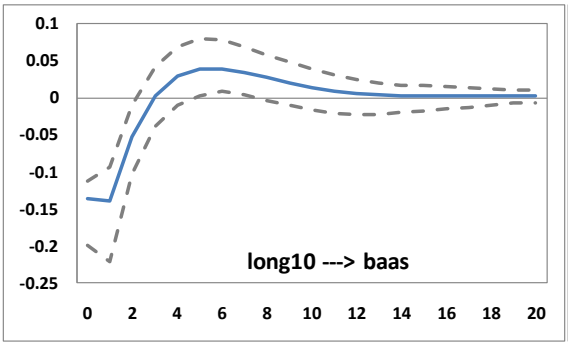

hbal ---> nfcbal
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
0 2 4 6 8 10 12 14 16 18 20

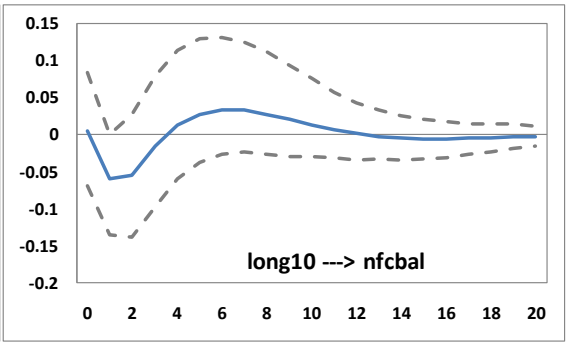

hbal ---> gdp
0.002
0.0015
0.001
0.0005
0
-0.0005
-0.001
0 2 4 6 8 10 12 14 16 18 20

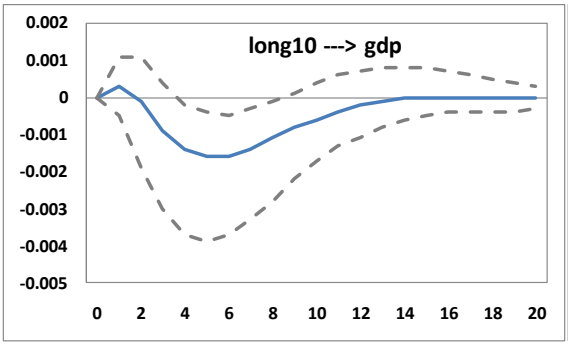

hbal ---> hbal
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0 2 4 6 8 10 12 14 16 18 20

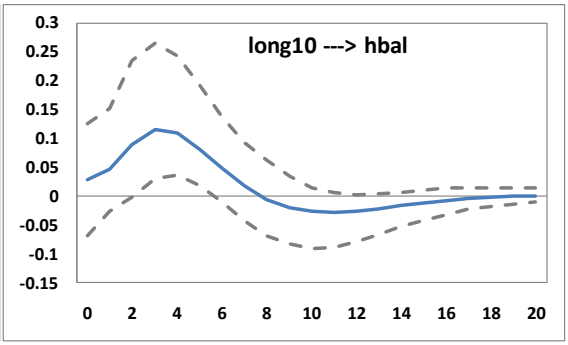

hbal ---> long10
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
0 2 4 6 8 10 12 14 16 18 20

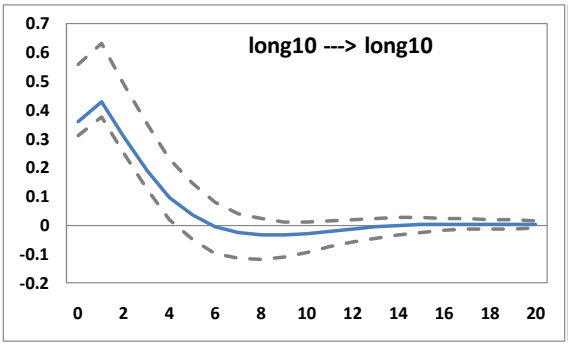

hbal ---> sp500
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
0 2 4 6 8 10 12 14 16 18 20

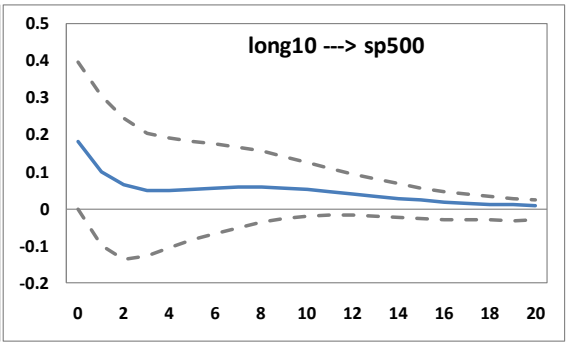

long10 ---> baas

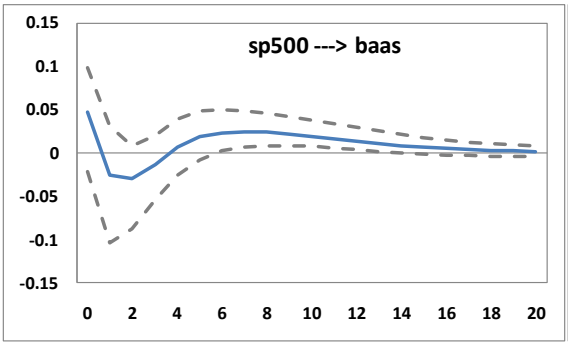

long10 ---> nfcbal

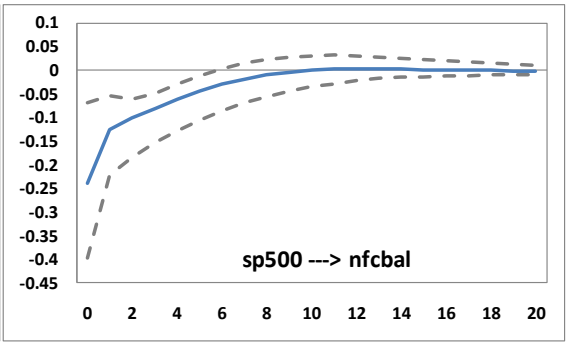

long10 ---> gdp

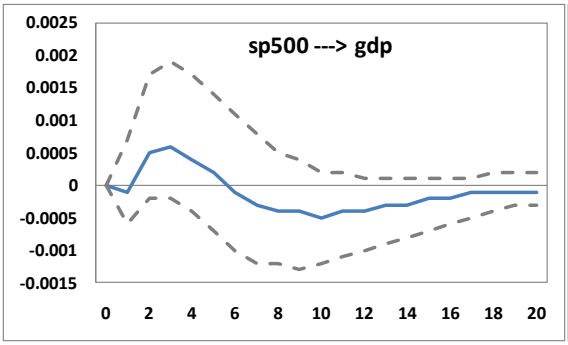

long10 ---> hbal

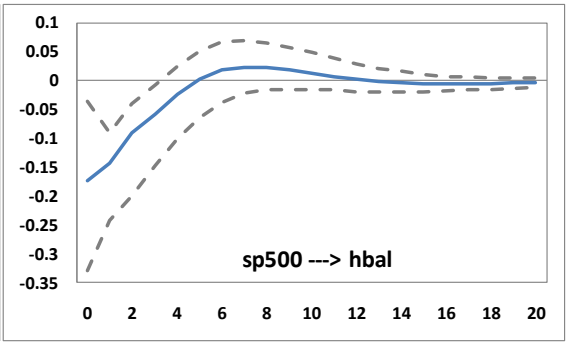

long10 ---> long10

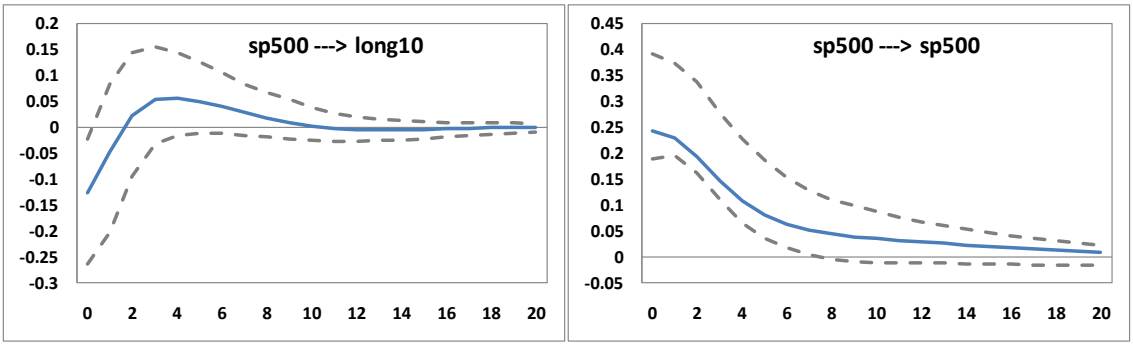

long10 ---> sp500


sp500 ---> baas


sp500 ---> nfcbal


sp500 ---> gdp


sp500 ---> hbal



Notes: Dotted lines indicate 95% Hall bootstrap confidence intervals using 1,000 bootstrap replications.