

## **The weight of residential investment in the French economy**

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**Abstract:** The recent subprime crisis attracts the attention of the policymakers on the role of real estate in economic stability. This paper evaluates the weight of residential investment in the French economy using a quarterly data set from 1950Q2 to 2013Q1. Our main results, deduced by the Leamer's methodology (2007) and based on the rolling regression models and the structural vector autoregressive models, show that the contribution of real estate sector in the French GDP reduction is both negligible and decreasing over-time. Shocks to residential investment, thereby, do not appear to pose any serious problem to the macroeconomic stability in France.

Keywords: Real estate, financial stability, GDP Growth.

*Jel Classifications:* E32, L85, E44

## **1. Introduction:**

Since the inception of the recent subprime crisis of 2007, economists started inquiring about the role of real estate in the economic performance of countries with developed financial systems. It is usually argued that in order to assure financial stability, the policymakers need to use macroprudential measurements in the property market.<sup>1</sup> Taking into account the heterogeneity of the property markets which includes their institutional framework, economic characteristics, intervention of the public authorities and financing conditions, the weight of the residential investment in the economic evolution differs from one country to another. Accordingly, the macroprudential policies aimed at controlling the fluctuation in the real estate market also need to be granular across countries and regions (Hartmann, 2015).

The economic literature usually focuses on the importance of real estate sector in the domestic GDP growth as well as in international financial stability. Due to the significant share of real estate in the economic growth of certain countries, changes in its price (or volume) exert considerable long-term consequences for these economies. Coulson and Kim (2000) note that the residential investment influences the evolution of the U.S GDP. Bernanke (2007) also confirms a strong link between residential investment and economic activity for the U.S economy. Cardarelli et al., (2008) show that the development of real estate financing system intensifies the impact of monetary policy on the residential investment and housing prices.

Applying the impulse response function, on the U.S data set from 1959 to 2007, Miles (2009) shows that the impact of the residential investment is particularly high after 1980s. Liu and others (2002) use Chinese data set from 1981 to 2000 and show that the residential investment strongly influences the economic fluctuation, although its weight does not exceed 8.6% of the GDP. Álvarez et al., (2010) posit that the residential investment can be used as an indicator of the evolution of GDP. Their study finds asymmetry in the effects of residential

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<sup>1</sup> In general, the evolution of real estate sector is measured by the indicators like residential investment, the real estate prices and the building stock.

investment on GDP growth; expansionary periods play a more important role in the evolution of the GDP than the recessionary episodes of the same magnitude.

With the advent of the financial crisis of 2007, a bulk of empirical literature has been devoted to the topic; albeit, focusing mainly on the three developed economies; Spain, the United Kingdom and the United States (Leamer 2007; Bernanke 2007; Timbeau 2014). Generally, this literature shows a positive relationship between residential investment and economic growth. Coming to the French housing sector, there exists a dearth of work on the subject. This can be explained by an apparently weak impact of the current (subprime) crisis on the evolution of French residential investment; compared to the above-mentioned economies. Cardarelli and others (2008) note that during the last decade the share of residential investment in the French GDP growth remained only around 5%. Ferrara and Vigna (2009) argue that the French economy benefitted from two structural characteristics to avoid a collapse of its property market; the application of fixed loan rate and the moderate debt level of the households.<sup>2</sup> Boulhol (2011) focuses on the importance of real estate in the French economy, in particular the weight of real estate debt in the household budget. The author finds contradictory evidence from the above by noting that the contribution of mortgage expenditures in the households' spending has increased significantly since 1980. In 2000, nearly 20% income of the middle class families has been allocated for the repayment of real estate purchase.

The conflicting views about the relevance of the real estate sector for the French GDP growth necessitate further inquiry into the subject. Besides, the recent trends in the real estate markets have also been considered unusual and the concerning authorities of the financial stability started constantly supervising the evolution of the housing sector indicators; especially the real estate prices. The High Board of Financial Stability (Haut Conseil de Stabilité Financière) which observes the conditions of the housing credit, mentions in the report of the "council of financial regulation and systemic risk" that the eruption of real estate crisis in the United States, the United Kingdom and Spain has alerted the French authorities forcing them to reevaluate the performance of the real estate sector (Corefris, 2011).<sup>3</sup> This specific focus on the

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<sup>2</sup> It is important to note that since the years 2000, the credit granting conditions are increasingly flexible in France with more duration of credit length and lower interest rates. To illustrate, the duration of the credit increased from 14 years in 1999 to 20 years in 2012 (Avouyi-Dovi and al., 2014). Despite these easy loan facilities, the level of households' debt remained moderate compared with the other western countries.

<sup>3</sup>Corefris is replaced by the High Board of financial stability since July 2013.

real estate sector has also been motivated by the contemporaneous research (e.g., Leamer, 2007) which finds its significant contribution in triggering recession among the other sectors including the spending by consumers, the business, the government and the external sectors of the U.S economy. More importantly Leamer reports this unique behavior of housing sector by arguing, *“Housing is the biggest problem in the year before recession, but is the first to start to improve in the second quarter of the recession”* (Leamer 2007, p.16).

Against this backdrop, our main task is to explore whether the French real-estate market indeed requires the use of macroprudential measurements for managing the real estate cycles. Certainly, the use of macroprudential tools is justified only if the residential investment significantly contributes to the GDP growth reduction in France. That said we also aim to see whether the contribution of real estate sector in the fluctuations of the French GDP growth has changed over-time. A time-varying rolling regression model helps us to answer this question. Lastly, we test the persistence of shocks by using a structural vector autoregressive model. For our empirical investigation, we measure the cumulative abnormal contribution of the residential investment to the GDP growth before and after a peak by applying the Leamer’s (2007, 2009) methodology. This allows us to separately analyze the negative contribution of residential investment in reducing the GDP growth, for our selected time period from 1950Q2 to 2013Q1. Our empirical results illustrate a weak contribution of the residential investment to the GDP reduction in France before and after the recessionary periods. Furthermore, this contribution significantly reduces during the recent decades.

The rest of the paper is structured as follows. Section 2 outlines the structural vector autoregressive model for the French economy. Section 3 presents the selected data set used in this study. Section 4 reports the summary of our main findings. Section 5 offers conclusion.

## **2. Structural Vector Autoregressive model (SVAR model)**

In order to estimate the effects of residential investment shocks on the French GDP growth and its components, we estimate a structural vector autoregressive (SVAR) model. The SVAR methodology facilitates us in analyzing both the magnitude as well as the persistence of changes in the GDP to shocks in real estate market and other variables. A main advantage of this approach is that by using this methodology we can model the non-recursive structure of the economy and thus interpret the contemporaneous correlations of disturbances. Effectively, a

decomposition of variance-covariance matrix using a SVAR model yields a recursive scheme among variables that has clear economic implication and that can be tested as any other relationship (see Mamoudou et al., 2009).

An important step in the SVAR model is the selection of an appropriate number of covariates. As we are interested to analyze the effects of shocks to residential investment on the French GDP, several other growth covariates including inflation, short term interest rate, European GDP –for external shocks – and the real exchange rate, etc. could also be included. However, all these relevant covariates were not incorporated mainly for two reasons; first, the information on these variables was not available for the whole sample period and second, by adding more variables, the size of our SVAR model could become larger and, thereby, difficult to manage. Consequently, our SVAR model only explains how shocks to different components of the GDP including residential investment, imports, exports and household consumption impact the GDP growth in France. The selected open economy can be represented by the following structural form equation:

$$BX_t = C(L)X_{t-1} + u_t \quad (1)$$

where

$$E(u_t u_t') = D, \quad E(u_t u_{t+s}') = 0, \quad \forall s \neq 0,$$

B is a nonsingular matrix that is normalized to have 1s on the diagonal,  $X_t$  is an 'n x 1' vector of the above-mentioned included variables, C(L) is polynomial in the lag operator L, and  $u_t$  is an  $n \times 1$  vector of structural disturbances. D is a diagonal matrix whose off-diagonal elements are zero and whose diagonal elements are variances of structural disturbances.

As matrix  $X_t$  comprises endogenous variables, its estimation using OLS yields biased and inconsistent results. The solution lies in estimating a reduced form model in order to get maximum likelihood estimates of B and D. Mathematically:<sup>4</sup>

$$X_t = A(L)X_{t-1} + \varepsilon_t \quad (2)$$

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<sup>4</sup>See Lawson and Rees (2008) for a detail description of the model.

where  $E(\varepsilon_t \varepsilon_t') = \Omega$ .

The structural disturbances and the reduced-form residuals are related by  $u_t = B\varepsilon_t$ , implying that:

$$D = E(B\varepsilon_t \varepsilon_t' B') \quad (3)$$

From equation (3), B and D can be recovered by imposing certain restrictions on some of the contemporaneous relationships between the included variables. Conventionally, the economic literature follows the method of Cholesky decomposition where reduced-form disturbances are orthogonalised by implying a recursive temporal ordering of the variables. However, Cooley and LeRoy (1995), criticize this method because of its deficiency in finding a theoretically valid causal structure. The alternative is to use the theoretical reasoning and assuming that changes in some variables affect the others only after some lags. We adopt this method here and impose the following restrictions on the off-diagonal elements:<sup>5</sup>

$$BX_t \equiv \begin{bmatrix} 1 & 0 & 0 & \alpha_{14} & \alpha_{15} \\ 0 & 1 & 0 & 0 & \alpha_{25} \\ 0 & 0 & 1 & 0 & \alpha_{35} \\ \alpha_{41} & 0 & \alpha_{43} & 1 & \alpha_{45} \\ \alpha_{51} & 0 & \alpha_{53} & 0 & 1 \end{bmatrix} \begin{bmatrix} Invest \\ Imp \\ Exp \\ Cons \\ GDP \end{bmatrix} \quad (4)$$

Here Invest, Imp, Exp, Cons and GDP are residential investment, imports, exports, household consumption and GDP growth, respectively. Each non-zero co-efficient indicates that variable  $j$  affects variable  $i$  contemporaneously. The diagonals coefficients are normalized to 1 while the off-diagonals are constrained to be zero.

In the above matrix, residential investment variable is affected by the contemporaneous changes in GDP or its consumption component. However, it is not contemporaneously affected by imports or exports. The rest of the equations of the matrix can be explained accordingly. Lastly, it is important to mention that although the ordering of our non-recursive models follows

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<sup>5</sup> For a model to be exactly identified there must be  $(k(k-1))/2$  restrictions on the BX matrix. This allows us to estimate a maximum of 10 parameters in this model. However, since we are estimating only 9 parameters, the model is over-identified. The likelihood test for the validity of our identifying restrictions therefore suggests that they should be rejected.

the economic theory, the estimated results of the SVAR model are robust with respect changes in this ordering.

### 3. Data

The National Institute of Statistics and Economic Studies (INSEE, hereafter) provides data set on the GDP and its components starting from the second quarter of 1950 to 2012.<sup>6</sup> The data are expressed in volumes at the chained prices of the previous year – seasonally adjusted and corrected for working days—using 2005 as base year. To evaluate the contribution of the residential investment around the peak value of GDP, we apply Leamer (2007, 2009) method which consists of three steps: i) extract the normal component, ii) determine the abnormal component, and finally, iii) standardize the series.

Following majority of the above-mentioned studies, we use the Hodrick-Prescott (HP) filter with the value of smoothing parameter as  $\lambda = 1600$  (for quarterly data) to extract the trend from our series.<sup>7</sup> To get the “abnormal” component of GDP, we subtract the normal series (the trend component) from the original data. Similarly, we estimate the cumulated abnormal contribution of each component of the GDP, expressed in percentage points. To determine the turning points of the GDP series, we use the algorithm Harding and Pagan (2002): “the Bry-Boschan algorithm for quarterly data” (BBQ).

Thereafter, we analyze the evolutions of each component compared to the peak dates. For this step, we process the data by interval: for each peak, we select the data for N periods before the peak and K periods following the peak. The choice of the duration of the two periods is arbitrary. In the present case we consider the contribution of the components one year before

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<sup>6</sup>The components of GDP comprise : import, export, Household final consumption expenditure , final consumption expenditure of general government of which individual consumption expenditure, final consumption expenditure of general government of which collective consumption expenditure, final consumption expenditure of non-profit institutions serving households, gross fixed capital formation (GFCF) of general government, GFCF of non-financial corporation and unincorporated enterprise, GFCF of financial corporation and unincorporated enterprise, GFCF of households excluding unincorporated enterprise, GFCF of non-profit institutions serving households and changes in inventories.

<sup>7</sup>For robustness purposes we also apply a second filter, known as Baxter and King filter, with an interval of [6.32] quarters to check whether the choice of the filters influences our main results.

the peak and four years after the peak. Then, within each interval, we subtract the value of the peak, resulting in a zero value for all the peak points. Finally, to calculate the cumulative abnormal contribution of each component to the reduction of GDP, we make the sum of the negative contributions for each component. Any positive contribution is replaced by zero value.

Table 1 : Contributions to GDP growth

Time	GDP (%)	Import(-)	Consumption	Residential Investment	Investment	Inventory change	Export
1951T1	0.104	0.400	1.330	0.263	0.993	-1.804	-0.016
1961T1	1.288	0.020	1.620	0.197	1.111	-1.613	0.188
1971T1	1.614	-0.203	0.837	0.587	0.707	-0.483	0.351
1981T1	0.302	-0.206	0.212	-0.081	-0.190	-0.362	0.435
1991T1	-0.029	0.287	0.114	-0.141	-0.176	0.249	0.071
2001T1	0.576	-0.311	0.581	0.036	0.147	-0.614	0.150
2011T1	1.104	1.243	0.187	-0.012	0.275	1.385	0.500

Source: INSEE

Table 1 shows the contribution of all components of GDP for some selected data points in every ten years (average duration of a GDP cycle). As can be noticed, the GDP growth in first quarter of 1971 is 1.6% of which the contribution of residential investment is 0.5 (Percentage Point) and that of export is of 0.3 (Percentage Point). The sum of the contributions of components is equal to the growth rate of GDP for the same period. In 2011, the growth rate of the GDP is about 1.104% resulting from the sum of contribution of consumption (0.187), investment (0.275), inventory change (1.385) and export (0.5) minus the contribution of the imports (1.243).

The small contribution of residential investment to GDP growth, however, does not reflect the weight of residential investment during recessions or expansions periods. Learner (2007) also finds a small contribution of the US residential investment to the GDP growth. Nevertheless, due to the weight of residential investment in the U.S recessions or expansions, the author argues that ‘the American business cycle is the housing cycle’.

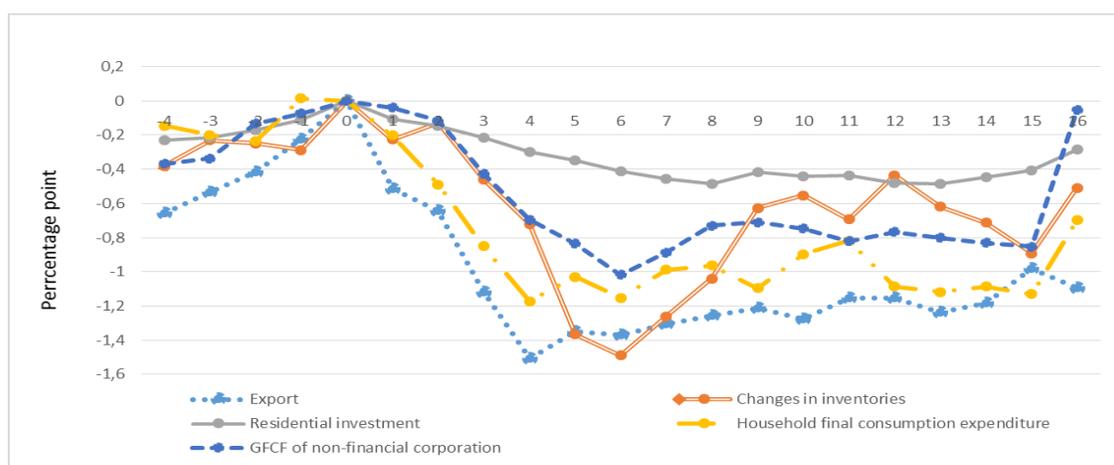
#### 4. Results and discussion:

By employing the BBQ algorithm on detrended series of our HP filter, we could identify the following peaks: 1957Q3, 1963Q3, 1974Q1, 1980Q1, 1990Q1, 2001Q1 and 2008Q1.<sup>8</sup> With

<sup>8</sup>By using the Baxter and King filter, the peak dates sometimes shifted by one or two quarters and we get the following peak points: 1957Q4, 1964Q1, 1974Q2, 1979Q4, 1989Q4, 2000Q4 and 2008Q.

this information we measure the cumulative abnormal contribution of each component to the sluggishness of the GDP for our selected time period and find that on average the residential investment contributes to 10% downwards movement of the GDP growth one year before the peak.<sup>9</sup> On average, the GDP growth observed a reduction of merely 1.67%. The main components responsible for this GDP reduction include exports, the inventory changes and the investment of the non-financial companies with their shares of 30%, 19% and 16%, respectively. Figure (1) presents the contribution of the four main components to the French GDP growth before and after the peaks since 1950.<sup>10</sup> The abscissa axis of this graph represents five years period (twenty quarters) around a peak. The point 0 indicates the date of the peak, the period before the peak ranges between [- 4, - 1] and the four years following the peaks are between [1, 16].The ordinate axis presents the average of cumulative abnormal contributions from one component of the GDP growth. Through the figure (1), we can also determine the component that, on average, contributes most to the fall in GDP in the seven peaks, defined earlier.

Figure1: Cumulative Abnormal Contribution to GDP Growth



Source: Authors' calculation

According to our results, for both pre- and post-peak periods, the export component brings the largest contribution in the reduction of GDP. For the year before the peak, its contribution is 0.6% while the one from the residential investment is merely 0.2%. Four quarters

<sup>9</sup>Cardarelli and al. (2008) report similar results for their sample of 1970 to 2007. The authors note that during the French recession of 2002-T3 to 2003-T2, the residential investment only contributed 4% of cumulated downwards movement of the GDP whereas this contribution was 25% and 13% for the U.S and the U.K, respectively.

<sup>10</sup>These include exports, final consumption expenditure of households, GFCF of non-financial corporation and unincorporated enterprises, GFCF of households excluding unincorporated enterprises, changes in inventories.

after the peak, the adverse contribution of export reaches its extreme value (nearly 1.5%), whereas the residential investment does not contribute more than 0.4%. By calculating the average contribution of the residential investment for the seven peaks, we note that the impact of the later on the evolution of the GDP is limited.<sup>11</sup> Briefly, residential investment occupies the fourth place in contributing to average GDP sluggishness after export, stocks and the household consumption, respectively; irrespective of the choice of the filter (see Appendix A: Table A2).

In order to see whether the contribution of residential investment in the GDP reduction has remained persistent over time or not, we separately analyze this contribution for all of the detected peak points. The results are shown in Table 2. As can be seen, for the first four peaks (1957, 1963, 1974, 1980), the cumulated GDP reduction, one year prior to peak, remains 2.03%. The residential investment, however, contributes only 15% to this fall. During the last three detected peaks (1990Q1, 2001Q1 and 2008Q1) the cumulated GDP reduces by 1.2%, and the contribution of residential investment appears to be a negligible 3%. This indicates a structural break in the relationship between residential investment and the GDP reduction before and after the 1990s. In other words, the growth inhibiting role of residential investment diminishes after 1990s. On the other hand, the cumulative negative contribution of export as well as non-financial companies, one year before a peak, accentuates at the end of the 1980s. The impact of the last two components on the GDP growth seems much more important than the residential investment during the last three peaks.

Contrary to the cumulative abnormal contributions one year before the peak, the average weight four years after the peak shows certain regularity. This can be noticed from Table 3. The cumulative abnormal contribution shows an increasing share of export in the GDP reduction. About the residential investment, its average contribution does not change and remains stable around 10%: except for the two time periods 1957-Q3 and 2001-Q1 where it reduces down to 3% and 4%, respectively.

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<sup>11</sup> For robustness purposes, we determine the normal contribution of the components by applying a filter of Baxter and King. As the table in the annex indicates, the choice of the filter does not really alter our results.

Table 3: Cumulative Abnormal Contribution in reducing the GDP, four years after the peak

turning point indicator (pic)	Export	Changes in inventories	Gross Fixed Capital Formation					final consumption expenditure				Import	GDP Growth (%)
			Residential investment	non-profit institutions serving households	Public Administration	financial corporation and unincorporated enterprise	non-financial corporation and unincorporated enterprise	Household	Non-profit Institutions Serving Households	General Government of which Individual Consumption Expenditure	General Government of which Collective Consumption Expenditure		
57T3	12%	24%	16%	0%	0%	0%	4%	21%	0%	0%	0%	-23%	-1,04
63T3	16%	17%	18%	0%	7%	1%	10%	28%	0%	3%	0%	0%	-3,14
74T1	33%	41%	14%	0%	0%	1%	6%	5%	0%	1%	0%	0%	-2,25
80T1	17%	39%	9%	0%	4%	0%	30%	1%	1%	0%	0%	0%	-1,68
90T1	29%	6%	4%	0%	0%	2%	19%	21%	1%	8%	4%	-6%	-1,12
01T1	55%	4%	0%	0%	1%	0%	15%	4%	0%	1%	0%	-21%	-1,11
08T1	54%	0%	6%	0%	0%	4%	35%	2%	0%	0%	0%	0%	-1,43
Average	30%	19%	10%	0%	1%	1%	16%	12%	0%	2%	1%	-8%	-1,68

Source: Author's calculations from the methodology Learner (2007), HP filter

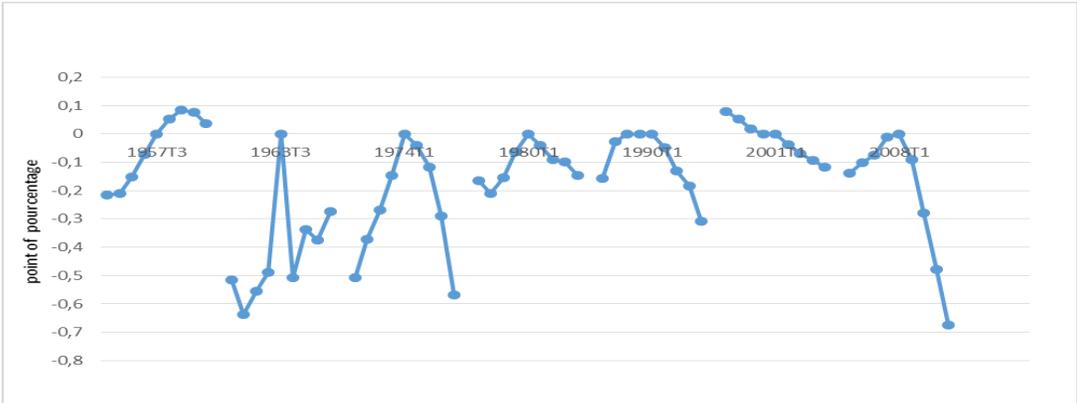
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57T3	6%	12%	3%	0%	3%	0%	7%	54%	1%	8%	5%	0%	-4,74
63T3	10%	16%	9%	0%	2%	2%	14%	40%	0%	1%	2%	-5%	-2,59
74T1	24%	28%	13%	0%	0%	2%	14%	16%	1%	1%	0%	0%	-5,81
80T1	24%	39%	9%	0%	1%	2%	9%	14%	0%	2%	0%	0%	-3,25
90T1	29%	16%	14%	0%	1%	2%	14%	24%	0%	1%	0%	0%	-3,08
01T1	49%	9%	4%	0%	5%	3%	16%	13%	0%	0%	1%	0%	-4,18
08T1	46%	9%	11%	0%	1%	2%	22%	8%	0%	0%	0%	0%	-5,14
Average	28%	17%	10%	0%	2%	2%	13%	24%	0%	2%	1%	-1%	-4,11

Source: Author's calculations from the methodology Learner (2007), HP filter

In what follows, we will be interested only in the residential investment and its contribution in the GDP diminution before and after a peak period. Figure (2) illustrates the cumulative abnormal contribution of the residential investment in the GDP growth around peaks. As can be noticed, since the beginning of the sample period, the average contribution of the residential investment to GDP reduction remains weak. Indeed, the maximum contribution of residential investment in the year before 1990 does not exceed 0.2% whereas in 1968 its contribution downwards of the GDP remains above 0.6%. Moreover, most of our peak points can be connected with some international events and national decisions. These include the first oil price shock (1973), the credit restriction of 1973 to 1985, the financial deregulation (1984) and the Gulf War (1990). All of these events inevitably influenced the consumption and investment behavior and certainly affected the contribution of components to economic growth. But the most important change has been ‘the boom’ of innovation in the means of mortgages financing which has impacted both the real sector and the overall economic growth, particularly starting from the mid-1980s. It is usually held that within the Euro zone, the relation between the real sector and the economic growth strengthened with the financial deregulation.<sup>12</sup>

Figure 2: Cumulative Abnormal Contribution of residential investment to reducing GDP before and since a peak



Source: Authors' Calculations

<sup>12</sup>Dynan et al. (2005) support this view for the U.S by showing that innovation in credit financing system had weakened the link between the U.S real estate and economic activity during the 1980s. They explain how the diversity of the funding sources had allowed an effective distribution of the risk between the economic agents.

#### **4.1. Macroeconomic events behind the recessions:**

The cumulative effects of the two World Wars and the interventions of the authorities on the property market, in particular the law of 1948, can explain the insignificant contribution of the residential investment to the GDP growth in the year before 1957. However, the contribution started to become significant in the years following the peak of 1957Q1 and it remained up to 7% for the four subsequent years. Then, the credit restriction of 1968 to 1985 with an aim of controlling the money supply inevitably left its prints on the third peak, recorded in the first quarter of 1974. According to our measurements, the contribution of the real estate one year before the two peaks 1974Q1 and 1980Q1 was 14% and 9%, respectively. In the periods 1973Q1 and 1979Q3 this contribution even reached at 17%, making it the third most influential component in reducing the GDP. During these years of credit control, the access to loans became limited and increasingly complicated. The households having access to credit were mainly no risky borrowers. Despite this selective credit granting policy, the residential investment observed an average increase of 2.4% in 1973 (INSEE, National Accounts, Base 2005).

Obviously, the first oil price shock adversely affected the contribution of the residential investment, export and variation of stocks through its impact on the balance of the international trade and interest rate. Our measurements show that in the second and the third quarters of 1973, the GDP reducing participation of the residential investment was about 15%. During the decade of 1980, the expansive budget policy and the financial deregulation – a decision which had supported the expansion in credit – were costly decisions for the French economy and they affected the contribution of the housing investment to the GDP reduction (Horty et al., 1995). From this period onwards a second era started concerning the weight of the real estate in the French economic growth.

The BBQ algorithm allows us to detect the fifth peak in 1990 which precedes the recession of 1992-93. Before this recession, the French real estate passed through a crisis characterized by spiraling prices and the scarcity of land in the large urban areas. This housing crisis was fed by the economic events such as the speculative real estate bubble, 1990-1991 (Braye et Repentin, 2005), the rise of short-term interest rates, 1988-1991, the increase in

unemployment rate, the excess of savings, the elevated level of companies' debt.<sup>13</sup> This situation was not favorable for investment, and it resulted in a reduction of growth rate from 2.8% to 0.2% from 1989Q2 to 1990Q1 (INSEE). Precisely, our estimations show that the contribution of the residential investment to recessions strongly reduced since 1989Q2. This can appear from two factors; first, the lower overall volume of the residential investment and second, a more prudent and risk averse behavior of the French financial institutions.

The mere 4% prior to peak contribution of residential investment in the GDP growth enables us to argue that the former does not pose any threat to the economic stability. Regarding the four quarters afterwards effects, we notice that between 1991Q2 and 1992Q2 the contribution of the residential investment has raised and reached at 33% in 1992Q1. But this unfavorable contribution was rectified at the end of the four quarters to reach at 11%, making the four year average contribution at 15%. This contribution, being highest since 1950, relates with the French recession of 1993. Therefore, we can conjecture that even in the adverse economic circumstances, the contribution of the residential investment in the GDP reduction was not so alarming. Finally, in the crisis of 2001, the role of residential investment appears insignificant both before and after the crisis. These results can be explained by the origin of the deceleration which is none other than the Internet bubble (Leamer, 2009).

The results also show that the intensity of the adverse effects of residential investment on the GDP growth weakened over-time. In other words, the contribution of the real estate in reducing the GDP growth seems to appear in two phases: the first phase starts in 1950 till the end of 1980 and the second phase starts from 1990. The behavior of the French residential investment in these two periods is systematically different from one another: the first period is characterized by strong fluctuations and a high growth rate (nearly 12%) and then starting from 1980s, the evolution of the residential investment is not very volatile though the cycles remain longer than the first phase. For robustness of our results, in the first step, we adopt a rolling regression analysis, and in the second step, a SVAR model.

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<sup>13</sup> Households save more than they consume in order to mitigate the impact of a potential unemployment. This saving behavior generates excessive saving (Horty, 1995).

#### **4.2. The real estate and the GDP growth changes: *rolling regression analysis***

Our analysis heretofore explain two main aspects of the relationship between the French residential investment and GDP growth; first, the contribution of weakness of the residential investment to the economic sluggishness has not been so important in most of the recessionary episodes and second, this contribution has not remained stable and rather reduced over time. However, this descriptive analysis of different recessionary periods does not provide a concrete picture of the relationship over the whole sample period. To get a more solid depiction of this relationship and to capture the time variation in it, we use a rolling regression approach. To this end, we test the connection between the cyclical changes of the residential investment and the GDP growth. A main advantage of our rolling regression technique is that here the coefficients of each sub-sample are completely independent and therefore allow greater flexibility in detecting the structural changes in this relationship over time. Our rolling regressions are based on the fixed window size of 100 quarters, the first regression is run by using the first 100 observations and then the window moves downwards by excluding the first observation of the sample and including the next quarter in the sequence. A constant window size enables us to compare the coefficients across samples. As we are interested to see the structural changes with respect to time, we retain the same temporal ordering of our sample.

Figure (3): Evolution of the GDP growth and residential investment relationship over-time

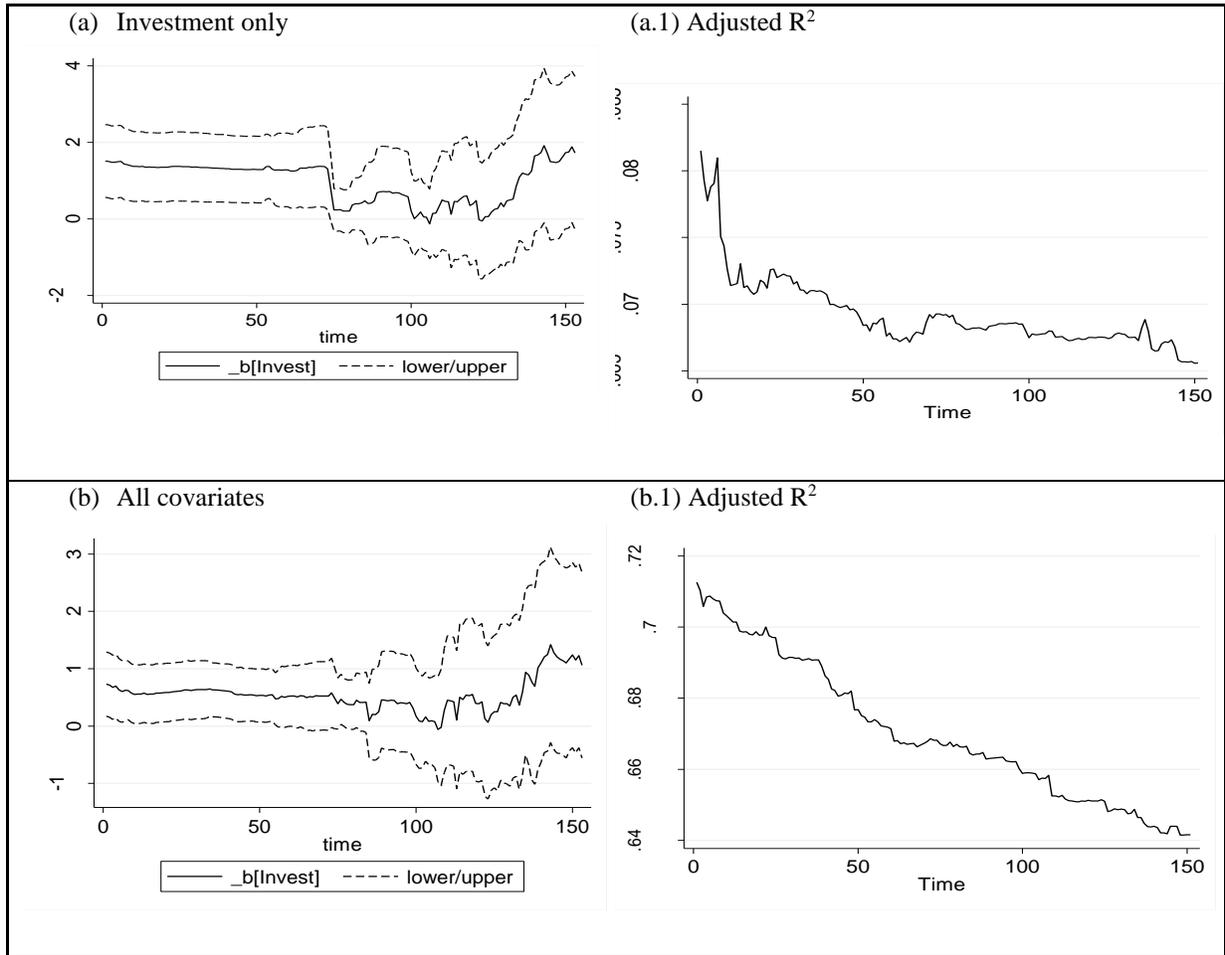


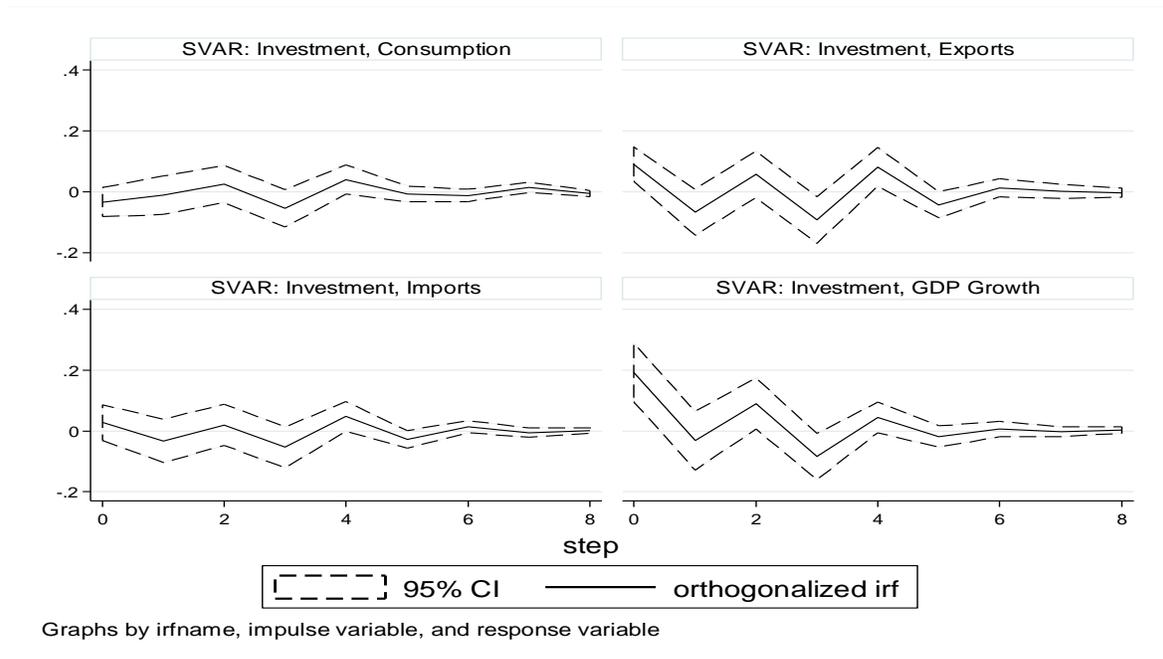
Figure 3 reports the sub-sample coefficients of the residential investment retrieved from the rolling regression exercise. Panel (a) uses the investment variables only while the panel (b) incorporates all the other covariates, the bold lines represent the coefficients while the dashed lines show the 10% confidence interval. The results are generally in line with our previous findings. Here, the positive cyclical changes in the residential investment increase the cyclical output growth; albeit, the coefficient is significant only up till early 1990s. Beyond this period a new regimes starts where changes in residential investment are inconsequential for their effects on the output growth. The right side column of the figure (6) reports the adjusted  $R^2$  for both these models. For robustness purposes, we have changed the window size and took 120 observations per regression. Our results are generally in line with the above findings, illustrating

the robustness of this relationship with respect to the sample size.<sup>14</sup>A lack of robust relationship does not necessitate the use of precautionary macroprudential measurements during the recent financial crisis in the French economy.

### 4.3 Structural VAR results:

Our estimated SVAR model incorporates GDP and its components including consumption, investment, exports, imports and residential investment. All of these variables are stationary at  $I(0)$ . After the stationarity tests, the next step in the SVAR estimation is to determine the number of lags. If lags are too few, the parameters are not white noise while, by contrast if lags are too many, the estimations risk over-parameterization. The optimal number of lags was four in our case except for imports and exports where it was two. In order to maintain uniformity, we maintained 4 lags in the estimations.<sup>15</sup> Our main results of the impulse response functions are presented in Figures 4, 5 and 6.

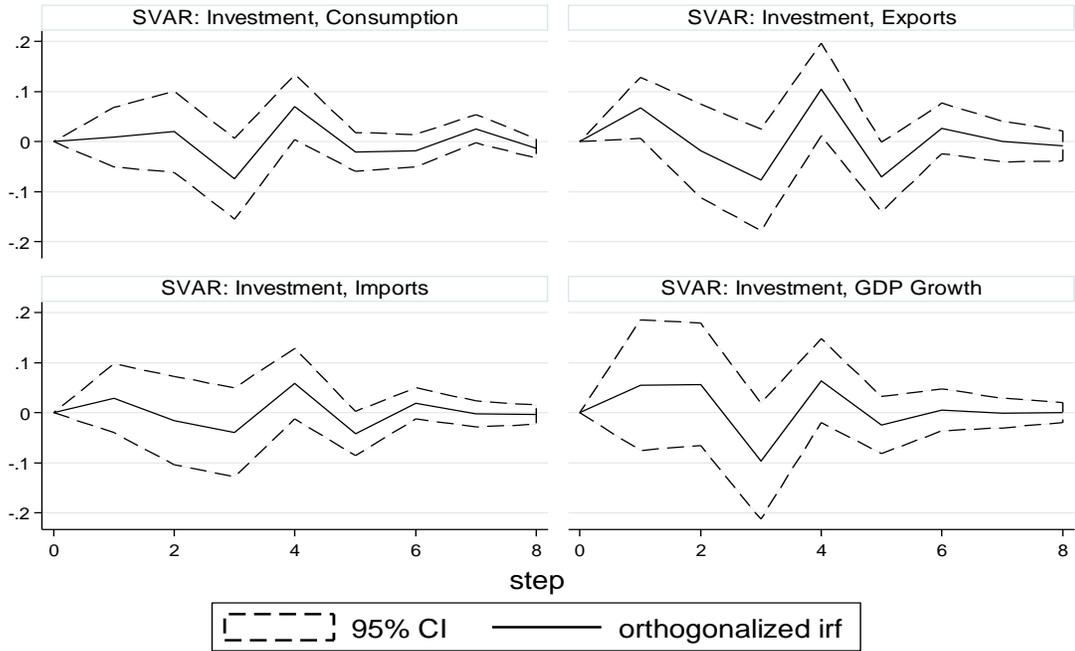
Figure (4): Response to Structural one S.D Innovations  $\pm$  S.E



<sup>14</sup>These results can be provided by the authors upon request.

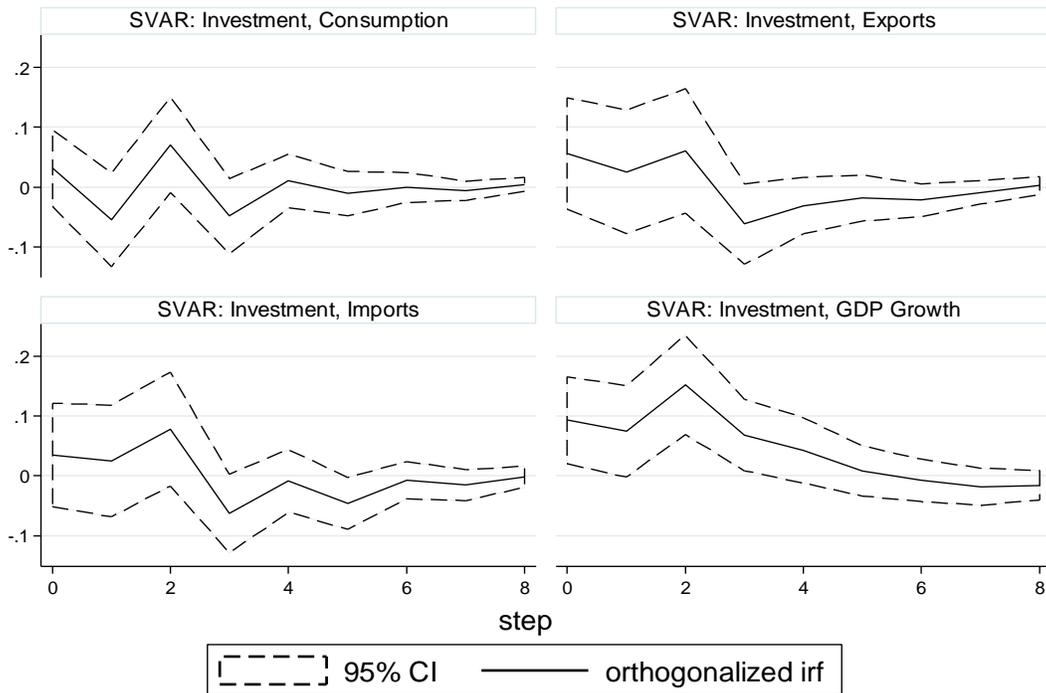
<sup>15</sup>Both the stationarity tests (Augmented Dickey Fuller) and the lag length tests (AIC, BIC, HQIC) can be provided by the authors upon request.

Figure (5): Response to Structural one S.D Innovations  $\pm$  S.E (1950-1991)



Graphs by irfname, impulse variable, and response variable

Figure (6): Response to Structural one S.D Innovations  $\pm$  S.E (1992-2013)



Graphs by irfname, impulse variable, and response variable

As can be seen from Figure (4), the impulse response of the GDP to the shock of the residential investment does not exceed 2%. It tends to become insignificant following the second quarter, representing the weakest response of the GDP to shocks, among the selected variables. These results of the weak relationship between residential investment and GDP growth contrast with Erceg and Levin (2002), who find a strong connection between the two variables for the U.S economy. The authors support a more important role of residential investment for the GDP growth than that of durable and nondurable consumption goods. In light of the present findings, we can argue that their results of a high magnitude of the GDP response to the shock of the residential investment were mainly due to the significant portion of the American residential investment in the GDP growth (see also Leamer, 2007; Timbeau, 2014). In line with our results of the global sample data set, our sub-sample results of 1950-1991 and 1992-2013 also show insignificant response of the GDP to changes in residential investment. On the whole, fluctuations in residential investment did not cause any changes in the French GDP growth.

Table 4: Relative importance of different shocks: variance decomposition analysis

Steps	Residential Investment	Import	Export	Consumption
0	0	0	0	0
1	.090017	.305831	.129824	.093892
2	.074658	.25125	.124259	.096684
3	.095164	.253498	.12063	.094647
4	.095756	.253101	.120818	.09456
5	.09724	.252961	.12092	.094398
6	.097276	.252898	.120898	.094379
7	.097424	.252876	.120879	.09436
8	.09743	.252872	.120877	.094362

In order to see the relative contribution of different factors to changes in the GDP growth, we conduct forecast error variance decomposition (FEVD). As can be seen from Table 4, among the four components of GDP growth, the contribution of residential investment is very modest. Throughout the eight periods, the contribution of the residential investment to the growth of the GDP does not exceed 10%. This confirms our previous results which were based on the methodology used by Leamer (2007).

## 5. Conclusion:

In the aftermath of the recent financial crisis, a bulk of literature has studied the real estate sector. The eruption of real estate crisis in some European countries and the United States

along with the recent trends in the French property market forced the concerning authorities to reevaluate the performance of the property market (Corefris, 2011). The analysis of the trend of prices, the residential investment and the revision of the credit conditions became necessary in the French economy in order not to find itself in the same critical situation as the other developed economies. Despite this consensus view favoring the use of macroprudential measurements to control the real sector's fluctuations, the recent empirical research stresses the necessity of country-specific analysis before going for these measurements (Hartmann, 2015).

In this paper, we tried to address this issue for the French economy. To this end, we analyze the contribution of French residential investment to the GDP reduction around the recession periods, measured by the Leamer (2007) methodology. For our selected period from 1950 to 2013, we find that on average the residential investment contributes only up to 10% in the downfall of GDP growth one year before the peak. This weak contribution does not pose any significant problem during the recession periods. Therefore, the present macroeconomic conditions do not call for the application a macroprudential policy in the real estate sector, directed to the amelioration of mortgage conditions. The results of the time-varying rolling regression models also indicate that the ability of the residential investment to influence the GDP has reduced over-time and became insignificant during the recent decades. Finally, our SVAR estimates show that the response of the GDP growth to changes in the residential investment is minor and short-lived. These results complement Avouyi-Dovi et al., (2014) who consider the credit financing system in France as “structurally resilient” system.

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## Appendix A:

Table (A1): Cumulative Abnormal Contribution to GDP Growth after and during the seven peaks(BK.filter)

Growth component	(p.p)	(%)
Export	-0,63	31%
Household final consumption expenditure	-0,50	24%
Changes in inventories	-0,37	18%
GFCF of non-financial corporation and unincorporated enterprise	-0,28	14%
Residential investment	-0,11	6%
GFCF of public administration	-0,04	2%
Final consumption expenditure of general government of which individual consumption expenditure	-0,02	1%
GFCF of financial corporation and unincorporated enterprise	-0,02	1%
Final consumption expenditure of general government of which collective consumption expenditure	-0,01	1%
Final consumption expenditure of non-profit institutions serving households	-0,01	0%
GFCF of non-profit institutions serving households and changes in inventories	0,00	0%
Import	0,05	-2%
<b>TOTAL</b>	<b>-2,04</b>	<b>100%</b>

Table (A2): Cumulative Abnormal Contribution to GDP Growth after the seven peaks (HP filter)

Growth component	(%)	(%)
Export	-1.02	27%
Household final consumption expenditure	-0.78	21%
Changes in inventories	-0.69	19%
GFCF of non-financial corporation and unincorporated enterprise	-0.50	13%
Residential investment	-0.32	9%
GFCF of public administration	-0.07	2%
Final consumption expenditure of general government of which individual consumption expenditure	-0.06	2%
GFCF of financial corporation and unincorporated enterprise	-0.05	1%
Final consumption expenditure of general government of which collective consumption expenditure	-0.04	1%
Final consumption expenditure of non-profit institutions serving households	-0.01	0%
GFCF of non-profit institutions serving households	0.00	0%
Import	0.03	-1%
<b>TOTAL</b>	<b>-3.71</b>	<b>100%</b>

Source: Authors' Calculations