

# The Link between Housing Prices and Current Account Deficit: a study of 10 OECD countries

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June. 30, 2007

**Abstract.** I construct a Panel dataset over 10 OECD countries for 1985-2006. Making use of a Panel VAR technique, I estimate a negative relationship between housing prices and the current account for the overall sample. Housing price shocks have a positive impact on investment, consumption and growth, and, as result, the current account deficit, even if the sample includes some countries which are saving and running a current account surplus.

Keywords: current account, housing prices, Panel VAR.

JEL Codes: E2, F32, C33, J22.

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# 1 Introduction

For many of the OECD countries, housing prices in real terms (the ratio of actual housing prices to the consumer price index) have shown a strong run-ups since the mid-1990s. Contemporaneously, those countries are also running current account deficit. Important cases are the U.S., U.K., Spain, Australia and Ireland. On the other hand, a number of countries have developed a large surplus vis-a-vis the United States. Japan and China have increased their current account surplus, while emerging Asia continued to run large current account surpluses. The current account surplus also increased in the Middle East and Russia due to higher oil prices. Another aspect of this imbalance stems from the financial side, as there have been and continue to be large international capital flows towards the United States in order to allow it to finance its current account deficit. The trend shown by these variables constitutes a risk to international financial stability and worldwide economic activity that merits the close attention of policy-makers.

Much of the literature has been focused on investigating the causes and origins of such global imbalances, as well as the implications of the sustainability and adjustment processes in terms of exchange rate and economic growth. For the case of the U.S., Krugman (2006) argues that the large deficit in the U.S. is driven by low savings rates, while Bernanke (2005) focuses more on the excess savings and low investment rates in Asian countries after the Asian crisis in 1997 as a possible reason for global imbalances. Some other authors have pointed to the recycling of the increased oil revenues by oil-producing countries and on the efforts to accumulate large foreign reserves by some Asian monetary authorities to avoid an appreciation of their respective currencies. Corsetti, Dedola and Leduc (2006) show that the current account in the U.S. is driven by higher U.S. import demand relative to the rest of the world due to strong productivity and economic growth. Mendoza, Quadrini and Rios-Rull (2006) show how different levels of financial market development and financial market integration can yield patterns for global imbalances. Blanchard, Giavazzi and Sa (2005) and Obstfeld and Rogoff (2005) argue that a large exchange rate depreciation is necessary to increase US exports in order to correct the trade balance and current account deficit, while Engel and Rogers (2006) show that an exchange rate adjustment is not necessary, since a remarkable growth performance of the US economy relative to the world output can rationalize part of the US current account deficit.

A closely related potential explanation for the large US current account deficit concerns asset price bubbles. The late 1990s and early 2000s were characterized by an unparalleled global equity market boom, led in particular by the United States. The significant growth in equity markets led to substantial wealth effects, with the increased household wealth from equity holdings contributing in particular to higher private consumption and lower savings. Ventura (2001), Caballero, Farhi and Hammour (2006) and Kraay and Ventura (2005) argue that this is likely to have played an important role in raising the US current account deficit in the late 1990s and early 2000s, i.e. during a period when the sharp increase in the US trade deficit was entirely driven by the dramatic increase in the private savings-investment deficit. Thus, wealth effects similar to those of the early equity market boom may have contributed to the low private savings rate in recent years. Roubini and Setser (2005) have argued that the sharp drop in national savings in the United States, which reflects the deterioration in the fiscal position and the increase in housing wealth, and the recent rebound in investment are at the root of current account imbalances.

Empirically, Bems, Dedola and Smets (2007) investigate the role of technology and policy to explain the U.S. imbalances. Fratzscher, Juvenal and Sarno provide an empirical analysis of the link between asset prices, exchange rate and the trade balance in the U.S. But no one to date has formally investigated the relationship between the housing market and current account imbalances from a multi-country prospective.

Studies on the OECD countries show that at least since 1970, real housing prices have fluctuated around an upward trend, with an increase on average of close to 40%. This increase is generally attributed to rising demand for housing space linked to increasing per capita income, growing populations, supply factors such as land scarcity and restrictiveness of zoning laws, quality improvement and comparatively low productivity growth in construction. The size of the real price gains during the current upturn is striking. For Australia, Denmark, France, Ireland, the Netherlands, Norway, Sweden, the United Kingdom and the United States, the cumulative increases recorded in the recent upturn have far exceeded those of previous upturns. With the exception of Finland, real housing prices in the countries experiencing gains are above their previous peaks. Its duration has surpassed that of similar past episodes of large real price increases for almost all countries. It is at least twice as long in the Netherlands, Norway, Australia, Sweden and the United States.

This paper empirically investigates the impact of housing price increases on the current account by analyzing 10 OECD countries. The hypothesis is that an increase in housing prices, when expected to be permanent, will increase the expected income of households and, therefore, increase consumption. Firms will increase investment in response to this higher demand, thus worsening the overall current account position. There is extensive literature on estimating the current account deficit in the U.S. a vector autoregression (VAR) approach, but, unlike the standard approach, I use a Panel VAR technique over a set of countries experiencing large current account imbalances with a strong run-up in the housing market. The use of the VAR approach helps to isolate the response of the current account to housing prices and other fundamental factors. Specifically, I focus on the orthogonalized impulse-response functions, which show the response of one variable of interest (i.e. current account) to an orthogonal shock in another variable of interest (i.e. housing prices or real variables). By orthogonalizing the response, I am able to identify the effect of one shock at a time, while holding other shocks constant.

The results show that with an percentage point increase in housing prices, the OECD countries respond with a 1.55% increase in the current account deficit.

The paper is organized as follows: section 2 includes the derivation of the fundamental equation of the current account including housing prices; section 3 includes a description of the Panel VAR procedure; section 4 describes the data of the 10 OECD countries; section 5 shows the impulse response results; section 6 concludes.

## 2 The Baseline Model with Houses

The baseline model considers a small open economy with no capital controls and given world interest rate. A representative household derives utility by consuming general goods (C) and holding housing (H). Houses purchases are assumed to be reversible and can be undertaken instantaneously without incurring adjustment costs. The household maximizes the following lifetime expected utility function

$$U = E_0 \sum_{t=0}^{\infty} \beta^t [\gamma \log(C_t) + (1 - \gamma) \log(H_t)], \quad \text{with} \quad 0 < \beta < 1, \quad (1)$$

where  $E_0[\cdot]$  denotes the expectations conditional upon the information available at time 0, and

$\beta$  is the subjective discount factor.

The model assumes incomplete international securities markets and allows for a one-period bond. The household can accumulate external assets  $B$  which evolve according to

$$B_{t+1} = (1 + r_t)B_t + Y_t - C_t - I_t - G_t - q_t[H_t - (1 - \delta)H_{t-1}], \quad (2)$$

which represents the budget constraint.  $q_t$  is the purchase price of houses relative to the consumption good which is considered to be the numeraire in each period;  $B_t$  is the stock of external assets at the beginning of time period  $t$ ;  $r_t$  is the world interest rate measured in terms of the numeraire;  $Y_t - I_t - G_t$  can be rewritten as the net output ( $NO_t$ ), meaning the GDP minus the sum of investment and government expenditures.

Maximization of the household's intertemporal utility function leads to the Euler equations that describe optimal intertemporal consumption decisions for  $t \geq 0$

$$\frac{1}{C_t} = \beta(1 + r_{t+1})E_t\left[\frac{1}{C_{t+1}}\right], \quad (3)$$

and

$$\gamma \frac{q_t}{C_t} = \frac{1 - \gamma}{H_t} + \beta(1 - \delta)\gamma E_t\left[\frac{q_{t+1}}{C_{t+1}}\right]. \quad (4)$$

Assuming a constant real interest rate, the relationship between house stock and consumption can be expressed as:

$$\left(\frac{1 - \gamma}{\gamma}\right) \frac{C_t}{H_t} = q_t - \left(\frac{1 - \delta}{1 + r}\right) E_t[q_{t+1}] \equiv i_t \quad (5)$$

where  $i_t$  represents the implicit date  $t$  rental price, or user cost, of the house, which is equal to the net expense of buying the house in one period, using it in the same period, and selling it the next, at no transaction costs.

Iterating (1.2) and imposing a "no-Ponzi game" condition yields the intertemporal budget constraint of a representative agent as follows:

$$\sum_{t=0}^{\infty} \left(\frac{1}{1 + r}\right)^t (C_t + i_t H_t) = (1 + r)B_t + (1 - \delta)q_t H_{t-1} + \sum_{t=0}^{\infty} \left(\frac{1}{1 + r}\right)^t NO_t. \quad (6)$$

This constraint states that the present value of nondurables purchases and the implicit rental cost of the durables held equals initial financial assets plus the present value of net output.

Plugging both Euler-equations and the expression (1.5) in the intertemporal budget constraint, we can obtain the optimal allocation for consumption and housing holdings:

$$C_t = \frac{\gamma r}{1+r} [(1+r)B_t + (1-\delta)q_t H_{t-1} + \sum_{t=0}^{\infty} (\frac{1}{1+r})^t (NO_t)] \quad (7)$$

and

$$H_t = \frac{(1-\gamma)r}{i_t(1+r)} [(1+r)B_t + (1-\delta)q_t H_{t-1} + \sum_{t=0}^{\infty} (\frac{1}{1+r})^t (NO_t)], \quad (8)$$

The current account for period t is equal to:

$$CA_t = B_{t+1} - B_t = rB_t + NO_t - C_t - q_t[H_t - (1-\delta)H_{t-1}]$$

Using equation (1.6), the current account equation can be rewritten as:

$$CA_t = B_{t+1} - B_t = NO_t - \frac{r}{1+r} \sum_{t=0}^{\infty} (\frac{1}{1+r})^t NO_t - \frac{r}{1+r} (1-\delta)q_t H_{t-1} + \frac{(1-\gamma)C_t}{\gamma} - q_t H_t + (1-\delta)q_t H_{t-1},$$

and using equation (1.5), the equation can be expressed as follows getting rid of  $C_t$ :

$$\begin{aligned} CA_t = B_{t+1} - B_t &= (NO_t - \tilde{NO}) - \frac{r}{1+r} (1-\delta)q_t H_{t-1} + \frac{(1-\gamma)C_t}{\gamma} - q_t H_t + (1-\delta)q_t H_{t-1} \\ &= (NO_t - \tilde{NO}) + \left( \frac{1-\delta}{1+r} \right) q_t H_{t-1} + i_t H_t - q_t H_t \\ &= (NO_t - \tilde{NO}) + [i_t - q_t] H_t - [i_{t-1} - q_{t-1}] H_{t-1} \\ &= (NO_t - \tilde{NO}) - \left( \frac{1-\delta}{1+r} \right) [E_t q_{t+1} H_t - E_{t-1} q_{t-1} H_{t-1}] \end{aligned} \quad (9)$$

where  $NO_t - \tilde{NO}$  provides a measure for how much the actual net output exceeds the “permanent” level.

If output in a given country is temporarily above the permanent level, the net foreign asset position of the economy increases (decreases) and it runs a current account surplus (deficit). Such net savings serve to stabilize consumption at the permanent level. Under the assumption that net output is exogenous, the consumption behavior of private agents drives the current account

against the background of a time-varying resource flow. Equation (1.9) shows that also the change of demand for housing has implication for the current account: if the expected housing price value increases respect his present value, then the current account decreases and it is running a deficit. Consumers spend  $q_t$  to purchase them outright rather than renting their services period-by-period at cost  $i_t$ .

Housing is an important component of demand, and the current account may become more variable since agents tend to lump their purchases of housing.

### 3 Panel Vector Autoregression

Instead of using traditional country vector autoregressive models, I use a panel VAR that allows me to use the larger data set on housing prices and the current account<sup>1</sup>.

The advantage of using a VAR approach derives from the fact that each variable under study can be regressed on a finite number of lags of all variables jointly considered. The VAR model consists of a multivariate simultaneous equation system and is useful when the intention is to analyze a phenomenon without having any strong priors about competing explanations of it. The method focuses on deriving a good statistical representation of the interactions between variables, letting the data determine the model. A panel data Vector Autoregression (VAR) technique, on the other hand, combines the traditional VAR approach, which treats all the variables in the system as endogenous, with panel-data approach, which allows for unobserved individual heterogeneity.

Following Love and Zicchino (2002), I specify a first-order VAR model as follows:

$$y_{i,t} = \alpha + \beta y_{i,t-1} + \gamma x_{i,t} + \eta_i + \delta_{i,t} + \epsilon_t,$$

where  $y_{i,t}$  is an observation on some series for individual country  $i$  in period  $t$ ,  $y_{i,t-1}$  is the observation on the same series for the same country in the previous period,  $x_{i,t}$  is a vector of current and lagged values of additional explanatory variables,  $\eta_i$  is an unobserved individual-specific time-invariant effect (country fixed effect) which allows for heterogeneity in the mean of the  $y_{i,t}$  series across countries,  $\delta_{i,t}$  is a disturbance term, and  $\epsilon_t$  is a time fixed effect.

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<sup>1</sup>Panel VAR code is provided by Inessa Love (World Bank).

The analysis focuses on impulse-response functions, which hold all other shocks at zero when describing the reaction of one variable in the system to the innovations in another variable in the system. However, the actual variance-covariance matrix of errors is unlikely to be diagonal, and it is necessary to decompose the residuals to isolate shocks to one of the VAR errors in such a way that they become orthogonal. I use the usual Choleski decomposition of the variance-covariance matrix of residuals, and it is equivalent to transforming the system in a recursive VAR for identification purposes to order and allocate any correlation between the residuals of any two elements to the variable that comes first in the ordering. The identifying assumption is that the variables that come earlier in the ordering affect the subsequent variables contemporaneously, as well as with a lag, while the variables that come later only affect the previous variables with a lag. In other words, the variables that appear earlier in the system are more exogenous and the ones that appear later are more endogenous.

In applying the VAR procedure to panel data, the underlying structure needs to be the same for each cross-sectional unit when imposing restrictions. Since this constraint is likely to be violated in practice, one way to overcome the restriction on parameters is to allow for individual heterogeneity in the levels of the variables by introducing fixed effects, denoted by  $\eta_i$  in the model. Since the fixed effects are correlated with the regressors due to lags of the dependent variables, the mean-differencing procedure commonly used to eliminate fixed effects will create biased coefficients. To avoid this problem we use forward mean-differencing, also referred to as the Helmert procedure<sup>2</sup> to remove the mean of all the future observations available for each country at each quarter. Since this transformation preserves the orthogonality between transformed variables and lagged regressors, lagged regressors are used as instruments and estimate the coefficients by system GMM. The matrix of impulse-response functions is constructed from the estimated VAR coefficients and their standard errors are computed by using Monte Carlo simulation to generate their confidence intervals.

## 4 Data

I analyzed 10 OECD countries: Australia, Canada, France, Ireland, Japan, New Zealand, Spain, Switzerland, United Kingdom and the United States. The country choice was driven by the avail-

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<sup>2</sup>See Arellano and Bover (1995).

ability of data<sup>3</sup>. The sample size includes quarterly data from January 1985 until the second quarter of 2006 (except Ireland, for which data is available from 1997<sup>4</sup>). Again the period choice depends on the availability of housing price series for all 10 countries. Except for Canada, Switzerland and Japan, which are running a current account surplus in the second part of the sample, all the other countries show an increasing accumulation of current account deficit, especially in the last 10 years. Contemporaneously, those countries show a strong inflationary process in housing prices. For each country, I provide information about GDP growth, consumption, investment and government spending to analyze the real fundamentals that enter into the current account equation.

The theoretical model (1.9) implies that the deviation of the actual components of net output from the permanent level have an impact on the current account. The permanent level is not directly observable, but the cross-country average of the sample provides a natural proxy for the permanent value.

Housing price index (HPI) is used as a proxy for the housing demand entering in the equation (1.9). A house is recognized as a durable good, and its future value may be affected by changes in housing demand or supply or even by the effect of tax laws. In a very real sense, then, a house is an asset. It can be invested, resold, and it yields a return like other investments. Thus, the price of the house can reflect not only the relative supply and demand for shelter, but also the prospective returns on a speculative asset. In the past several years, while house prices have risen substantially, a parallel increase in rental prices has not occurred. This suggests that the current homeownership price measure has been inflated by the the capital appreciation that has taken place in housing. As a result, the recorded house price change reflects both the increase in shelter costs and the rise in the asset value of the investment in housing. Including the recorded house price in the CPI overstates the rise in shelter costs during a period of capital appreciation in housing.

Looking at the cross-correlation, all countries show a negative correlation of the current account and housing price index, even if the housing prices are not always positively correlated with output, investment and consumption. By taking the overall correlation over the 10 OECD countries, the housing price index is positively correlated with GDP, investment and consumption, and negatively

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<sup>3</sup>For Denmark data are available only after 1992, for the Netherlands after 1995, for Norway after 1993 and for Sweden after 1993.

<sup>4</sup>The Panel data is asymmetric to allow for the inclusion of Ireland, given its strong increase in the housing prices.

correlated with the current account, even if some countries are running an external surplus.

## 5 Results

The Panel VAR has been constructed to test the negative relationship between housing prices (q) and current account (ca), when a set of countries are taken into account. Results show the dynamic response of one selected variable to a shock in another variable of the system. First, I show impulse response of the current account and net output to housing price shocks as in the fundamental equation of current account (1.9); then I show how some real variables (that will themselves affect current account) are affected by shocks on housing price index: consumption (C), investment (I), and GDP (Y) to housing price shocks<sup>5</sup>. The estimation is based on the following autoregressive process:

$$Z_{i,t} = \alpha + \beta Z_{i,t-j} + U_{i,t}$$

where  $Z_{i,t}$  is the vector of variables and  $j$  is the number of lags, which in this case is equal to three. For each VAR, the ordering of the variables reflect potential contemporaneous influences. The housing price index is the first variable in the ordering because it is assumed that innovations in housing prices influence the other variables in the model within the same quarter. Through the wealth effect, housing booms affect consumption levels, and this last effect stimulates investment and GDP growth. The current account is last in the ordering because it is assumed that innovations in the accumulation of debt do not impact on the other variables within the same quarter.

The first column in Figure 2 depicts the dynamic response of current account as a percentage of GDP (third row, first column) and the response of net output (second row, first column) to housing price shocks for the 10 OECD countries. The response of the current account to housing price increases is -1.55 percent (contemporaneous effect) and peaks at -0.78% in quarter 1 (after the shock). Such deficit shows to be persistent over the 10 countries. Net output responds negatively to housing price shocks since the OECD countries are investing more respect to their output level. The current account responds positively by 1.9% to net output increases<sup>6</sup>. Only 1.9% of an increase in net output are saved, while the rest are consumed and invested. Housing prices (second column,

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<sup>5</sup>All variables are normalized by GDP ratios, except in case of output (or income) itself.

<sup>6</sup>Bussiere, Fratzscher and Müller estimated a change of 0.186 on the current account due to net output changes.

first row) respond to an increase in net output by  $-0.0010\%$  in quarter 2. The impact is almost zero and it is not statistically different from zero as reflected by the confidence intervals. The same results apply for housing prices after a current account shock.

Looking at the second VAR, the results show that an increase in housing prices, drives an increase in consumption, investment and output. With this ordering, the current account still responds with a deficit of  $-0.26$  percent in quarter 1. Also in this case, the current account shows to be persistent for 6 quarters, and it shows an initial reversal at the 7th quarter, after running a deficit, the current account has to run a surplus to repay back the debt. Over the 10 OECD countries, consumption responds positively to housing price increases and confirm the strong wealth effect channel.

## 6 Conclusion

In this paper, I have examined the importance of housing prices in the determination of the current account relative to GDP for 10 OECD countries since 1985. Understanding what sources drive the rise of external deficit for so many countries is fundamental to evaluating its sustainability and to considering what policy can ensure an orderly adjustment process. Theoretical works have emphasized the important role of housing prices through the wealth effect channel in the business cycle, but few empirical works have been carried out to quantify the role of housing prices for the overall OECD countries.

This paper assesses the role of housing prices in driving current account imbalances using a Panel VAR technique over the 1985:1 - 2006:2 period for 10 OECD countries. Most of the countries show an increasing current account deficit, but the sample also includes countries which are running a current account surplus, such as Canada, Japan and Switzerland. The Panel VAR approach allows us to evaluate the dynamic impulse response of one selected variable to a shock in another variable in the system. The response of current account to housing price shocks is  $-1.55$  percent in quarter 1 (contemporaneous effect) and peaks at  $-0.78\%$  in quarter 2 (after the shock). The results show persistence of external deficit. Increases in net output do not affect housing prices behavior. The model does not reject the wealth effect channel hypothesis since housing price increases strongly affect consumption level. Most of the current account deficit is driven by an increase in consumption,

investment and a boom in the housing market for the 10 OECD countries.

The analysis could be improved using more OECD countries over a larger sample period. The wealth effect channel should be investigated more carefully. Also it would be interesting to include the exchange rate to understand its role in terms of trade balance.

## References

- [1] Arellano, M. and Bover O. (1995). Another Look at the Instrumental Variable Estimation of Error Component Models. *Journal of Econometrics* 68: 29-51.
- [2] Bernanke, B. (2005). The Global Saving Glut and the US Current Account Deficit. *Homer Jones Lecture, St Louis, Missouri*.
- [3] Blanchard, O., Giavazzi, F. and Sa, F. (2005), The US Current Account and the Dollar. *NBER Working Paper*. 11137.
- [4] Blundell, R., S. Bond and C. Meghir (1996) Econometric Models of company investment, *The Econometrics of Panel Data: Handbook of Theory and Applications*, edited by L. Matyas and P. Sevestre, Martinus Nijhoff.
- [5] Bussière, Matthieu, Marcel Fratzscher and Gernot Müller (2004), Current Account Dynamics in OECD and EU Acceding Countries An Intertemporal Approach. *ECB Working Paper*. 311.
- [6] Bussière, Matthieu, Fratzscher, Marcel and Müller, Gernot (2005), Productivity Shocks, Budget Deficits and the Current Account. *ECB Working Paper* 509.
- [7] Caballero, Ricardo J. , Farhi, Emmanuel and Gourinchas, Pierre-Olivier (2007), An Equilibrium Model of Global Imbalances and Low Interest Rates. *Working Paper*.
- [8] Edwards, Sebastian (2005), Is the US current account deficit sustainable? And if not, how costly is adjustment likely to be?, *mimeo, UCLA*.
- [9] Erceg, Christopher J., Luca Guerrieri and Christopher Gust (2005), Expansionary Fiscal Shocks and the Current Account. *International Finance Discussion Papers 825, Washington: Board of Governors of the Federal Reserve System*.
- [10] Fratzcher, Marcel, Juvenal, Luciana and Sarno, Lucio (2007), Asset Prices, Exchange Rates and the Current Account. *Working Paper*.

- [11] Glick, Reuven and Kenneth Rogoff (1995), Global versus Country-Specific Productivity Shocks and the Current Account. *Journal of Monetary Economics* 35: 159-192.
- [12] I. Love and L. Zicchino (1995), Financial Development and Dynamic Investment Behavior: Evidence from Panel Vector Autoregression". *forthcoming in The Quarterly Review of Economics and Finance*.
- [13] Obstfeld, Maurice and Kenneth Rogoff (2004), The Unsustainable US Current Account Position Revisited. *NBER Working Paper*.
- [14] Piersanti, Giovanni (2000), Current Account Dynamics and Expected Future Budget Deficits: Some International Evidence. *Journal of International Money and Finance* 19: 255-271.

## 6.1 Data Sources

- Inflation  $\{CPI\}$ : Price Index, Seasonally Adjusted. Source: Datastream and IFS.
- Consumption  $\{C\}$ : Private Final Consumption Spending, Constant Price Seasonally Adjusted. Source: Datastream and IFS.
- Investment  $\{I\}$ : Private Domestic Fixed Investment, Constant Price Seasonally Adjusted. Source: Datastream and IFS.
- Government Spending  $\{G\}$ : Government Final Consumption Expenditure, Constant Price Seasonally Adjusted. Source: Datastream and IFS.
- Output  $\{Y\}$ : GDP, Constant Price Seasonally Adjusted. Source: Datastream and IFS.
- Current Account  $\{CA\}$ : Current Account Balance of Payment, Constant Price Seasonally Adjusted. Source: Datastream and IFS.
- Housing Price Index,  $\{HPI\}$ : Calculated using the residential property prices deflated by CPI. Sources: Bank of International Settlement and Datastream for the missing series.
  - Australia: RESIDENTIAL PROPERTY PRICES, EXISTING DWELLINGS (8 CITIES) - INDEX NSA.
  - Canada: RESIDENTIAL PROPERTY PRICES, EXISTING DWELL., AVG -IN CAD, M-ALL, NSA.
  - France: RESIDENTIAL PROPERTY PRICES, EXISTING DWELLINGS, NSA.
  - Ireland: RESIDENTIAL PROPERTY PRICES, EXISTING HOUSES, URBAN AREAS NSA .
  - Japan: HOUSING STARTED PRICE, NSA.
  - New Zealand: RESIDENTIAL PROPERTY PRICES, ALL HOUSES, BIG CITIES, Q-ALL NSA-DISC.
  - Spain: RESIDENTIAL PROPERTY PRICES, URBAN AREAS, IN EUR PER SQ.M. NSA.

- Switzerland: RESIDENTIAL PROPERTY PRICES, ALL ONE FAMILY HOUSES - INDEX, Q-AV NSA.
- UK: RESIDENTIAL PROPERTY PRICES, NEW DWELLINGS, AVERAGE - IN GBP, Q-AV NSA.
- USA: RESIDENTIAL PROPERTY PRICES, EXIST.SINGLE-FAMILY HOMES(OFHEO)- IND. NSA.

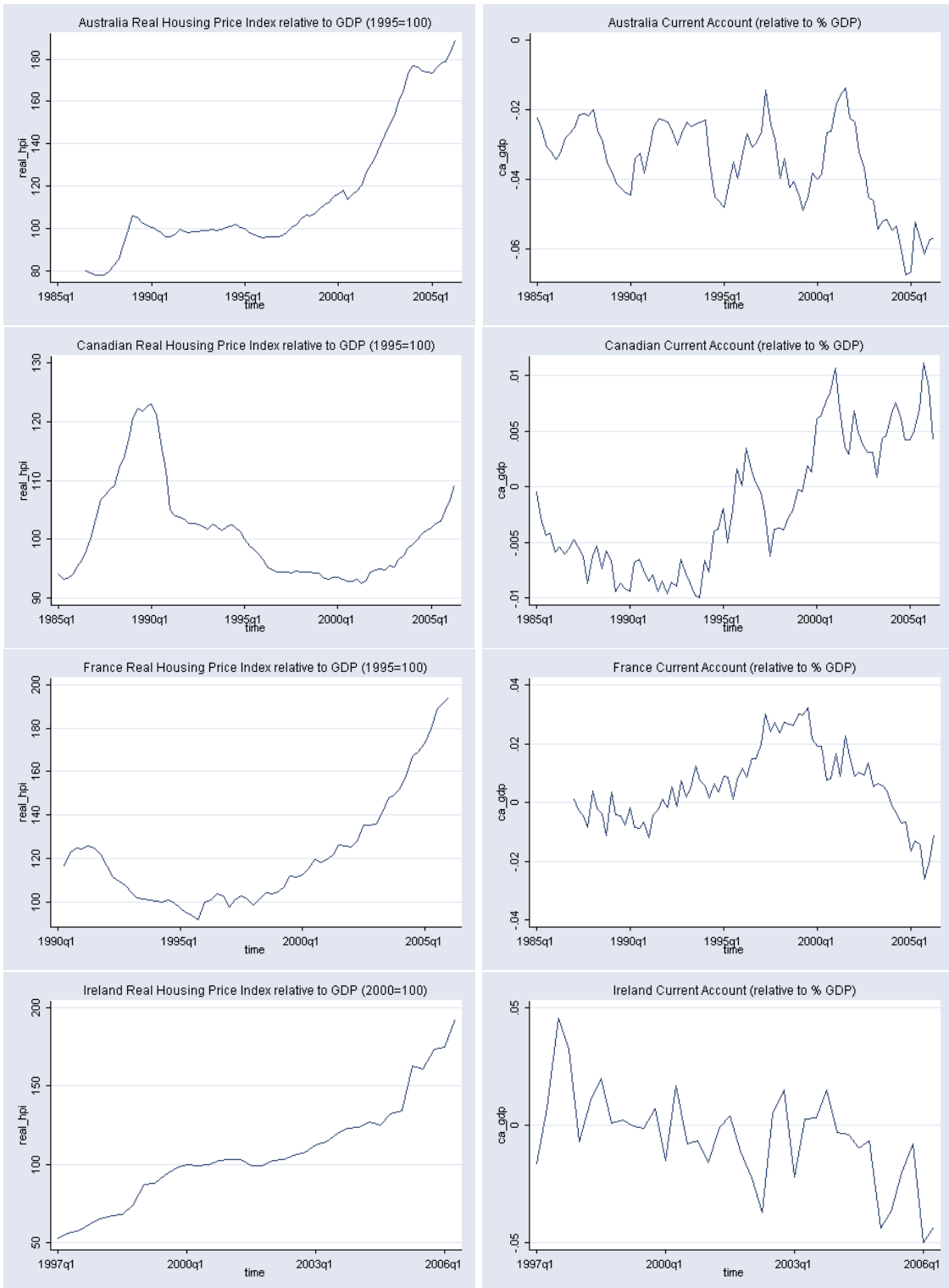
## 7 Appendix

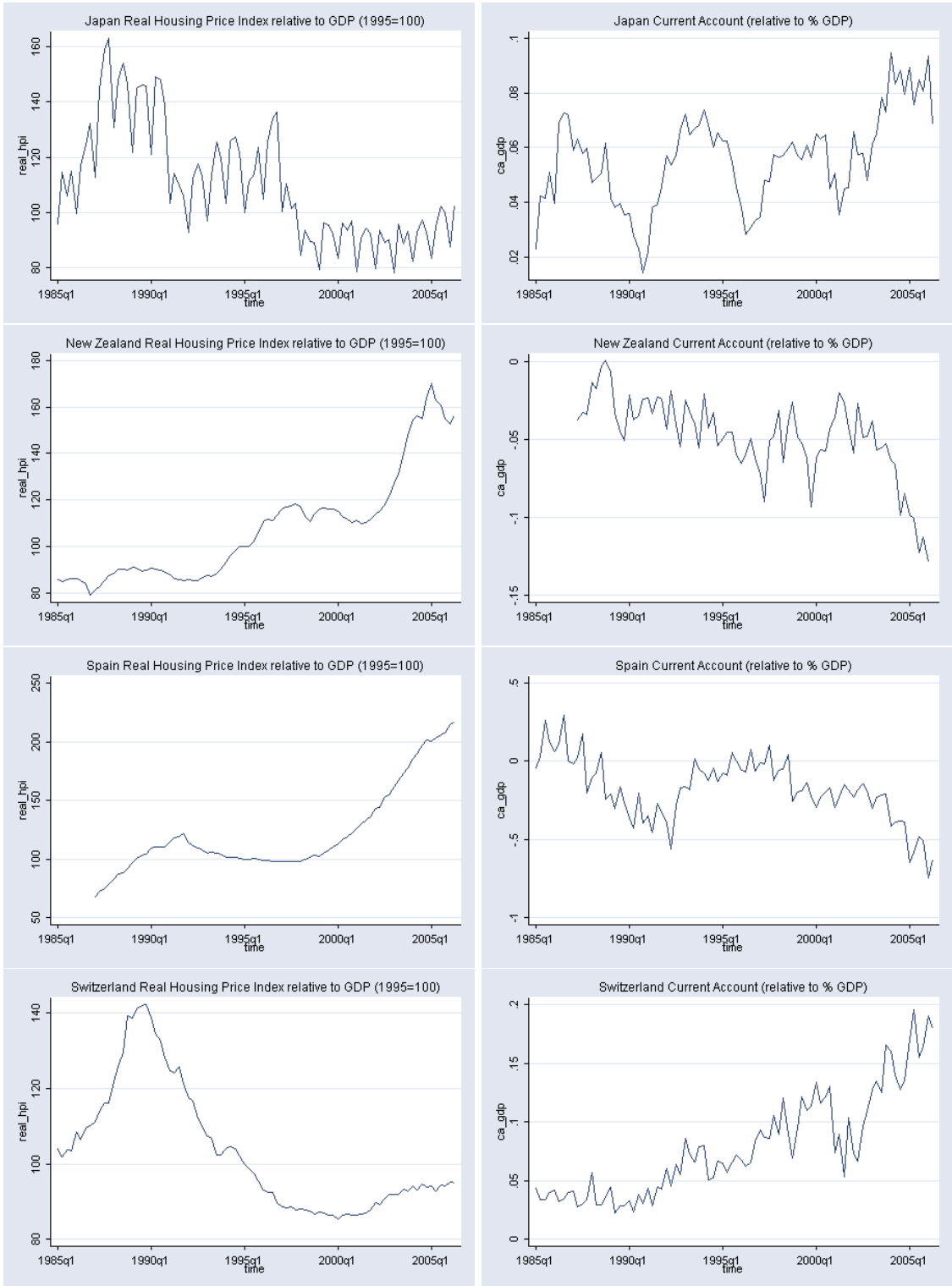
### 7.1 Results

Table 1: Correlation with Housing Market Index				
Country	$\rho(\text{cons}, \text{hpi})$	$\rho(\text{inv}, \text{hpi})$	$\rho(\text{GDP}, \text{hpi})$	$\rho(\text{ca}_{\text{gdp}}, \text{hpi})$
Australia	0.8946	0.8915	0.8764	-0.6899
Canada	-0.3043	-0.1534	-0.3339	-0.5010
France	0.8161	0.8502	0.7414	-0.6429
Ireland	0.9733	0.9740	0.9669	-0.6070
Japan	-0.5863	0.0607	-0.5102	-0.3794
New Zealand	0.9675	0.9619	0.9496	-0.7502
Spain	0.8339	0.8996	0.8406	-0.7175
Switzerland	-0.6449	-0.4488	-0.6058	-0.6734
UK	0.8723	0.8864	0.8589	-0.5353
USA	0.9075	0.8672	0.8902	-0.9163
OECD	0.0421	0.0591	0.0353	-0.3756

Data Source: Bank of International Settlement, IMF Financial Statistics, Datastream.

## 6.2 Figure 1: Data





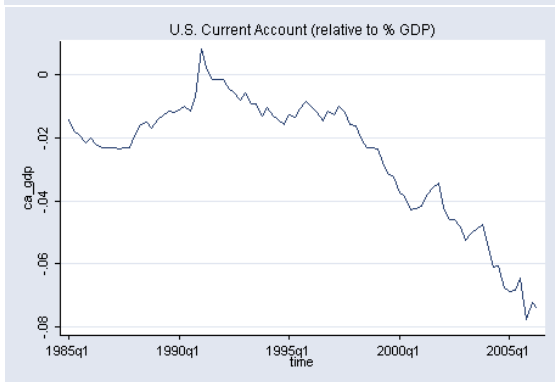
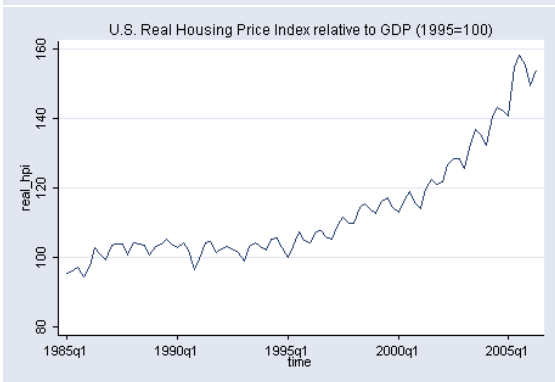
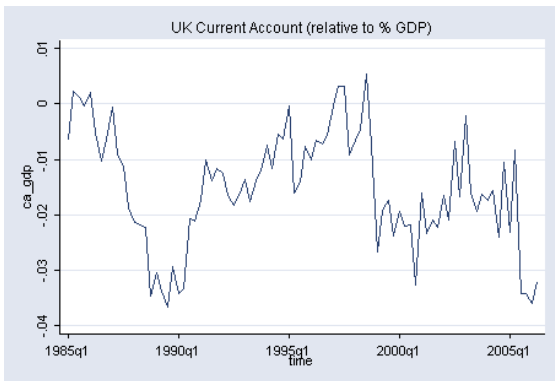
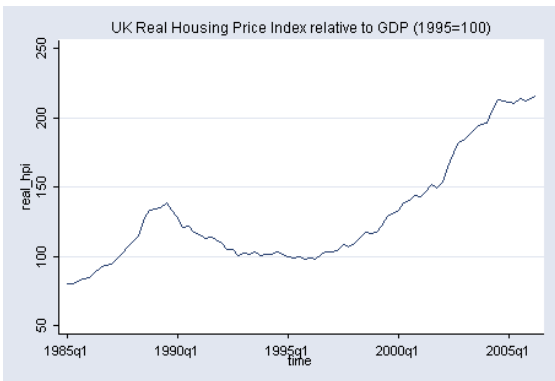


Figure 2. Impulse Response Functions:  $\{HPI, NO, CA\}$

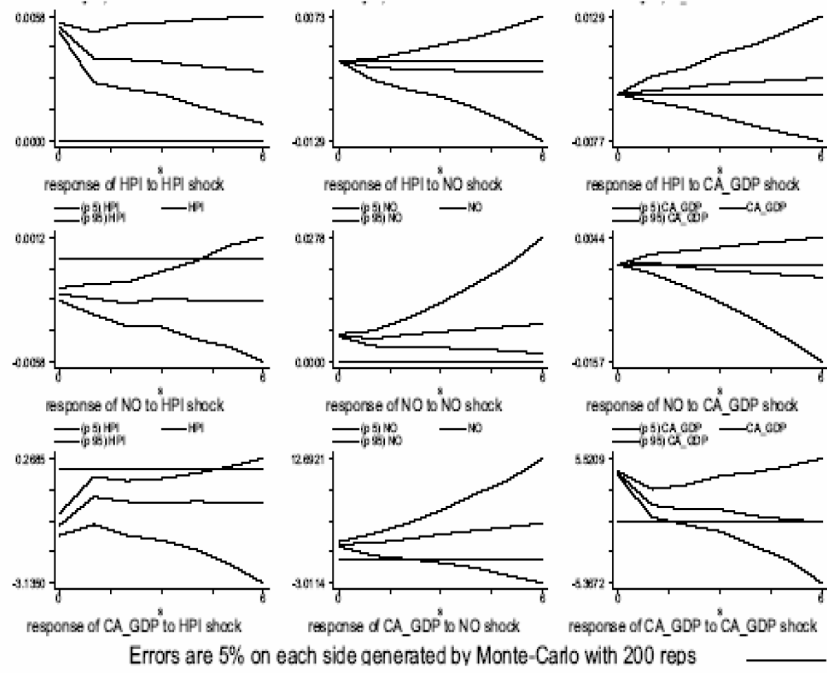


Figure 3. Impulse Response Functions of an increase in Housing Prices:  $\{HPI, C, I, Y, CA\}$

