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Housing Market and Current Account Imbalances in the International Economy

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Housing Market and Current Account Imbalances in the International Economy[1]

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Abstract. This paper presents a two-sector, two-country model showing that inflation in the housing market, a low personal savings rate, and a construction investment boom can contribute to a large current account deficit. In the model, demand by a group of households in the domestic country is constrained by the availability of collateral. This implies more procyclical debt capacity because constrained households can borrow against the increase in the value of their houses during an expansion. A higher degree of financial liberalization and development helps constrained households reach higher loan-to-value ratios, thus relaxing their borrowing constraints. The resulting higher net worth and lower need for savings imply a worsening current account.

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1 Introduction

Several economies have experienced substantial appreciation in housing prices in the last decades and a strong appreciation in recent years, along with large external deficits (relative to GDP) and a sharp decline in household savings.

Taking into account these stylized facts, this paper explores whether there is a systematic negative relationship between housing prices and the current account. The paper assess the quantitative impact of this linkage using a two-sector, two-country, dynamic, stochastic, general equilibrium model with heterogeneous agents and a financial accelerator. In the model, changes in housing prices are generated by aggregate technology shocks, housing preference shocks and loan-to-value shocks. Houses are durable goods that provide valuable services and serve as collateral for loans. The wealth effects from housing appreciation boost household consumption and better access to credit improves investment opportunities. A more flexible financial sector due to financial liberalization increases liquidity by augmenting funding for the whole economy, is thus a contributing factor to the recent run-up in global asset imbalances. Table 1 shows the importance of the data on the housing market for the current account dynamics. [**INSERT Table 1 here**]. Housing variables are negatively correlated with the current account.[1] The correlation coefficients have increased since 1990, which has been a period of financial liberalization and deregulation.

The model includes two types of production because the real estate sector requires different activities and is subject to different risks than the other production sectors.[2] In particular, Greenwood and Hercowitz (1991) and Greenwood, Hercowitz and Krusell (2000) have built several dynamic general equilibrium models to reproduce jointly the business and the residential investment cycles observed in the US.[3] Similarly, our model assumes common shocks affecting both production sectors, but differs in that households face credit constraints and housing serves as collateral for borrowing. Moreover, innovations in the mortgage markets intensify the collateral role of housing and strengthen the endogenous link.

[1]Aizenman and Jinjarak (2009) showed that the current account is negatively correlated with real estate prices, using cross-country data from 43 countries, including 25 OECD countries. They obtained this result by regressing changes in real estate prices on the ratio of current account to GDP in several regression equations, controlling for lagged urban population growth, per capita GDP growth, inflation, financial depth, institutions, and the real interest rate.

[2]See Greenwood and Hercowitz (1991), Greenwood, Hercowitz and Krusell (2000), Ortalo-Magne and Rady (2006), Jin and Zeng (2004), Davis and Heathcote (2005), Iacoviello and Neri (2010).

[3]They assumed reversibility between residential and business capital, which implies that the relative price of housing is always unity. Besides this, the present model assumes that demand and supply of houses are the forces determining the equilibrium price. As in Kan, Kwong and Leung (2004) and Leung (2007), this model does not support the "Law of One Price" by introducing housing price dynamics to study their interactions with output growth through substitute production.

Davis and Heathcote (2005) use a real business cycle model that includes housing to replicate business cycle movements, but they fail to account for the observed volatility of housing prices in the US. In contrast, this model is able to capture the volatility of housing prices as revealed in the data. Jin and Zeng (2004) develop a three-sector model driven by three different productivity shocks and one monetary shock. Their model is quite successful in accounting for some of the salient business cycle properties of residential investment and housing prices, but it does not study the dynamics of some key macroeconomic variables, such as aggregate consumption and household debt.

Finally our model considers two types of agents, Saver and Borrower, which motivates the existence of credit flows and the financial accelerator. Borrower raises secured credit facilities against residential properties to fuel consumption. As in Iacoviello (2005), they differ in terms of discount factors, Borrower being the relatively impatient agent.[4]

There are papers that show the impact of housing prices on the business cycle, and their propagation effect on consumption and investment, but none of them link housing prices to current account imbalances. This paper combines Iacoviello and Neri (2010) and Matsuyama (1990). It extends Iacoviello and Neri (2010) by allowing economic agents to borrow abroad and evaluates the impact on the current account. Matsuyama (1990) was the first to study the link between residential investment and the current account. He states that in a model with residential property, the accumulation of housing stock would be affected by a change in government purchasing, since housing is a normal good. Unlike Matsuyama, this paper focuses on the collateral value of houses as an incentive for investing in residential investment, consume, and accumulate current account. Gete (2010) documented the correlation between housing dynamics and current account dynamics, showing that increases in the demand for nontradables relative to tradables imply trade deficits which levels out consumption across tradables and nontradables. However, he does not refer to collateral effect or wealth effect, nor he does not consider residential investments.

This paper proceeds as follows: Section 2 presents the model; Section 3 discusses the solution methods, calibration, and dynamics of the model; and Section 4 concludes.

2 Model

In the ensuing formal analysis we use a two-sector DSGE model with flexible prices[5].

[4]In Kiyotaki and Moore (1997) patient and impatient agents are represented as a farmer and a gatherer. Campbell and Cocco (2007) study heterogeneity in wealth effects between old and young households. They estimate the largest effect of house prices on consumption to be for older homeowners, and the smallest effect for younger renters. See also Bernanke and Gertler (1989) and Aoki, Proudman and Vlieghe (2004).

[5]The flexibility of housing prices seems reasonable since economic agents usually contract for the initial price during the selling process.

The model combines heterogeneity of time preferences with collateral constraints and features a role for housing market imperfections in the propagation of international business cycles. As in Davis and Heathcote (2005), households gain utility by consuming goods and streams of housing services.[6] The service flow is assumed proportional to the real value of holdings of housing stock.[7] A sector of the economy produces a consumption good using labor and capital owned by households who rent it to firms. Another sector produces a composite real estate good using residential structures and labor as inputs. As the residential structures used to produce houses come from the first sector, some goods produced in the "good sector" are used as intermediate inputs in the "house sector".

The model allows for constrained agents who collateralize the value of their homes[8]. This financial friction gives rise to the familiar financial accelerator.

Finally, the model analyzes two large economies[9]. The U.S. and Japan are good representatives of these economies. The domestic country, (US), is characterized by an increasing housing price index and a developed household credit system. It borrows from the foreign country, Japan, which is characterized by a decreasing housing price index and a higher rate of savings. Therefore, Japan is financing the US current account deficit[10].

2.1 Households

There are two types of households: Saver and Borrower.

Saver applies a higher discount factor, so she is more patient. She earns income by renting physical capital to the firms and owns all the assets, which makes her a high-wealth household.[11] In contrast to Campbell and Hercowitz (2006), here Saver participates in the labor market.[12] Saver is viewed as a financial intermediary between Borrower and the rest of the world.[13] Given her large wealth, she is willing to trade

[6]See also Matsuyama (1990), Greenwood and Hercowitz (1991), Baxter (1996), Chang (2000).

[7]The stock of houses is highly price inelastic because of its low depreciation rate; therefore, housing services adjust slowly to demand shocks. An increase in demand for housing causes housing prices to rise, rather than causing housing stock to expand. Therefore, houses and housing prices are important variables for household portfolio

[8]Luengo-Prado (2006) and Díaz, A. and M.J. Luengo-Prado (2008, 2010) study the distribution of housing wealth and the volatility of nondurable consumption goods relative to income using a model where households obtain utility from the consumption of nondurables and housing services because they can save in the form of either liquid financial assets or houses, and use the durable good as collateral for credit purchases.

[9]For simplicity, the model assumes equal sizes of the domestic and foreign economy.

[10]Japan has been the main Asian country financing the US current account deficit. Also China, Hong Kong and Taiwan have been buying a big portion of long term US securities over time.

[11]Flavin and Yamashita (2002) examines the portfolio choice problem of an agent who invests in both financial assets and real estate.

[12]See Krusell and Smith's (1998).

[13]Saver can also be viewed as a financial intermediator between the foreign economy and Borrower. For example, in the United States private banks lend to households, after which the bank sells the loan to Fannie Mae or Freddie Mac, which then pools

assets abroad, after collecting mortgage loans from borrowers.[14] Borrower is a low-income household, whose main source of funds is the labor income. She faces a borrowing constraint, consistent with the standard lending criteria for the mortgage and a consumer loan market. The borrowing constraint is introduced through the assumption that households cannot borrow more than a fraction $m \in (0, 1)$ of the value of their houses. Saver can repossess Borrower's assets only after paying a proportional transaction cost weighted by $(1 - m)$. The coefficient m, the loan to value (LTV) ratio, also represents the degree of credit market development of the economy. A large m indicates a more flexible and developed financial system, and a small m an underdeveloped financial sector.[15] This model does not include a rental housing market. This is because if agents can rent their houses, there would be no wealth effect since Borrower can rent its houses and save out of rental income. Therefore, the model, in allowing for heterogeneous agents, does not include a rental market.

2.2 Saver's Problem

In this model, Saver chooses to work in the good production sector, (L_c) and the construction sector, (L_h). She consumes non-durable goods (c) and housing services (h), and owns all the capital used in the production of consumption goods, (k_c) and all the capital used in the production of new houses, (k_h), which is rented to firms. She extends financial credit (b) to Borrower and has access to international asset (b^*). The housing price index, (q), shows how many units of consumption are necessary to buy one unit of housing services.

Saver maximizes the utility function:

$$U_t = E_t \sum_{t=0}^{\infty} \beta^t \left[ln\ c_t + j_t\ ln\ h_t - \eta \frac{(L_{ct}^{1/\nu} + L_{ht}^{1/\nu})^{\alpha\nu}}{\alpha} \right] \tag{1}$$

all similar loans together to construct a portfolio in order to diversify risk through mortgage backed securities (MBS). Freddie Mac is a stockholder-owned corporation chartered to keep money flowing to mortgage lenders in support of homeownership and rental housing. Freddie Mac purchases single and multifamily residential mortgages and mortgage-related securities, which it finances primarily by issuing mortgage pass-through securities and debt instruments in capital markets.

[14] The loan market is becoming more flexible not only in the U.S. but also abroad: foreign banks have increased their presence in most emerging countries over the past several years. These banks have spearheaded the growth of lending to households attracted by high margins.

[15] Reducing legal limitations regarding true sale treatment of securitization transactions, reducing excessive transfer taxes and no requirements of borrowers' prior consent to structure securitized deals help to develop the financial system in terms of maximum loan-to-value (LTV) ratios, maximum debt-service-to-income ratios and interest rate conventions.

subject to:

$$
\begin{aligned}
& c_t + q_t i_t^h + i_{ct} + i_{ht} + b_t + b_t^* \\
& \leq w_{ct} L_{ct} + w_{ht} L_{ht} + R_{ct-1} k_{ct-1} + R_{ht-1} k_{ht-1} + R_{t-1} b_{t-1} \\
& + R_{t-1}^* b_{t-1}^* + \frac{\psi_b}{2} (b_t^* - \bar{b^*})^2
\end{aligned} \tag{2}
$$

where

$$
h_t = (1 - \delta_h) h_{t-1} + i_t^h - \frac{\psi_h}{2} \left(\frac{h_t - h_{t-1}}{h_{t-1}} \right)^2, \tag{3}
$$

$$
k_{ct} = (1 - \delta_k) k_{ct-1} + i_{ct} - \frac{\phi_c}{2} \left(\frac{k_{ct} - k_{ct-1}}{k_{ct-1}} \right)^2 k_{ct-1}, \tag{4}
$$

$$
k_{ht} = (1 - \delta_k) k_{ht-1} + i_{ht} - \frac{\phi_h}{2} \left(\frac{k_{ht} - k_{ht-1}}{k_{ht-1}} \right)^2 k_{ht-1}. \tag{5}
$$

j_t determines the relative utility weight for housing services and proxies housing demand shocks. It follows an autoregressive process to allow for housing preference shocks. R_t and R_t^* are the domestic and international interest rate, respectively. The model is constructed such that Saver is indifferent between borrowing abroad at rate R_t^* and lending to Borrower at rate R_t. ψ_h, ϕ_c, ϕ_h indicate the coefficients for adjustment cost (i.e., the relative prices of installing the existing capital) for housing stocks, capital used in the goods sector and housing sector, respectively. Adjustment costs are included because without them, the supply of fixed capital would be infinitely elastic, implying excessive volatility in sectoral investment flows in response to technology shocks. Following Schmitt-Grohe and Uribe (2003),[16] ψ_b and $\bar{b_t^*}$ are constant parameters defining the portfolio adjustment cost function. The benchmark value of ψ_b is 0.008. If the household chooses to borrow an additional unit abroad, current consumption will increase by one unit minus the marginal portfolio adjustment cost $\psi_b(b_t^* - \bar{b^*})$. Next period, the household must repay the additional unit of debt plus interest. At the optimum, the marginal benefit of a unit debt increase must equal its marginal cost. The portfolio adjustment cost solves the non-stationarity problems associated with market incompleteness.[17] Introducing the adjustment cost term as a function of debts forces wealth allocations in

[16]Schmitt-Grohe and Uribe (2003) impose a premium on the asset return which is proportional to the outstanding stock of foreign debts.

[17]For alternative ways to induce stationarity, see Devereux (2003) and Cavallo and Ghironi (2002).

the long run to return to their initial distribution. δ_k and δ_h represent the depreciation rate for capital and housing stock, respectively. Following Davis and Heathcote (2005), Jin and Zeng (2004) and Iacoviello and Neri (2010), δ_h is assumed to be smaller than δ_k to reflect the fact that houses depreciate more slowly than non-residential capital.

2.3 Borrower's Problem

Borrower consumes non-durable goods $\{c^{'}\}$ and housing services $\{h^{'}\}$. It can decide to work in the non-residential $\{L_c^{'}\}$ or residential sector $\{L_h^{'}\}$.

Borrower maximizes the utility function:

$$U_t = E_t \sum_{t=0}^{\infty} \gamma^t \left[ln\ c_t^{'} + j_t\ ln\ h_t^{'} - \eta \frac{((L_{ct}^{'})^{1/\nu} + (L_{ht}^{'})^{1/\nu})^{\alpha\nu}}{\alpha} \right] \tag{6}$$

subject to:

$$c_t^{'} + q_t i_t^{h^{'}} + R_{t-1} b_{t-1}^{'} \leq w_{ct}^{'} L_{ct}^{'} + w_{ht}^{'} L_{ht}^{'} + b_t^{'} \tag{7}$$

and

$$b_t^{'} \leq m_t q_t h_t^{'} \tag{8}$$

where $\gamma \in (0, \beta)$ captures Borrower's relative impatience. As for Saver, the parameter ν defines the degree of substitution between the two sectors in terms of hours worked. For a high value of ν, labor hours are perfect substitutes, which means that the worker would devote most of her time to the sector that pays the highest wage. A small value of ν implies that hours worked are not perfect substitutes, so that the worker is willing to diversify labor, working the same number of hours in each sector even in the presence of wage differences across sectors.[18] The loan-to-value ratio, m_t, follows an autoregressive process to study the effect of improving credit conditions in the economy.

Borrower's housing demand differs from Saver's housing demand by the lagrangian multiplier λ for the collateral constraint. Because $\gamma < \beta$, the collateral constraint holds with equality at all times and in the steady state its value is always positive, $\lambda = \frac{(1-\gamma R)}{c^{'}} > 0$. This implies that the collateral constraint is binding in the steady state, and the hypothesis of small shocks ensures that it is binding elsewhere (in the relevant neighborhood of the steady state) as well.

[18] See Horvath (2000).

2.4 Firms

Firms produce non-durable goods (y) and new houses (N). Both sectors combine labor effort supplied by both agents and fixed capital in the production function. Firms pay wage to households and repay rented capital to Savers.

The firm's problem is to maximize the profit as follows:

$$Max \quad \left\{ y_t + q_t \; N_t - [w_{ct}L_{ct} + w_{ht}L_{ht} + w_{ct}^{'}L_{ct}^{'} + w_{ht}^{'}L_{ht}^{'} + R_{ct-1}k_{ct-1} + R_{ht-1}k_{ht-1}] \right\} \tag{9}$$

where

$$N_t = (A_{ct}A_{ht})(L_{ht}^{'})^{1-\mu_h-\theta_h}L_{ht}^{\theta_h}k_{ht-1}^{\mu_h}, \tag{10}$$

$$y_t = A_{ct}(L_{ct}^{'})^{1-\mu_c-\theta_c}L_{ct}^{\theta_c}k_{ct-1}^{\mu_c}. \tag{11}$$

Both production functions are Cobb-Douglas types and they entail complementarity across the labor skills of the two types of workers, which helps us obtain closed-form solutions for the steady state. An aggregate shock, A_{ct}, affects both sectors, since y can produce some intermediated goods used in the production of N, while a sector-specific shock, A_{ht}, affects only the real estate market.

2.5 Current Account Equation

The current account is defined as the change in net foreign assets:

$$\begin{aligned} CA_t &= (b_t^* - b_{t-1}^*) \\ &= -(R_t - 1)b_{t-1}^* + y_t + (1-\delta_k)(k_{ct-1} + k_{ht-1}) - c_t - c_t^{'} - k_{ct} - k_{ht} \\ &= -(R_t - 1)b_{t-1}^* + TB_t \end{aligned} \tag{12}$$

The last equation gives the current account as the sum of the service account (interest repayable) and the trade balance account, expressed as the difference between output and spending on consumption and investments[19].

[19] A similar definition is found in Obstfelf and Rogoff (1995) and Ghironi (2006). The standard expression for the current account includes the changes in the exchange rate, see Obstfeld and Rogoff (2004).

2.6 Foreign Economy

The foreign economy is assumed to be a saver economy and to run a current account surplus. For simplicity, there is a single representative household in the foreign economy that holds all the capital rented to firms, works in both sectors and saves. Firms produce consumption goods and new houses.

2.7 Exogenous Factors

The technology process for final goods ($A_{c,t}$) and new houses ($A_{h,t}$), house preference (j_t) and loan-to-value ratio (m_t) are exogenous variables following an autoregressive process of order one, with $(\varepsilon_{ct}, \varepsilon_{ht}, \varepsilon_{jt}, \varepsilon_{mt}) \sim i.i.d(0, \Sigma)$.

3 Quantitative Analysis

3.1 Calibration

The model is calibrated at quarterly frequency in order to match US and Japan business cycle properties[20]. Saver's discount factor is set equal to 0.99, so that the average annual rate of return is about 4%. Borrower, being impatient, is subject to a smaller discount factor, 0.98. Because houses depreciate more slowly than fixed capital, δ_h gets a value of 1.5%, while δ_k is equal to 3.5%. The share of labor income in goods sector is set at 0.45, (θ_c) and for the house sector at 0.55, (θ_h), reflecting a higher degree of labor intensity in the housing sector. j_t is set at 0.2. Together with the house depreciation rate, these parameters match the volatility of house investment relative to GDP found in the data, around 5%. ν is equal to 0.3 to guarantee imperfect labor substitutions across sectors. The parameter representing the degree of credit rationing (0.85) is in the range [0,1]. Capital adjustment costs are set at 10 for both sectors, again to match investment volatility in both sectors. On the other hand, adjustment costs for housing stock are set equal to zero because in general the purchase of houses is subject to non-convex adjustment costs (typically, some fixed expenses and an agent fee proportional to house value), which cannot be handled easily in this model.[21] The model assumes the same share for constrained and unconstrained households ($n = 0.5$): in a world with flexible wages and flexible prices, the share size doesn't affect the results. In a more realistic world with nominal rigidities, the size of the two groups matters in determining inflation and the real interest rate and thus has

[20]Data source: NIPA, Saint Louis Fed Fred2, Central Bank of Japan, Datastream. US housing data are from http://www.freddiemac.com/finance/cmhpi. Japan housing data are from Japan Real Estate Institute. The housing price index is deflated by CPI and the first quarter of 1995 is normalized to 100. Housing prices reflect the retail price at which a house is sold.

[21]Thomas (2002) found that infrequent microeconomic adjustment at plant level has negligible implications for the behavior of aggregate investment; in addition, a sizable fraction (25 percent) of residential investment in the National Income and Product Accounts consists of home improvements, where transaction costs are less likely to apply.

a pronounced impact on consumption and investment. All shocks are treated as an autoregressive of order one, AR(1) with persistence set estimated in Iacoviello & Neri (2010): 0.95 for the technology sector, 0.99 for housing production, 0.96 for housing demand and 0.994 for loan-to-value.[22] These estimates are consistent with Jin & Zeng (2004) and David & Heathcote (2005)[23].

The model's dynamic system is linearized around its non-stochastic steady state and it is solved for decision rules of endogenous variables via undetermined coefficients method.[24]

3.2 Business Cycle Property

Volatilities

The model generates a standard deviation of real GDP equal to 1.66, higher than in the data (1.54). [**INSERT Table 2 here**]. The calibration of the model is such that the relative volatilities of housing price (1.44) and current account (0.24) match the corresponding statistics for the data, including the correlation coefficients.[25] The model explains well the US business cycle properties, but not for Japan. The mismatch is due to the fact that the model simplifies the foreign country by allowing only for saver households. It is Saver who is financing the US current account, and the model highlights this fact. Furthermore, there is a substantial gender difference in labor supply in Japan and pronounced regional recessions, which makes it harder to explain this economy[26]. Abstracting from the housing market, a simple two-country open economy can reach only 0.049 % of the volatility of the US current account data (0.24).

3.3 Impulse Responses

The exogenous shocks analyzed in the simulation experiment are those to aggregate technology, specific-sector technology shock, housing preference and loan-to-value. [**INSERT Figure 1 about here**]. Improvement in productivity increases GDP and housing prices,[27] with a spillover to residential investment. Agents reallocate

[22]Iacoviello & Neri (2010) estimate a DSGE model with collateral constraint using Bayesian methods to allow for a priori information regarding the parameters and also because pure maximum likelihood tends to produce fragile results, particularly where some parameters are weakly identified. They estimate volatility as follows: $\sigma_{Ac} = 0.01011; \sigma_{Ah} = 0.01942; \sigma_j = 0.04094; \sigma_m = 0.0049$.

[23]They measure aggregate productivity shocks by the estimated Solow residuals.

[24]McCallum, (1983), King, Plosser and Rebelo (1987), Uhlig (1995).

[25]Capital investment and private consumption expenditures appear to be less volatile than their empirical counterpart, probably due to the undersized generated GDP volatility. The result is consistent with business cycle facts that private consumption expenditures are less volatile than output, and that capital investment and housing investments are more volatile than real GDP.

[26]See Braun, Esteban-Pretel, Okada and Sudou (2006) and Wall (2007).

[27]Due to the collateral constraint and flexible prices, house prices increases more for low values of m because higher m shifts even more housing service supply, decreasing housing prices. Log-linearized equation for the borrowing constraint:

the existing capital between different sectors of production, and because output produces capital used in the construction sector, residential investment increases, but by less than non-residential fixed investments. Consumption is increasing for both agents, in particular for Borrower. Through the wealth effect, it uses the house value as collateral for extra credit, and extra consumption. Saver takes advantage of investment opportunity by adjusting capital via borrowing abroad, so that foreign debt rises. As a result, the current account decreases by 0.4% of the steady state. There is also an impact on labor supply. Borrower decides to work less in both sectors in the case of better credit conditions, because it can finance consumption of goods and housing services partly with labor income and partly by borrowing[28]. The model generates similar results in the case of housing demand shock and loan-to-value ratio shock, where the current account respond with a deficit of 0.18% and 0.6% of steady state, respectively. On the other hand, specific-sector shock to housing generates decreasing housing price and current account surplus. This helps in matching the higher volatility of residential investment relative to non-residential. Figure 2 highlights the importance of flexible credit market and the degree of market openness. [**INSERT Figure 2 about here**]. Financial liberalization and deregulation amplifies the responses of the current account.[29]

4 Conclusion

This paper develops a two-sector, two-country DSGE model and shows that housing market boom can contribute to a large current account deficit. Housing is an important variable, because as a durable good, it yields a flow of housing services that provide utility to households, and it is also a valuable asset that serves as a collateral for loans. The model predicts that aggregate technology shocks and housing preference shocks cause increases in housing prices and current account deficits, whereas sectoral specific shocks to the real estate sector induce lower housing prices because of the increased supply and a small current account surplus. The model has some limitations. It does not specify nominal rigidities because it assumes flexible prices in both sectors. Moreover, the model does not enlighten us as to exchange rate effects under different regimes. Those are possible extensions for future research.

The Appendix for the detailed model and for all the optimality conditions is available upon request.

References

$\hat{q}_t = \hat{b}'_t - \hat{m}_t - \hat{h}'_t$.

[28]Hryshko, Luengo-Prado and Sorensen (2010) find that homeowners are able to maintain a high level of consumption following job loss (or disability) in periods of rising local house prices whereas in times of declining house prices cuts in consumption are substantial for homeowners who lose their jobs.

[29]A simple regression shows that housing prices have a strong wealth effect on current account growth, which is amplified by the degree of the loan-to-value ratio ($\Delta\, CA_t = -0.6186 * \Delta\, lnHW_{t-1}$, t-stud=-4.06).

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Table 1: Correlations with the Current Account

U.S.	1965-2009	1965-1989	1990-2009
Housing Prices	-0.103377	-0.0702847	-0.254637
GDP	-0.1065499	-0.1758612	-0.2673452
Consumption	-0.1408088	-0.2695167	-0.3100607
Business Investment	-0.134284	-0.2293511	-0.2982749
Housing Investment	-0.148409	-0.2971196	-0.3448623
Hours good sector	-0.0692695	-0.1139554	-0.1774878
Hours housing sector	-0.104897	-0.1601517	-0.2363513
Mortgage Loans	-0.1187326	-0.0971763	-0.2835509
Japan	1985-2009	1985-1989	1990-2009
Land Prices	-0.3852398	-0.2890864	-0.3750634
GDP	0.0092697	-0.3672764	0.109913
Consumption	-0.232501	-0.2980619	-0.1996599
Business Investment	-0.1480796	-0.588758	-0.0528257
Housing Investment	-0.0839658	-0.2921207	-0.0559324
Hours good sector	0.115535	-0.0097996	0.1442850
Hours housing sector	0.0345493	-0.1103793	0.058656
Mortgage Loans	-	-	-

Table 2: Business Cycle Properties

% St. Dev. (% GDP)	USA: 1965-2009	Full Model	Model without Housing
GDP	1.54	1.66	1.74
CPE	0.81	0.58	0.49
INV_K	3.33	2.72	2.38
INV_H	6.65	6.12	
L_C	0.92	1.003	
L_H	2.73	2.30	
b^*	1.38	0.55	0.22
q	1.44	1.006	
ca	0.24	0.27	0.049
% Correlation			
q, ca	-0.11	-0.09	
b, b^*	0.12	0.58	
% St. Dev. (% GDP)	Japan: 1985-2009	Full Model	Model without Housing
GDP	1.52	0.94	1.06
CPE	0.59	0.43	0.49
q	1.48	0.34	
ca	0.007	0.33	

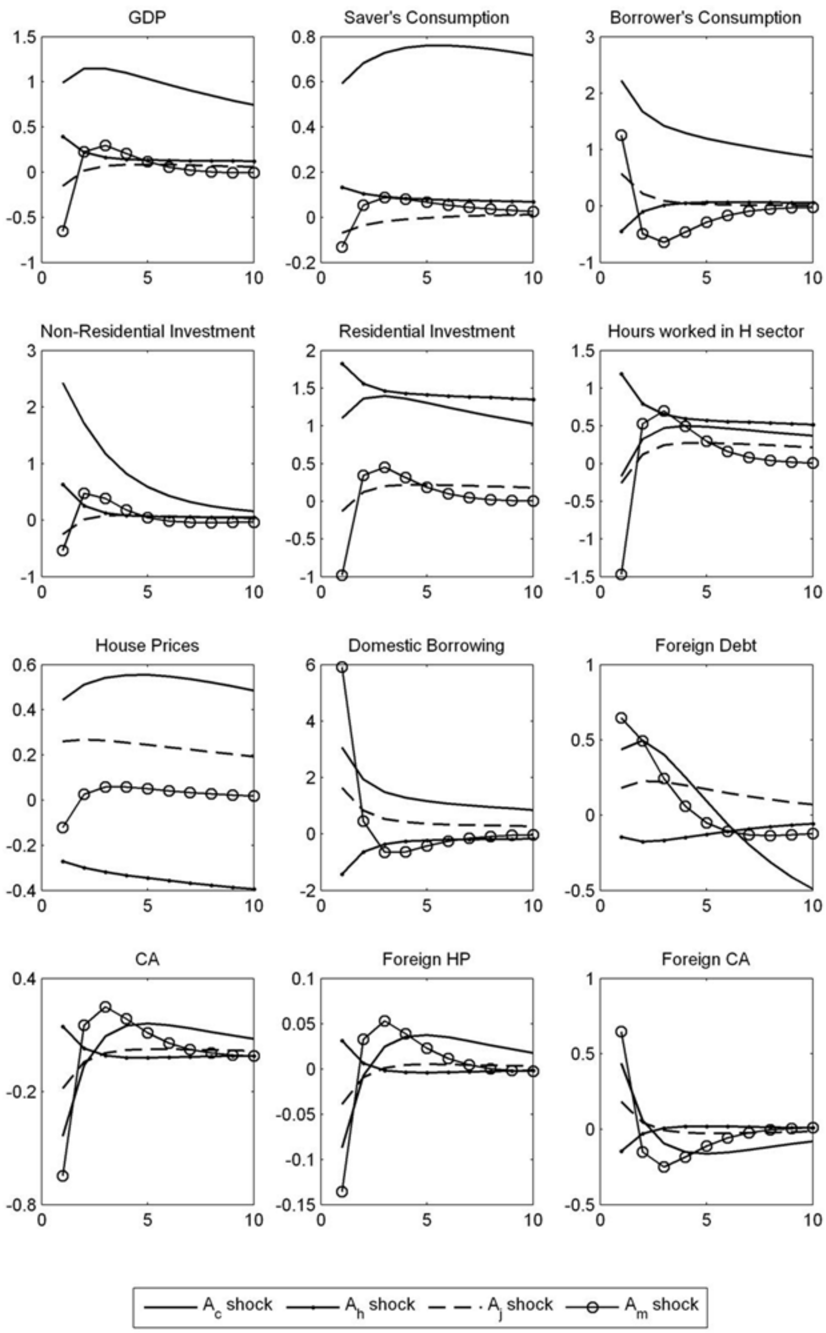

Figure 1: Impulse Responses to Different Shocks.

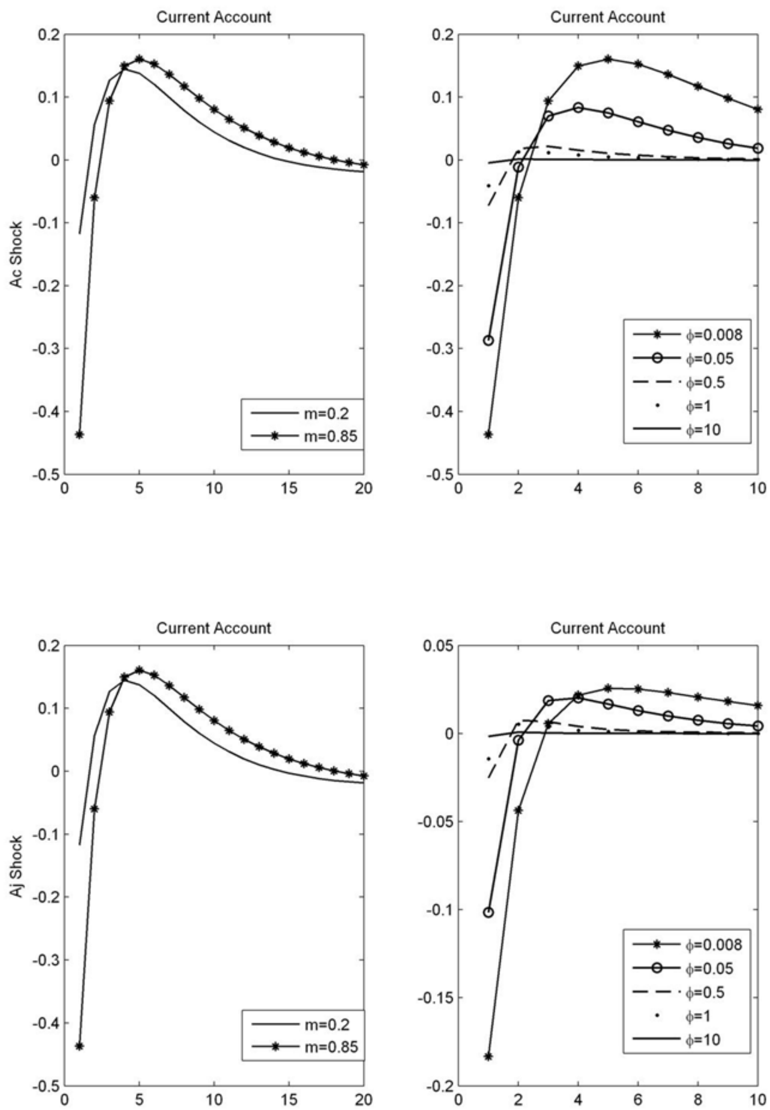

Figure 2: Current Account Responses to Different L-t-V Ratios and Portfolio Adjustment Costs.

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