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ABSTRACT

This paper studies the association between the current account and real estate valuation across countries, subject to data availability [43 countries, of which 25 are OECD], during 1990 - 2005. We find robust and strong positive association between current account deficits and the appreciation of the real estate prices/(GDP deflator). Controlling for lagged GDP/capita growth, inflation, financial depth, institution, urban population growth and the real interest rate; a one standard deviation increase of the lagged current account deficits is associated with a real appreciation of the real estate prices by 10%. This real appreciation is magnified by financial depth, and mitigated by the quality of institutions. Intriguingly, the economic importance of current account variations in accounting for the real estate valuation exceeds that of the other variables, including the real interest rate and inflation. Among the OECD countries, we find evidence of a decline overtime in the cross country variation of the real estate/(GDP deflator), consistent with the growing globalization of national real estate markets. Weaker patterns apply to the non-OECD countries in the aftermath of the East Asian crisis.

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1. Introduction and overview

The financial liberalization wave in emerging markets during the 1990s has frequently led to boom-bust cycles, when the initial boom had been often followed by a financial crisis. Significant literature has focused on the dynamics of financial liberalization in emerging markets, accounting for some of these boom/bust dynamics as a reflection of the "Overborrowing syndrome" [McKinnon and Pill (1996)]. Accordingly, financial liberalization has led to large inflows of capital, bankrolling growing current account deficits, investment and consumption booms. Frequently, these booms were manifested in sizable real estate and real exchange rate appreciations, and in the buildup of balance sheet vulnerabilities. These vulnerabilities had been magnified in countries using a fixed exchange rate, where occasionally incipient capital flights and sudden stops led to financial crises, abrupt real deprecation, and to a bust in the real estate market and to V type recessions. Observers frequently noted that the real estate market played a key role in the propagation of the boom and bust cycle. A frequent concern has been that capital inflows tend to magnify the welfare costs of preexisting distortions (like moral hazard), as they may increase the size of the distorted activities, deepening the bust at the end of the cycle.[1]

Most of the above literature dealt with East Asia and Latin America, implicitly presuming that the US and Europe are less exposed to the vulnerabilities that come with such cycles. The ability of OECD countries to borrow in their currency, the greater reliance on flexible exchange rate regimes, and the presumption of better institutions suggests that the potential volatility induced by real estate boom/bust cycles is indeed larger in developing countries. Yet, there is little evidence regarding the degree to which countries share similar qualitative links between current account patterns and national real estate markets. The purpose of our paper is to provide evidence on the robustness of the current account/real estate channel across all countries, subject to data availability. Our main finding is that, indeed, this channel is potent across all countries, subject to interactions with other domestic variables.

[1] See Kiyotaki and Moore (1997) and Aghion et al. (2004) for models of credit cycles in the closed and open economy, respectively. For further discussion of the association between capital inflows, asset valuation and financial fragility, see Calvo, Leiderman and Reinhart (1996), Krugman (1998), Edison, Luangaram and Miller (1998), Quigley (2001), and Kim and Lee (2002). See Aizenman (2004) for an overview of the policy challenges facing financial opening, and the magnification of domestic distortions associated with capital inflows. See Debelle and Galati (2007), Edwards (2004), Chinn and Ito (2005), Freund (2005) and Faruqee and Lee (2008) for overviews of current account patterns in recent decades.

We don't pertain to deal with causality, as we don't model and control for the factors that may induce capital flows. Instead, we take the view that current real estate valuation has a sizable dependence on lagged macroeconomic variables. This is consistent with the notion that adjustment to changing macro conditions is more protracted in real estate markets than in stock markets [see Glaeser and Gyourko (2007) and Case and Shiller (1989)].[2] We provide evidence consistent with the view that the price adjustment of equities (assets traded in well organized liquid markets, subject to low trading costs) is faster than that of real estate (less liquid assets, subject to high trading costs). We also study regressions that account for the real appreciation of the housing stock, controlling for lagged variables, including GDP per capita, real interest rate, inflation, and the current account. We find that lagged current account patterns are important in accounting for the real appreciation of the real estate market. In addition, the current account changes interacted with other macro variables are important in accounting for future real valuation of housing. Specifically, a one standard deviation increase of the lagged current account deficits [by 4% in our sample] is associated with real appreciation of real estate prices by about 10%. This real appreciation is magnified by financial depth [about 2%], and mitigated by the quality of institutions [about 3%]. Intriguingly, the economic importance of current account variations in accounting for the real appreciation of real estate prices exceeds that of the other variables, including the real interest rate -- a one standard deviation drop of the lagged real interest rate [by 2.5% in our sample] is associated with real appreciation of real estate prices by about 7%. Among the OECD we find evidence of decline overtime in the cross country variation of the relative real estate prices, consistent with the deeper globalization of national real estate market. Weaker patterns apply to the non-OECD countries in the aftermath of the East Asian crisis. Finally, we subject our analysis to various robustness checks.

Sections 2 and 3 review the methodology and the data, respectively; the estimation and results are summarized in section 4. Section 5 closes the paper with concluding remarks.

[2] Adjustments in the real estate markets are subject to significant transaction costs on behalf of consumers, and time consuming installation costs on behalf of producers. These features imply that demand-side factors play important and persistent roles in explaining protracted adjustment in the real estate market. See Brock (1988) for an open economy analysis of these issues. For empirical studies of

2. **Methodology**

The possibility that financial flows are a contributing factor explaining real estate dynamics have been discussed recently by Reinhart and Rogoff (2008):

> "… a large chunk of money has effectively been recycled to a developing economy that exists within the United States' own borders. Over a trillion dollars was channeled into the sub-prime mortgage market, which is comprised of the poorest and least credit worth borrowers within the United States. .. we note that although this paper has concentrated on the United States, many of the same parallels hold for other countries that began experiencing housing price duress during the 2007, including Spain, the United Kingdom and Ireland."

The purpose of our paper is to investigate empirically, subject to data limitations, the merits of the linkages between capital inflows and real estate valuation in all countries. Our empirical analysis is inspired by models that focused on credit market imperfections, including Kiyotaki *and* Moore (1999) in a closed economy, and Aghion et al. (2004) in the open economy. Specifically, agency and moral hazard considerations imply that agents can borrow today up to a fraction μ of their wealth, W_B. This fraction may depend negatively on the real interest rate, *r*. Assuming lags in processing mortgages and closing transactions in the housing market, housing prices today P_H would reflect the lagged borrowing capacity $\mu W_{B,-1}$, and the lagged foreign demand for domestic houses, $H_{-1}^{*,d}$. The supply of housing, H^s, impacts negatively the equilibrium housing prices. In these circumstances, the reduced form of real estate valuation is postulated as

$$P_H = P_H[\overset{+}{W_{B,-1}}, \overset{+}{\mu(r)}, \overset{+}{H_{-1}^{*,d}}; \overset{-}{H^s}]; \quad \mu' \le 0.$$

Capital inflows may impact the real estate valuation via several channels: it may increase directly the demand [$H^{*,d}$], it may increase domestic wealth by bidding up the relative prices of other domestic assets, and may reduce domestic interest rates. The above specification reflects the presumption that, due to a multitude of reasons, real estate price adjustment is protracted.[3]

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the determinants of the real estate prices see Englund and Ioannides (1997), Case, Goetzmann and Geert (2000), Case, Quigley, and Shiller (2005), da Mata (2007), and Shiller (2007).

[3] Housing transactions occur through time consuming bilateral negotiations associated with heterogonous assets; the liquidity of the housing market is constrained because of the existence of high transaction costs and agency considerations; borrowers rely heavily on external finance; real estate is widely used as collateral; and the supply of houses is adjusting slowly to market conditions. All these factors suggest

Consequently, our empirical specification aims at explaining the real estate relative price by lagged variables including income growth, population, inflation, financial depth, the real interest rate, and capital inflows.

The above methodology presumes that the short/intermediate run dynamics of real estate prices differs from that of stocks. This may reflect differential adjustment and financing costs, the greater heterogeneity of real estate, and the different market structure underlying these two asset markets. In the next sections we provide evidence consistent with the above presumptions – we find that real estate relative prices are more persistent and less volatile than equity relative prices, and more correlated with the lagged current account. We also apply univariate and multivariate regression analysis; and find a much weaker association between lagged current accounts and equities than between lagged current accounts and real estate valuations.

While our focus is on the impact of past current accounts on the present real estate relative prices, the life cycle model of consumption implies that real estate appreciation may be associated with higher wealth, triggering higher consumption, thereby increasing the current account deficit. Hence, there may be a two-way causality between housing wealth and the current account. We examine the possibility of such a two-way feedback and the importance of the "housing wealth" channel using three different tests. We find that the case for "reverse causality," from real estate prices to current account deficits, is not supported in our 43 countries, 1990-2005 sample. We also apply the simultaneous-equations and instrumental-variables estimation. Based on the 3SLS, the effect of current account deficits on the real estate appreciation is positive and significant, but not the other way around. Finally, we use the Granger Causality tests on the quarterly data of current account deficits and various real estate indices in the US and the UK. Using this relatively long (30 years) and high frequency data, we find that the causality can run in both directions, varying across locations and types of national real estate markets. Our inference from these tests is mixed – there may be a two way feedback. Yet, one may need longer and more frequent data to validate it, something that is not available at present for a large panel of countries.

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that the adjustment of real estate valuations to shocks is much more time consuming than that of equity valuations.

3. Data Description

We obtained price indices of national real estate markets from the Datastream and the Global Property Guide. The data appendix provides a description and the primary sources of these indices. We gathered the real estate data from 1978 to 2008 for the countries, subject to data availability. Using the national real estate indices is subject to important limitations: 'national indices' cover diverse and potentially different sectors of real estate markets for different countries; some residential, others industrial, office or retail.[4] To get a broader perspective, we collect indices tracking real estate returns in several countries where the markets are considered investable by international investors. These 'investable indices' are compiled by companies that invest in real estate markets internationally, so the indices reflect the investable portion of the national real estate markets and offer detailed information at the sectoral level, in a consistent manner across countries. However, the coverage of these investable indices is limited, and they are subject to sample selection: the lack of data in any country is a result of the lack of interest and investment opportunities in the real estate markets there. For country-level data at an annual frequency, the investable indices cover 12 countries from 1998 to 2007. For city-level data at a quarterly frequency, the investable indices cover 6 cities from 1998:01 to 2007:04. Because of the short span and limited country coverage of the investable indices, our estimation focuses on the annual national indices. In addition, the UK and the US have quarterly indices spanning back to the 1980s, of which we also collect, including the investable indices for the UK, and the NCREIF indices and the Case&Shiller indices for the US.

The data on the current account deficits and relevant macroeconomic variables are taken from the World Development Indicators (WDI) and the International Financial Statistics (IFS). Following the literature, we control the annual growth of population in the urban areas (Urban Population Growth), the annual growth of real GDP per capita (Capita GDP Growth), GDP deflator inflation (Inflation), domestic credit provided by the banking sector as a percentage of GDP (Financial Depth), and the domestic real interest rate. We use the real interest rate from WDI, which is constructed from bank's one year lending interest rate, adjusted for inflation by the GDP deflator. While the mortgage rates will allow testing both the prime and sub-prime real

[4] Another problem with the national indices is their accuracy. For example, consider the March 2008 figure in China for Shenzhen: the National Development and Reform Commission (NDRC) reported that real estate prices dropped by 4.9%, but the Shenzhen Bureau of Land and Housing Management reported

estate loans, to our knowledge a panel data on the mortgage rates at that level of disaggregation is not publicly available across the OECD and Non-OECD countries. We use International Country Risk Guide (ICRG) scores on law & order (the higher the better) as a proxy for quality of institutions. Though the loan-to-value ratio is available only as a cross-section variable, we include it as potentially an important financial factor explaining real estate valuations.[5] After combining the national real estate series with the current account deficits and macroeconomic variables, our sample covers the period of 1990 to 2005 for 43 countries, of which 25 are OECD countries. We deflate the real estate indices in nominal terms with the country GDP deflator, and call the resultant series "appreciation of real estate prices" or "real estate/(GDP deflator) appreciation." The GDP deflator is chosen over the consumer price index to maximize the sample size.[6]

Table 1 provides the number of observations, sample averages, standard deviations, and the Mackinnon approximate p-value of the Dickey-Fuller test under the null hypothesis of a unit root. In testing the unit root, we note that the real estate prices/(GDP Deflator) appreciation series span from 1990-2005, while the Current Account Deficits/GDP series go back to 1980 for most of the countries in the sample. Non-OECD countries also have many missing observations for both the real estate and current account series, particularly the Eastern European countries. In our sample, the average number of observations (years available) for Real Estate /(GDP deflator) appreciation is 12 for the whole sample, 10 for the Non-OECD countries, and 14 for the OECD countries. We can see from Table 1 that the average appreciation of real estate prices in some countries is extreme: for the 7-12 year period, the appreciation exceeds 14 % in Estonia and Lithuania whereas the depreciation exceeds 20 % in Bulgaria and Russia. During 1990-2005, the average Real Estate /(GDP deflator) appreciation is .64 % per year for the whole sample, -1.35 % per year for the Non-OECD, and 2.08 % per year for the OECD countries. The

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a drop of 16.5% (Economist, 2008).

[5] Warnock and Warnock (2007) find that countries with stronger legal rights for borrowers and lenders, deeper credit information systems, and a more stable macroeconomic environment have a deeper housing finance system. There are several important financial variables which we lack in the cross-country data, including loan-to-value ratios, credit restrictions, and securitization of housing loans (see also BIS, 2006). Due to limited data availability, these figures also miss the recent market turbulences; the credit shock hitting the financial markets in 2007 has generated a decline in securitization of mortgages, which sharply reduces the demand for housing (Deutsche Bank, 2008).

[6] This is due to missing data in CPI series for a number of developing countries at the beginning of the sample period. Another side benefit of using the GDP deflator is that it is more consistent in terms of the

real estate markets in Non-OECD tend to be more volatile: the average standard deviation of the real estate appreciation deflated by GDP deflator is 17.57, compared to 5.90 for the OECD countries. Using the Dickey-Fuller test for unit root with a trend term, most of the Real Estate /(GDP deflator) appreciation series are found to be non-stationary: the Mackinnon approximate p-value of 35 countries is larger than .005. As for the Current Account Deficits/GDP, some of the outlier observations are countries running large current account surpluses: for example Singapore and Switzerland run an average 10% surplus over a 25-year period. The average Current Account Deficits/GDP is .25 for the whole sample, .66 for the Non-OECD, and -.04 for the OECD countries. Similar to the real estate series, the current account deficits to GDP of the Non-OECD tend to be more volatile: the average standard deviation of the Current Account Deficits/GDP is 4.56, compared to 2.85 of the OECD countries. Using the Dickey-Fuller test for unit root with a trend term, we also find that most of the current account series are non-stationary: the Mackinnon approximate p-value of 41 countries is larger than .005.

To examine further in details the stationarity of the real estate and the current account series, Table 2 reports a summary of unit root tests, one on the individual series for each country, and another across series in the panels. In the top panel, we can see that under the null hypothesis of a unit root the rejection rates of these tests suggest that the stationarity properties of these series are inconclusive.[7] The augmented Dickey-Fuller test and the Phillips-Perron test indicate that more than sixty percent of the Real Estate/(GDP deflator) Appreciation series and around ninety percent of the Current Account Deficits/GDP series are non-stationary. On the other hand, the Kwiatkowski-Phillips-Schmidt-Shin (1992) test indicates that most of the two series are stationary.[8] These mixed results apply to both the OECD and Non-OECD countries, reflecting the low-power of the unit-root tests on the short time series in the sample. The bottom panel of Table 2 reports the results from applying the panel unit root tests. Because the sample must be a balanced panel in order to perform the existing panel test procedures, there are 12 years (1993-2004) and 25 countries that qualify.[9] The test statistics correspond to specifications

changing basket and expenditure patterns across countries.

[7] The test statistics correspond to specifications with time trend. Except for the Kwiatkowski-Phillips-Schmidt-Shin test, the null hypothesis is non-stationarity. The rejection of stationarity under the Kwiatkowski-Phillips-Schmidt-Shin test is reported as a non rejection of the unit root.

[8] Faruqee and Lee (2008) also find that the Kwiatkowski-Phillips-Schmidt-Shin test tends to not rejecting the null of unit root (88 percent out of 94 countries from 1960-2003).

[9] The countries available for the panel unit-root tests include 19 OECD and 6 Non-OECD: Australia,

with time trend, under the null hypothesis of non-stationarity for the Levin-Lin-Chu (2002) test and the Im-Pesaran-Shin (2003) test; for the Nyblom-Harvey (2000) test, the test statistic can be considered as the generalization of the Kwiatkowski-Phillips-Schmidt-Shin test, and a failure to reject the null hypothesis of zero common stochastic trends is an indication that the series do not form a cointegrated combination. Applying to the panel of Real Estate/(GDP deflator) appreciation, the Levin-Lin-Chu and the Im-Pesaran-Shin tests reject the null of non-stationarity. The Nyblom-Harvey test rejects the null of zero common trends for the panels of OECD and Non-OECD, but not for the whole sample. For the Current Account Deficits/GDP panels, the results are inconclusive: the Levin-Lin-Chu test rejects the null of unit root, but the Im-Pesaran-Shin test cannot reject. The mixed results reflect the sample size and also a number of limitations with the existing tests of unit root in the panels.[10]

Figure 1 provides the unconditional sample distribution of the average current account deficits/GDP on the left panel, and the average real estate/(GDP deflator) appreciation on the right panel, between the early 1990s and the early 2000s in the top row. The bottom row disaggregates the sample to the OECD and the non-OECD countries. Note that the distribution of the current account is more dispersed for the non-OECD countries. The mean of the CA Deficits/GDP is 3 % and the standard deviation is 4.0 %. For the real estate prices, the distribution for the non-OECD countries is more skewed to the left than for the OECD countries. The figure also suggests a general appreciation trend for the recent period; based on the kernel density estimates, the cross-sectional distribution of the real estate appreciation has shifted to the right during the 2000-05 period, in comparison to the 1991-95 period.[11] There is an increase in the dispersion, with the mass of the distribution being less concentrated around the mean of zero (for 1991-95, the average appreciation = 1.2 percent per year) and shifting out toward the higher positive tails (for 2001-05, the average appreciation = 22.5 percent per year). The peakedness, measured by the kurtosis, of the sample distribution suggests that more of the variance is due to infrequent extreme deviations in the real estate markets in the early 1990s, as opposed to frequent and modest size deviations in the early 2000s.

Austria, Belgium, Bulgaria, Canada, Denmark, Finland, France, Germany, Indonesia, Ireland, Italy, Japan, Korea, Malta, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland, Taiwan, Thailand, United Kingdom, and United States.

[10] See for example the discussion in Enders (2004), pp.156-230.

[11] The density estimates are based on the Epanechnikov Kernel function.

Figure 2 shows the patterns of the current account deficits/GDP, real exchange rates, real estate /(GDP deflator) appreciation, and for the stock markets/(GDP deflator) appreciation during 1990 through 2005, for 18 non-OECD countries, 24 OECD countries ex. US, and for the US. The bust of the global real estate markets in the early 1990s, and the Asian financial crisis of 1997 are clearly evident in Figure 2. We can also see a positive association between the real estate/(GDP deflator) appreciation and the current account deficits/GDP during that period. The estimates of the AR(1) process for these series, reported below Figure 2, show that the current account deficits/GDP is the most persistent variable overtime, and the real estate/(GDP deflator) appreciation is more persistent than the stock markets/(GDP deflator) appreciation, but less than the real exchange rates appreciation. Figure 3 depicts similar patterns using the real appreciation of investable real estate and investable stock markets (using MSCI indices) at the annual frequency. At the country-level we find that the real estate/(GDP deflator) appreciation is more persistent over time than the stock markets/(GDP deflator) appreciation, as is confirmed by the estimates of AR(1), reported below Figure 3. Figure 4 presents the patterns of investable indices at the sectoral level: residential, office, retail, and industrial. It confirms the strong co-movements of these indices. Table 3 provides the correlations between the different types of real estate indices, both at the country level (8 countries) and city level (3 cities). We include the city level series as they take into account differences across localities within a country. With the exception of two observations out of 24, the correlations between residential housing valuation and other segments of the national real estate markets (office, retail and industrial) are positive and large.[12]

To get a sense of whether the cross-country dispersion in the appreciation of real estate prices corresponds to the dispersion in the current account deficits, real exchange rates, and stock markets appreciation, Figure 5 reports the standard deviation of these series for the OECD and the Non-OECD groups during the sample period. The dispersion rates of these series among the Non-OECD countries tend to be higher than that among the OECD countries. A tighter connection between the real estate and the stock markets characterizes the OECD countries: the

[12] Yet, there is a significant heterogeneity. At the country level, the correlations between the residential and the office real estate markets are positive in 7 out of the 8 countries, six of which are above 0.5. The correlations between the residential and the retail real estate markets are positive for 7 out of the 8 countries, 4 of which are above 0.5. The correlations between the residential and the industrial real estate markets are positive for all 8 countries, 4 of which are above 0.5.

correlation between the standard deviation in the real estate markets and that in the stock market is .77 for the OECD countries, but only .06 for the Non-OECD countries. In the real estate markets, the standard deviation of Real Estate/(GDP deflator) appreciation declines on the order of .02 % per year (p-value .05) among all countries, .26 % (p-value .06) among the OECD countries, and .0004 % (p-value .99) among the Non-OECD countries.[13] In the stock markets, the standard deviation of Stock Price /(GDP deflator) falls .01 % per year (p-value .21) among all countries, .02 % (p-value .01) among the OECD countries, and .002 % (p-value .89) among the Non-OECD countries. This global convergence in both the real estate markets and the stock markets is quite compelling. Figure 6 shows the correlations between the Current Account Deficits/GDP with the real exchange rates, the Real Estate /(GDP deflator) appreciation, and the Stock Markets/(GDP deflator) appreciation. We also plot as references of international interest rates the 3-month nominal interest rates using the U.S. Treasury Bill, the Japan Financing Bill, and the London Interbank Offer Rate (LIBOR, pound sterling). During the sample period, the correlations between the appreciation of real estate prices and the current account deficits increase by .041 % per year (p-value 0.0) among all countries, .029 % (p-value .006) among the OECD countries, and .036 % (p-value .283) among the Non-OECD countries.[14] Regressing the correlations between current account deficits and real estate appreciation on the LIBOR, the estimated coefficient is -.061 (p-value .000) for all countries, -.051 (p-value .000) for the OECD countries, and -.048 (p-value .449) for the Non-OECD countries.

The above results confirm our prior that real estate prices exhibit greater persistency and lower volatility than stock prices (see our earlier discussion in Section 2).[15] We turn now to analyze the degree to which real estate and stock prices are correlated with lagged current account/GDP.[16] Tables 4 and 5 provide the cross-correlograms of each series with the current

[13] Let σ denote the standard deviation and t the time trend, the approximate convergence rate (b_1) is derived from running the OLS regression of $\ln(\sigma) = a_1 + b_1 t + \omega_1$; where ω_1 is an error term.

[14] Let ρ denote the correlation and t the time trend, the approximate convergence rate (b_2) is derived from running the OLS regression of $\rho = a_2 + b_2 t + \omega_2$; where ω_2 is an error term.

[15] While the stock market wealth may not exceed the real estate (and housing) wealth as a share of national wealth in most countries, stock market wealth is more liquid, traded with relatively low transaction costs, hence more readily convertible to consumption than real estate wealth. This applies especially in countries in which home equity loans are not widely available; as is the case for most countries, except the US.

[16] The much lower transaction costs of trading equities relative to real estate suggests that pricing of equities is more forward looking than that of real estate, hence one expects a higher correlation between

account deficits/GDP using the national and investable real estate indices, respectively. Using the national real estate indices, Table 4 reveals a significant association between the lags/leads of the current account deficits/GDP and the real estate/(GDP deflator) appreciation (column 1), and a much weaker association between the current account deficits/GDP and the stock market/(GDP deflator) appreciation (column 3). In addition, the correlation between the current account deficits/GDP and real exchange rates that is found to be tenuous in high-frequency data, but more robust in low-frequency data (see Krugman 1991, 2007), also characterizes the present sample (Table 4, column 2). At the annual frequency and country level, we also find that the current account/GDP deficit is a good leading indicator of real estate markets for France, the UK, Japan, South Korea, the Netherlands, and the US. On the other hand, we find no statistical association between the lags/leads of the current account deficits and the stock markets/(GDP deflator) appreciation.[17] Table 5 reports the degree to which current account deficits/GDP is a good leading indicator of the real estate and equity prices in Bangkok, Hong Kong, Kuala Lumpur, and the UK. It uses the city-level data, applying investable real estate indices at a quarterly frequency. The evidence reported in Table 5 confirms that the current account tends to forecast the real estate prices better than the stock prices.[18]

Before the formal econometric tests in the next section, Table 6 provides the simple t-tests, adopted from Case, Goetzmann, and Rouwenhorst (2000),[19] under our null hypothesis that the real appreciation of national real estate markets are correlated through their current account patterns. We first remove the effects of a country's own current account deficits on its real estate/(GDP deflator) appreciation series using a linear regression of the real estate/(GDP deflator) appreciation on the contemporaneous current account deficits to GDP:

$$(1) \quad \left(\frac{\text{Real Estate}}{\text{GDP Deflator}}\, appreciation\right)_{i,t} = \phi_1 + \phi_2 \left(\frac{\text{Current Account Deficits}}{\text{GDP}}\right)_{i,t} + \psi_{i,t}$$

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lagged current account/GDP and real estate valuation.

[17] We run the OLS of the cross-correlograms between each variable and the CA Deficits/GDP, and report the coefficient estimates in the bottom panel of Tables 4 and 5.

[18] The coefficient estimates from the OLS of the cross-correlograms between the current account deficits/GDP and real estate/(GDP deflator) appreciation on the lags/leads are statistically significant and larger, with lower standard deviation than those of the correlograms of the stock markets/(GDP deflator) appreciation.

[19] They apply the test to sectoral real estate returns with the GDP factor in a smaller set of countries.

Then we compare the correlation matrices of the raw appreciation of real estate prices, $\left(\frac{\text{Real Estate}}{\text{GDP Deflator}}\,appreciation\right)_{i,t}$, to the regression residuals, $\psi_{i,t}$. In the last step, we conduct a paired t-test of the off-diagonal elements in the raw appreciation and the residual correlation matrices to determine whether the difference in the means of correlations is significant. Specifically, let ρ_i^j denote the correlation of the real estate/(GDP deflator) appreciation in country *i* and country *j*, and $\tilde{\rho}_i^j$ denote the correlation of the corresponding residuals from equation (1). The off-diagonal elements for the tests using *N*=43 countries are:

$$\begin{bmatrix} . & . & . & . & . \\ \rho_2^1 & . & . & . & . \\ \rho_3^1 & \rho_3^2 & . & . & . \\ \rho_*^1 & \rho_*^2 & \rho_*^3 & . & . \\ \rho_N^1 & \rho_N^2 & \rho_N^3 & \rho_N^* & . \end{bmatrix} \text{ and } \begin{bmatrix} . & . & . & . & . \\ \tilde{\rho}_2^1 & . & . & . & . \\ \tilde{\rho}_3^1 & \tilde{\rho}_3^2 & . & . & . \\ \tilde{\rho}_*^1 & \tilde{\rho}_*^2 & \tilde{\rho}_*^3 & . & . \\ \tilde{\rho}_N^1 & \tilde{\rho}_N^2 & \tilde{\rho}_N^3 & \tilde{\rho}_N^* & . \end{bmatrix}$$

If the null hypothesis of equality of the correlations in raw appreciation ρ_i^j and the correlations in residuals $\tilde{\rho}_i^j$ is rejected, then this would suggest that the co-movements of the national real estate markets are associated with common factors driving the current account patterns. Let σ denote standard deviation, the means of correlations of the raw real estate /(GDP deflator) appreciation are .089 (σ = .382) across all countries, .027 (σ = .361) across the Non-OECD countries, 0.147 (σ = .366) across the OECD, and .158 (σ = .438) between the OECD and Non-OECD countries. After removing the effects of the current account deficits, the correlations are .024 (σ = .377) across all countries, -.030 (σ = .366) across the Non-OECD countries, .058 (σ = .337) across the OECD countries, and .116 (σ = .446) between the OECD and the Non-OECD countries. The t-tests reject the null of equality of means of correlations for all-country pairs (though the test barely rejects that for the OECD versus Non-OECD countries pairs). Thus, removing the effects of own-country current account deficits results in a statistically significant drop in mean correlation of the real estate/(GDP deflator) appreciation across countries. The most significant drop is for the OECD countries. We can also see that removing the effects of current account deficits decreases the variance of the Real Estate/(GDP deflator) appreciation by 2.7 %. Nevertheless, these t-test results are only suggestive as it utilizes no particular procedure to control for common factors behind current accounts of individual countries.[20]

4. Estimation and Results

Further insight regarding the association between the current account deficits/GDP and the real estate/(GDP deflator) appreciation is gained by applying a battery of panel regressions, controlling for relevant macroeconomic variables. The previous sections suggest that the current account deficits are contemporaneously correlated with the real appreciation of real estate prices across countries. However, the real estate markets are more likely to adjust along with the current account deficits with lags. This is also true for the effects of other macroeconomic variables that we consider, including Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, and Real Interest Rates.[21] To account for the lagged effects and also for the non-stationarity of these macro time series, we make the following variable transformation. First, we include in the panel estimation the lagged values of the Current Account Deficits/GDP and other macroeconomic variables. The current account variable enters the panel regressions with a maximum of five lags, and other macro variables with one lag. While the choice of five lags is arbitrary, we test and report the results using other lag specifications. Later, we also supplement the benchmark estimation with additional results using the average and the cumulative change of the variables, though the results are not directly comparable to the panel regressions using annual data because the cross-section regressions do not take into account the lag structure and short- to medium-run dynamics. Second, trend and non-stationarity not only characterize the Real Estate /(GDP deflator) appreciation and the Current Account Deficits/GDP reported in Table 1, but also apply to other macro time series in the sample. The trends in these series can contain both stochastic and deterministic components: differencing can remove the former, and detrending can remove the latter. As we have seen with

[20] In addition, a meaningful current account dynamics would be generated by idiosyncratic factors – if all countries were subjected to common and identical shocks, all countries would have common and identical macroeconomic dynamics, leaving no need for adjustments via the current accounts.

[21] Another relevant variable, but beyond the scope of this paper, is the government regulation on real estate markets. The importance of this variable is highlighted in the case of China, where the published real estate indices tend to understate the underlying trends in major Chinese cities. Zheng and Kahn (2008) find that in Beijing, while the land prices and real estate prices decline with distance from the city center, the residential building heights and housing unit sizes do not, indicating some binding urban planning policies that do not reflect market forces.

the current accounts and the real estate series that the results of different individual and panel unit root tests on them tend to be inconclusive. In the sample, the maximum length of time series available is sixteen years (1990-2005): the standard Box-Jenkins methodology recommends differencing as the form of the trend may not be essential for short-term forecasts, but the form of the trend becomes more important as the forecast horizon expands. Yet, some series may have a deterministic trend, a stochastic trend and a stationary component (trend plus noise series). For our baseline estimation, we adopt a parsimonious approach to these macroeconomic variables by first-differencing the time-series already in percentage changes [(Real Estate /(GDP deflator) appreciation; Urban Population Growth; Capita GDP Growth; Real Interest)], converting to percentage change for those variables in levels [(Financial Depth; Institution; Current Account Deficits/GDP)], and then de-trending. This transformation is not perfect, but the Augmented Dickey-Fuller tests reject the null of unit root with trend in the resultant series. We also provide estimation results using other variable transformations, including a sign-preserving detrended current account series (to take into account the persistent trend feature of the current accounts) and non-transformed series (of which the estimates are not consistent and the statistical inference do not hold). After constructing the lags and transforming the macroeconomic variables, we have 354 observations and 41 countries available for the panel estimation. Table 7 provides the sample correlations among these variables.

We apply the dynamic equation, with the Real Estate/(GDP deflator) Appreciation as the dependent variable ($y_{i,t}$; %change per year).

$$(2) \qquad y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-i} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x is a set of main explanatory variables, including Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest rate; z is a vector of past Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. To provide a comparison between the equation (2) and alternative specifications, Table 8 reports the benchmark results, with the 'Dynamic Panel' regressions (equation (2)) in columns 1-5 using Arellano and Bond's (1991) GMM estimators; the 'Fixed Effects' regressions using the least squares dummy variable (LSDV) estimation in columns 6-7; and the pooled OLS in column 8.

Across the econometric specifications, the lagged Real Estate /(GDP deflator) appreciation is negatively associated with its current value. The lagged Urban Population Growth and the lagged Capital GDP Growth are positively associated with the appreciation of real estate prices. A higher lagged Inflation is associated with a lower Real Estate/(GDP deflator) appreciation in the next period. The effects of the Financial Depth and the lagged Institution are statistically insignificant. The effect of the lagged real interest rates is significant with the expected sign: the higher the cost of borrowing, the lower the appreciation of real estate prices. Most significantly, we find that the lagged Current Account Deficits/GDP is positively associated with the appreciation of real estate prices across the specifications. The effects are stronger for the lags 1-3 according to the benchmark dynamic panel specification. Based on the fixed-effects and the OLS estimation, the positive effects of the Current Account Deficits/GDP on the Real Estate /(GDP deflator) appreciation persist five years, and are statistically significant. For the interaction between the current account and other key macro variables, we find that the effects of the current account deficits are magnified by the level of inflation and financial depth. A deeper Financial Depth in itself has no statistical association with the real estate prices, but it increases the effects of the current account deficits on the real estate market appreciation. The interaction between the CA Deficits/GDP and the Institution is negative and significant: the effects of the current account deficits on the real estate appreciation tend to be smaller in a country with a better quality of institution. Overall, the results are consistent across the benchmark and alternative specifications. Our estimation explains around 70 % of the variation in the real estate/(GDP deflator) appreciation across countries.

We then use the present panel methodology to examine several important issues. First, we compare the conditional correlations between the real exchange rates-the current accounts with that between the real estate appreciations-the current accounts. This is done by applying a version of equation (2), replacing the real estate appreciation with the real exchange rates as the dependent variable. Table 9 reports the findings. The real exchange rate appreciation is significant but weakly associated with the current account deficits at the 3-5 year lags (column 1), while it is significant and strongly associated with the current account deficits at the 1-3 year lags in the case of the real estate appreciation (Table 8). Second, we compare the association between the current accounts-the real estate prices with the association between the current accounts-the stock prices. Table 10 reports the results of replacing the real estate appreciation with stock market appreciation as the dependent variable in a variant of equation (2). Consistent with the findings in previous sections, the relationship is weak; it is negatively significant only at the one year lag. This suggests that, in our sample, a current account signal is fully internalized within one period.[22] Finally, we verify the possible role of real estate financing patterns, adding the 'loan to value' (LTV) ratio to the explanatory variables, subject to data limitations: the LTV is available only in a cross-section. Of the 43 countries in the sample, the 2000-05 average of LTV ratios ranges from 90 percent in Estonia to 40 in the Czech Republic. Interacting the LTV ratio with the current account deficits, we find that the positive effects of current account deficits at 2 and 3 year lags remain [see Table 11]. The LTV ratio interacted with the current account deficits/GDP turned out to have a positive, but insignificant association with the real estate/(GDP deflator) appreciation.[23]

We check the sensitivity of the estimation with respect to the choices of real estate variables in Table 12. We re-estimate the main regressions in Table 8, for different types of real estate markets, using the investable indices of twelve countries. While this sample is smaller, it is more balanced than the one in Table 8, enabling us to include more lags for the real estate indices and the LTV interactions.[24] We find that inflation and real interest rates are still negatively associated with the real estate markets. The results indicate that current account deficits/GDP have positive effects on the real appreciation of office, retail, and industrial markets with the one-year lag, and the residential/housing market with the two-year lag. We also find that a higher LTV mitigates the real estate appreciation associated with higher current account/GDP deficit. While statistically significant, this effect is very small -- mitigating about 1.5% of the induced real appreciation.

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[22] These results are in line with the view that the price adjustment of equities (assets traded in well organized liquid markets, subject to low trading costs) is faster than that of real estate (less liquid assets, subject to high trading costs).

[23] The availability of panel information on LTV would allow future research to examine in detail the role of monetary policy and capital account openness on real estate markets. For example, in China some real estate developers, facing a tightening credit environment, turn to external financing, including foreign hedge funds which are eager to lend to the Chinese property companies: not only can they charge higher interest rates (25% or more), they also expect to gain from the continuing appreciation of the Chinese Renminbi (Economist, 2008). See Ahearne et al. (2005) for the relationship between house prices and monetary policy in OECD countries.

[24] Due to the short sample length of the investable indices, we include only two lags of the current account deficits to preserve the degree of freedom; nevertheless lags 3 to 5 are statistically insignificant once included in the estimation.

Table 13 provides additional results from other econometric specifications. First, we split the movements of real estate prices into the appreciation and the depreciation, then apply the panel Tobit estimation. We find that the positive effects of the current account deficits/GDP on the real estate prices are more significant for the appreciation or boom period (top left panel, censoring "appreciation of real estate price" <0). We also run a dynamic panel estimation using the average and the cumulative change of the explanatory variables. Because these cross-section regressions ignore the short- to medium-run dynamics and the lag structure of the current account deficits, they are not directly comparable to the benchmark estimation using annual data in Table 8. Nevertheless, using the average and the cumulative change of the explanatory variables, we can see in the bottom panel of Table 13 that the effects of Inflation and Real Interest Rates remain, as well as the positive effects of the interaction of Inflation and Financial Depth with the Current Account Deficits/GDP.

Table 14 reports additional estimation, taking into account two features of the CA Deficits/GDP patterns. The first feature is the persistency of the current account series:[25] a country can run current account deficits for an extended period, followed by a reversal. To account for this trend pattern, we follow Faruqee and Lee (2008) by de-trending the current accounts with the sign-preserving trend:

$$(3) \qquad \operatorname{sgn}\left(CA_{i,t-1}\right)\times trend;\operatorname{sgn}\left(CA_{i,t-1}\right)=\frac{CA_{i,t-1}}{\left|CA_{i,t-1}\right|}.$$

Using the sign-preserving detrended current account series, we can see in Table 14 columns 1-5 that our baseline findings remain: the current account deficits are positively associated with the real estate appreciation, the effects which increase (via interaction) with the rate of inflation, the level of financial depth, and the lower quality of institution. The size of the coefficient estimates on the five lags of the current account deficits are also similar, though smaller, than those obtained using the normal de-trended current account series in Table 8.

The second feature of the current account is that the sustainability of the imbalances can be related to the country's size.[26] Figure 7 plots the lagged 3-year cumulative correlations

[25] See Taylor (2002).

[26] Aizenman and Sun (2008) find that, with the exception of the US, the length of current account deficit

between the Real Estate/(GDP deflator) appreciation and the Current Account Deficits/GDP, against the countries' GDP Size. The observed association is rather weak in the present sample, though excluding large G7 countries uncovers a small and non-linear correlation between the country size and real estate-current accounts appreciation. To account for this size feature, we include the interaction between the Current Account Deficits/GDP and the country's GDP Size as another explanatory variable. Because our estimation period is 1990-2005, we use the GDP Size as the average over the period of 1980-1989. Table 14 column 7 provides the results from including the GDP Size interactions of five lags, for both the normal de-trended and the sign-preserving de-trended current account series. We find that the main results continue to hold. The country-size effects are negative at all lags, but only statistically significant at one year lag in the regression using the sign-preserving de-trended current account series.

Theory suggests that causality between real estate valuation and the current account may operate in both directions. To illustrate, an exogenous increase in the availability of international capital may increase the demand for real estate assets in a capital-recipient country, leading to a real estate appreciation there. Alternatively, the permanent income hypothesis and the present value model of the current accounts predicts that a real estate boom that increases households' perceived wealth may lead consumers to increase their consumption and thus generates current account deficits. In both cases, we may observe a positive correlation between the real estate appreciation and the current account deficits. Furthermore, although real estate may be viewed as an asset class that can be the target of international investment (thus having the characteristics of tradables), the dominant portion of real estate remains nontradable, providing a conceptual affinity to the analysis of nontradable prices in the present value model of the current account.[27]

To sort out these possibilities, we provide three additional sets of evidence. First, Table 15 reports the results of reversing the baseline specification (reported earlier in Table 8), using the current account deficits as the dependent variable and the real estate/(GDP Deflator) appreciation and its lags as explanatory variables. We find that the case for "reverse causality," from real estate prices to current account deficits, is not supported in the present panel sample. Table 16 proceeds with another approach, using the simultaneous-equations and instrumental-variables estimation. We include the real exchange rate and the percentage of population older

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spells is negatively related to the relative size of the countries' GDP.

[27] See Bergin and Sheffrin (2000).

than 65 years as additional instruments for the current account deficit/GDP.[28] Based on the three-stage estimation (3SLS), the effect of current account deficits on the real estate appreciation is positive and significant, but not the other way around. In Table 17, we use the Granger Causality tests on the quarterly data of current account deficits and various real estate indices in the US and the UK. Using this relatively long and high frequency data, we find that the causality can indeed run in both directions, varying across locations and types of national real estate markets. In the UK, the causality tests suggest two way feedbacks between the current account deficits and the real estate appreciation for all types of real estate returns and market sectors. The US findings may be a case of a large real estate market in a large country, "driving" the business cycles.[29] While the composite indices (both the NCREIF and the Case&Shiller data) display reverse causality from the real estate appreciation, there are differences at the regional level: the current account deficits/GDP "drives" the real estate markets in the Midwest, whereas the real estate/(GDP deflator) appreciation in the West "drives" the US current account deficits.

We summarize the key factors accounting for real estate/(GDP deflator) variation in our sample by reporting the economic significance of the explanatory variables in our benchmark regression (Table 8, column 1). This is done in Figure 8, reporting the association between a one standard deviation change in each of the conditioning variables and the real estate/(GDP deflator). The estimated response of the appreciation of real estate prices ($y_{i,t}$; % change per year of real estate prices/(GDP deflator) in Table 8), are calculated for each macroeconomic variable ($x_{i,t}$; $z_{i,t}$; $x_{i,t-1}$ x $z_{i,t-1}$) by multiplying a one standard deviation increase (σ) of the variable with its estimated coefficient (γ, β, θ). The importance of the various factors accounting for variations of the real estate/(GDP deflator) is gauged in Figure 8. A one standard deviation increase of the current account deficit (about 4%) is associated with a cumulative real estate/(GDP deflator) appreciation of about 10%.[30] The impact of the current account deficit on the real estate/(GDP deflator) appreciation is further magnified by financial depth (about 1.8%)[31], and mitigated by

[28] See Lee and Chinn (2006) for the structural relationship between real exchange rates and the current account, and Campbell and Cocco (2007) for the relationship between house prices, age structure, and consumption.
[29] See Leamer (2007).
[30] The 10% change is the product of a one standard deviation current account shock (4%) times the sum of the coefficients of its lags = 4.0x(1.02+0.57+0.64+0.18+0.14) ≈ 10 %.
[31] The 1.8% change is the product of a one standard deviation of (Financial Depth*CA Deficits), (= .14)

better quality of institutions (about 2.8%). Intriguingly, the most important factor accounting for the appreciation of the national real estate is a one standard deviation increase of the *current account deficit* (associated with 10 % real estate/(GDP deflator) appreciation), exceeding the adjustment to a one standard deviation drop of the *real interest rate* (about 7 % appreciation), and a one standard deviation increase of the *GDP/Capita growth* (about 2% appreciation).

5. <u>Concluding remarks and interpretations</u>

Our results are consistent with the notion that for all countries, current account deficits are associated with sizable real appreciation of the real estate. This effect holds controlling for the real interest rate, GDP growth, inflation, and other conditioning variables. We also find evidence consistent with growing globalization of national real estate markets. These findings are consistent with various scenarios explaining patterns of capital flows across countries, including differential productivity trends and varying saving patterns. In the absence of pre-existing distortions, financial inflows are unambiguously welfare improving. Yet, in a second-best environment, public finance considerations imply that inflows of capital may magnify distorted activities, increasing thereby the ultimate costs of these distortions. Arguably, the experience of emerging markets in the aftermath of financial liberalizations during the 1990s illustrated these concerns. Needless to say, this second-best assertion is not an argument against financial integration, but a cautionary tale -- greater financial globalization implies the need to be more assertive in dealing with moral hazard and other pre-existing domestic distortions.

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times its estimated coefficient = 0.14 x 12.76 = .14*12.76 ≈ 1.8 %.

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Data Appendix

Table A.1 – Sources of National Real Estate Prices in 43 Countries.

The real estate series are taken from the Datastream and the Global Property Guide.

No	Country	Real Estate Price Indices	Source Name
1	Australia	House price index, 8 capital cities	AusStat
2	Austria	Residential property price index, Vienna	Oesterreichische (Austria) National Bank
3	Belgium	Residential property price index, Flats	Institut National de Statistique
4	Bulgaria	Dwelling: Avg Price per Sq Meter	National Statistical Institute of Bulgaria
5	Canada	New housing price index	Canadian Statistics
6	China	Property Price Index: Bldg: CM: Residential	National Bureau of Statistics of China
7	Colombia	New housing price index	Departamento Administrativo Nacional de Estadística
8	Croatia	New Dwellings Sold Price Index: 1995=100	Republic of Croatia - Central Bureau of Statistics
9	Czech Republic	Prices of habitable area, multi-dwelling	Cesky Statisticky Urad
10	Denmark	Property Price Index: One Family Houses: All Denmark	Statistics Denmark
11	Estonia	Ave. price per sq.m. of dwellings in satisfactory condition, 2 rooms & kitchen, Tallinn	Statistikaamet
12	Finland	Dwellings in old blocks of Flat, whole country	StatFin
13	France	Index of prices of old residences, France	Institut National de la Statistique et des Etudes Economiques
14	Germany	Prices of owner-occupied flats	BulweinGesa
15	Greece	Index of prices of dwellings, other urban	Bank of Greece
16	Hong Kong	Property Price Index: 1999=100: Domestic Premise (DP)	差餉物業估價處
17	Hungary	House prices, Budapest - old condominium	Otthon Centrum
18	Indonesia	Residential property price index, new houses, major cities	Bank Indonesia
19	Ireland	Average Property Price: New	Department of the Environment, Heritage and Local Government
20	Israel	Average prices of owner occupied dwellings	Central Bureau of Statistics
21	Italy	Average price for residential, 13 urban areas	Nomisma Spa Real Estate
22	Japan	Urban Land Price Index: REI: Whole Nation: Average	財団法人 日本不動産研究所
23	Korea	House Price Index	Kookmin Bank
24	Lithuania	Ave. price of one- to two-room apartments, Vilnius	Invalda Real Estate
25	Luxemburg	Price of habitable surface	STATEC Luxembourg
26	Malaysia	House Price Index: Malaysia	Valuation and Property Services Department, Ministry of Finance
27	Malta	House Price Index	Central Bank of Malta
28	Netherlands	House price index, nationwide	Nederlandse Vereniging van Makelaars
29	New Zealand	House price index, detached houses	Reserve Bank of New Zealand
30	Norway	House Price Index: New Detached: sa	Statistisk Sentralbyra
31	Philippines	Ave. price of prime 3-bedroom condominiums, Makati CBD	Colliers International
32	Portugal	Bank evaluation on housing, mainland	Instituto Nacional de Estatística de Portugal
33	Russia	Property Price Index: Residential: Primary Sales (PS): YoY	Federal State Statistics Service (Rosstat)
34	Serbia	Avg Price of Dwellings: New Construction: Republic of Serbia	Републички Завод за Статистику
35	Singapore	Property Price Index: Private Residential (PR): All	Urban Redevelopment Authority
36	South Africa	ABSA House Price Index	ABSA
37	Spain	Housing Price Index: Free House	Instituto Nacional de Estadistica
38	Sweden	Real estate price index for 1- & 2- dwelling buildings	Statistics Sweden
39	Switzerland	Real Estate Price Index: Single Family Homes	Swiss National Bank
40	Taiwan	Sinyi Residential Property Price Index: Taiwan Area	信義企業集團
41	Thailand	Housing Price Index: Single Detached House: including Land	ธนาคารอาคารสงเคราะห์
42	United Kingdom	House Price Index: UK	Nationwide
43	United States	House Price Index: OFHEO: United States	Office of Federal Housing Enterprise Oversight

Table A.2 – Sources of Investable Real Estate Indices and Macroeconomic Variables.
The time series of the macroeconomic variables cover 1980-2005. WDI = World Development Indicators; IFS = International Financial Statistics. Non-stationary series are first-differenced and de-trended for the panel estimation and VAR.

Variables	Definition	Data Source: Code	Transformation for Estimation
Real Estate/GDP Deflator Appreciation	National: %change per year of real estate, house, and property prices, deflated by GDP deflator	National sources and government statistics	first differenced; de-trended
	Investable: AUS CAN DEU FIN FRA GBR IRL NLD NZL SWE USA ZAF	Investment Property Databank	none, reference
	Investable: Bangkok, Beijing, Hong Kong, Kuala Lumpur, Shanghai, United Kingdom	Jones Lang LaSalle Research	first differenced for VAR
	10 Cities in United States	S&P/Case-Shiller Indices	first differenced for VAR
Urban Population Growth	Annual growth (%) of population in the urban areas	WDI: SP.URB.GROW	first differenced; de-trended
Capita GDP Growth	Annual growth (%) of GDP per capita (constant price year 2000 US$)	WDI: NY.GDP.PCAP.KD.ZG	first differenced; de-trended
Inflation	GDP deflator (%)	WDI: NY.GDP.DEFL.KD.ZG	first differenced; de-trended
	CPI inflation (%)	Datastream (quarterly; city level)	
Financial Depth	Domestic credit provided by banking sector (% of GDP)	WDI: FS.AST.DOMS.GD.ZS	percentage change; de-trended
Institution	Measure of law and order, 0-12 scale (higher=better)	International Country Risk Guide	percentage change; de-trended
Real Interest	Annual real interest rates (%)	WDI: FR.INR.RINR	first differenced; de-trended
Current Account Deficits/GDP	End of year current account of deficits to GDP (%)	WDI: BN.CAB.XOKA.GD.ZS (annual)	percentage change; de-trended
		Datastream (quarterly)	
Stock Market/GDP Deflator Appreciation	%change per year of the stock market indices, deflated by GDP deflator	Datastream; WDI	first differenced; de-trended
		MSCI (Investable Indices)	none, reference
Nominal Interest (3-month)	US Treasury Bill Rate Constant Maturity (%)	IFS	none, reference
	Japan Financing Bill Rate (%)	IFS	none, reference
	London Interbank Offer Rates (pound sterling, %)	IFS	none, reference
GDP Size	GDP (constant year-2000 trillion US$)	WDI: NY.GDP.MKTP.KD	average: 1980-1989
Real Exchange Rate	Trade-Weighted Real Effective Exchange Rates	WDI: PX.REX.REER (annual)	first differenced; de-trended
		JP Morgan (quarterly)	
Population Age above 65 Years Old	Population ages 65 and above (% of total)	WDI: SP.POP.65UP.TO.ZS	first differenced; de-trended
Loan to Value	Estimated average loan-to-value of new mortgage loans	Warnock and Warnock (2008)	none (cross-section)

Table 1 – Summary Statistics and Unit Root Tests.

The statistics are for the period 1980-2005 for the current account deficits/GDP, and 1990-2005 for the real estate/GDP deflator appreciation, % per year. Local GDP deflator is chosen over the consumer price index to maximize the sample size and allow for the changing expenditure patterns across countries. The Mackinnon approximate p-value is from the Augmented Dickey-Fuller test under the null of unit-root with trend. The cumulative appreciation sums for the period 2001-2005 the Real Estate/GDP Deflator Appreciation for each country.

Country	Current Accout Deficits/GDP (percent)				Cumulative Deficits (percent)	Real Estate/GDP Deflator Appreciation (percent)				Cumulative Appreciation (percent)
	obs.	avg.	s.d.	p-value	from 2001 to 2005	obs.	avg.	s.d.	p-value	from 2001 to 2005
Australia	26	4.3	1.0	.031	25.8	16	4.7	7.6	.153	37.3
Austria	26	.8	1.8	.573	-5.1	16	2.6	8.0	.295	15.0
Belgium	25	-2.5	2.9	.977	-14.8	15	4.2	4.3	.866	42.9
Bulgaria	26	3.0	4.8	.266	41.8	12	-20.1	101.3	.010	90.1
Canada	26	1.0	2.3	.433	-9.2	16	.1	4.3	.000	19.6
China	23	-1.4	2.4	.098	-16.0	7	-1.8	3.1	.678	-13.1
Colombia	26	2.1	3.2	.356	7.5	9	-4.5	7.8	.001	5.5
Croatia	13	5.2	5.0	.164	34.7	11	-1.0	6.6	.022	-10.6
Czech Republic	13	4.0	2.3	.182	24.9	10	.5	7.8	.013	9.5
Denmark	25	-.2	2.7	.516	-13.9	13	6.4	5.0	.883	39.3
Estonia	14	7.4	4.7	.506	60.2	9	15.2	22.5	.009	108.9
Finland	25	-1.5	5.0	.866	-30.0	16	-.3	11.2	.207	32.9
France	26	-.2	1.3	.949	1.7	16	2.7	8.9	.002	50.3
Germany	26	-1.1	2.3	.929	-17.9	16	-1.0	1.5	.303	-4.6
Greece	24	4.8	2.8	.913	41.0	12	3.6	4.9	.017	24.6
Hong Kong	8	-7.5	3.4	.004	-49.7	12	-.1	16.5	.178	38.0
Hungary	24	4.5	3.6	.080	35.7	5	7.5	8.1	.100	35.9
Indonesia	24	.9	3.4	.092	-8.4	12	-9.5	18.4	.100	-10.9
Ireland	25	1.6	4.2	.967	4.1	16	7.0	5.8	.311	38.1
Israel	25	2.1	3.6	.348	-6.3	8	.0	8.3	.009	-2.4
Italy	25	.3	1.6	.840	4.5	16	1.3	5.6	.377	26.8
Japan	26	-2.5	1.2	.132	-17.4	16	-3.5	4.5	.000	-26.3
Korea	26	-.6	4.3	.191	-9.7	16	-1.8	8.9	.001	25.9
Lithuania	13	7.1	3.3	.641	37.7	7	14.4	16.3	.275	96.4
Luxembourg	11	-10.2	1.7	.001	-53.1	13	1.7	3.0	.347	7.8
Malaysia	25	-.8	8.9	.364	-48.3	5	-.1	2.6	.986	-4.3
Malta	25	2.6	5.1	.106	15.9	15	6.8	5.8	.177	30.0
Netherlands	26	-3.9	2.2	.407	-33.3	16	5.4	5.3	.111	10.6
New Zealand	26	5.7	2.7	.403	33.0	14	5.0	6.0	.663	48.0
Norway	26	-5.5	6.4	.406	-71.9	16	1.0	5.0	.030	8.7
Phillipines	25	2.7	3.2	.145	-4.3	10	-6.9	9.4	.000	3.9
Portugal	26	4.6	4.7	.657	41.4	4	.0	2.2	.000	.1
Russia	12	-7.3	5.6	.718	-47.2	8	-22.8	30.2	.001	-68.4
Serbia	6	6.1	2.1	.081	8.8	6	-14.6	31.0	.439	-11.5
Singapore	25	-9.2	11.0	.153	-90.7	16	4.1	17.8	.027	8.5
South Africa	26	.3	2.9	.279	13.7	6	11.8	8.7	.950	74.2
Spain	26	2.3	2.4	.948	28.1	10	6.0	5.1	.982	49.0
Sweden	25	-.9	3.3	.754	-27.2	16	2.8	7.5	.148	36.3
Switzerland	26	-7.3	4.7	.185	-72.1	16	-2.1	4.0	.162	7.3
Taiwan	21	-5.7	3.7	.777	-34.0	14	-2.0	5.3	.023	10.9
Thailand	26	1.8	5.8	.449	-5.9	14	-.7	4.9	.012	6.1
United Kingdom	26	1.3	1.9	.759	10.4	16	3.0	9.6	.355	49.6
United States	26	2.6	1.9	.954	27.9	16	2.8	3.5	.018	31.3

Table 2 – A Summary of Unit Root Tests.
The null hypothesis is non-stationarity for the augmented Dickey-Fuller test and the Phillips-Perron test. For the Kwiatkowski-Phillips-Schmidt-Shin test, the null is stationarity: a rejection of stationarity under the Kwiatkowski-Phillips-Schmidt-Shin test is reported as a non rejection of the unit root.The null hypothesis is non-stationarity for the Levin-Lin-Chu (2002) test and the Im-Pesaran-Shin (2003) test. For the Nyblom-Harvey (2000) test, the test statistic can be considered as the generalization of the Kwiatkowski-Phillips-Schmidt-Shin test, and a failure to reject the null hypothesis of zero common stochastic trends is an indication that the series do not form a cointegrated combination. The test statistics correspond to specifications with time trend. Because the sample must be a balanced panel in order to perform the existing panel test procedures, the sample is restricted to 12 years (1993-2004) and 25 countries (19 OECD and 6 Non-OECD). ***, **, * signifies 1, 5, and 10 level of significance.

	Real Estate/GDP Deflator Appreciation			Current Account Deficits/GDP		
Testing Procedures	Whole Sample	OECD	Non-OECD	Whole Sample	OECD	Non-OECD
	percent of rejecting unit roots:					
Individual Country Series						
Augmented Dickey-Fuller	44.2	40.0	50.0	7.0	8.0	5.6
Phillips-Perron	44.2	36.0	55.6	9.3	8.0	11.1
Kwiatkowski-Phillips-Schmidt-Shin	97.7	100.0	94.4	100.0	100.0	100.0
	test statistics:					
Panel of Series						
Levin-Lin-Chu (2002)	-18.296 ***	-12.073 ***	-11.299 ***	-12.002 ***	-10.196 ***	-4.496 *
Im-Pesaran-Shin (2003)	-2.783 ***	-2.586 *	-3.014 **	-2.138	-2.189	-1.769
Nyblom-Harvey (2000)	1.556	1.556 ***	.580 *	1.556	1.556 ***	.561 *

Table 3: Correlations Between Different Types of Real Estate Indices.
This table reports for each country the correlations of the real appreciation rates of different types of real estate markets with the housing (residential) markets. The ‘real appreciation is % change per year of investable real estate prices/CPI inflation for each specific location (except for Kuala Lumpur, where the city-level CPI is not available and replaced by the national CPI).

	Correlation with housing/residential series		
	Office	Retail	Industrial
	Annual: 1998-2007		
Canada	.73	-.06	.29
Germany	.32	.77	.09
Finland	.88	.55	.89
France	.64	.57	.91
Ireland	.72	.09	.42
Netherlands	.90	.44	.80
Sweden	.85	.76	.78
United States	-.23	.37	.26
	Quarterly: 1998Q1-2007Q4		
Bangkok	.90	.85	n.a.
Beijing	.42	.22	n.a.
Kuala Lumpur	.67	.82	n.a.

Table 4: Cross-Correlograms with Current Account Deficits/GDP: National Indices, Annual.
This table provides for each country and variable the cross correlograms with current account deficits/GDP. The variables are real exchange rate appreciation (%), the 'real appreciation of real estate prices'=change per year of real estate prices/GDP deflator (%), and the 'real appreciation of stock markets'=change per year of stock market indices/GDP deflator (%). The 12 countries included have complete time series of these variables over the period of 1990 to 2005 (16 annual observations): AUS, AUT, CAN, CHE, DEU, FRA, GBR, JPN, KOR, NLD, NOR, and USA.

	Average Correlation with Current Account Deficits/GDP		
	Real Estate/GDP Deflator Appreciation	Real Exchange Rates Appreciation	Stock Market/GDP Deflator Appreciation
lags/leads (years)			
-4	-.10	.03	.00
-3	-.10	.06	-.02
-2	-.14	.08	-.04
-1	-.18	.09	-.09
0	-.16	.08	-.13
1	-.07	.09	-.10
2	.04	.11	-.04
3	.09	.17	.02
4	.10	.18	.00
OLS on #lags/leads:			
coefficient estimate	.03	.02	.00
standard deviation	.01***	.01**	.01
R-sq.	.14	.06	.00
observations	108	108	108
countries	12	12	12

Robust standard errors, with ***, **, * signifies 1, 5, and 10 level of significance.

Table 5: Cross-Correlograms with Current Account Deficits/GDP: Investable Indices, Quarterly.
This table provides for each country and variable the cross correlograms with current account deficits/GDP. The variables are the real appreciation of investable stock markets (in %; source: MSCI investable) and the real appreciation of investable real estate prices (in %; source: Jones Lang LaSalle Research). Three types of investable real estate markets are retail, office, and housing (residential). Real appreciation = % change minus CPI inflation of the specific location/city (except for Kuala Lumpur, where the city-level CPI is not available and replaced by the national CPI). For China, CA/GDP at quarterly frequency is not available and replaced by trade balance. The 6 locations included have complete time series of these variables over the quarterly period of 1998:Q1-2007:Q4: Bangkok, Beijing, Hong Kong, Kuala Lumpur, Shanghai, United Kingdom

	Average Correlation with Current Account Deficits/GDP			
	Real Estate/GDP Deflator Appreciation			Stock Market/GDP Deflator Appreciation
lags/leads (quarters)	Housing/Residential	Office	Retail	MSCI Investable
-10	-.220	-.042	.028	.011
-9	-.212	-.079	-.020	-.029
-8	-.213	-.100	-.029	-.044
-7	-.193	-.134	-.045	-.086
-6	-.195	-.156	-.034	-.075
-5	-.182	-.165	-.064	-.096
-4	-.206	-.172	-.095	-.119
-3	-.191	-.167	-.116	-.176
-2	-.197	-.200	-.097	-.176
-1	-.197	-.236	-.137	-.193
0	-.191	-.217	-.143	-.176
1	-.120	-.127	-.114	-.162
2	-.016	-.035	-.028	-.100
3	.041	.004	.007	-.077
4	.049	.013	-.005	-.066
5	.056	.042	-.003	-.050
6	.065	.049	-.012	-.013
7	.066	.038	-.010	-.007
8	.061	.004	-.038	-.007
9	.067	.005	-.018	.012
10	.068	.004	-.007	.014
OLS on #lags/leads:				
coefficient estimate	.019	.009	.002	.003
standard deviation	.004***	.003***	.003	.002*
R-sq.	.309	.099	.002	.029
observations	63	126	105	126
countries	3	6	5	6

Robust standard errors, with ***, **, * signifies 1, 5, and 10 level of significance.

Table 6 – Univariate t-tests.
The sample period is 1990-2005. The t-tests are on the hypothesis that the national real estate markets are correlated through the current account patterns. In the first step, we remove the effects of a country's own current account deficits on its real estate/GDP deflator appreciation series by running a linear regression of the real estate/GDP deflator appreciation on the contemporaneous current account deficits to GDP:

$$\left(\frac{\text{Real Estate}}{\text{GDP Deflator}}\text{appreciation}\right)_{i,t} = \phi_1 + \phi_2\left(\frac{\text{Current Account Deficits}}{\text{GDP}}\right)_{i,t} + \psi_{i,t}$$

Then we compare the correlation matrices of the raw appreciation of real estate prices and of the regression residuals. In the last step, we conduct a paired t-test of the off-diagonal elements in the raw appreciation and the residual correlation matrices to determine whether the difference in the means of correlations is significant. A standard deviation of variable is in parenthesis.

	All Countries	Non-OECD	OECD	OECD v.s. Non-OECD
Means of Correlations:				
Appreciation of Real Estate Prices	.089	.027	.147	.158
	(.382)	(.361)	(.366)	(.438)
Residuals of the Appreciation	.024	-.030	.058	.116
after removing the effects of CA Deficits	(.377)	(.366)	(.337)	(.446)
t-test on the equality of means of correlations:				
t-value	6.367	3.776	5.804	1.646
p-value	.000	.000	.000	.102
Variance Reduction (%)	2.700			

Table 7 – Correlations between Variables for the Panel Estimation.

Due to the construction of lag structure and data availability, there are 354 observations (41 countries) for the panel estimation.

	Explanatory Variable (Lagged Annual Observation)	Obs	Correlation with: Real Estate / GDP Deflator Appreciation	a)	b)	c)	d)	e)	f)	g)
a)	Urban Population Growth	354	.036	1.000						
b)	Capita GDP Growth	354	.130	-.118	1.000					
c)	Inflation	354	.363	.009	-.117	1.000				
d)	Financial Depth	354	-.368	.018	-.221	-.119	1.000			
e)	Institution	354	-.138	.017	.006	-.098	.065	1.000		
f)	Real Interest	354	-.717	.002	.005	-.773	.314	.137	1.000	
g)	Current Account Deficits	354	.192	.012	.030	.207	-.103	-.066	-.277	1.000

Table 8 – Benchmark Estimation.

The dynamic equation for the appreciation of real estate prices ($y_{i,t}$; % change per year of real estate prices/GDP deflator) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. The 'Dynamic Panel' regressions (columns 1-5) use Arellano and Bond (1991)'s GMM estimators. The 'Fixed Effects' regressions use 'least squares dummy variable' (LSDV) estimation. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1990 to 2005. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Dynamic Panel Estimation										Fixed Effects				Pooled OLS	
Explanatory Variables	Lag	5-lag		4-lag		3-lag		2-lag		1-lag		5-lag		3-lag		5-lag	
Lagged Real Estate/GDP Deflator Appreciation	1	-.49	(.10) ***	-.50	(.10) ***	-.50	(.10) ***	-.41	(.10) ***	-.43	(.10) ***	-.60	(.10) ***	-.63	(.10) ***	-.56	(.13) ***
Urban Population Growth	1	2.53	(1.53) *	2.47	(1.53)	2.44	(1.52)	2.43	(1.56)	2.43	(1.55)	1.70	(1.64)	1.65	(1.66)	1.53	(1.23)
Capita GDP Growth	1	.75	(.31) **	.75	(.31) **	.75	(.31) **	.57	(.31) *	.56	(.31) *	.57	(.30) *	.64	(.30) **	.53	(.51)
Inflation	1	-.33	(.04) ***	-.33	(.04) ***	-.34	(.04) ***	-.31	(.04) ***	-.31	(.04) ***	-.21	(.04) ***	-.24	(.04) ***	-.18	(.07) **
Financial Depth	1	-4.90	(7.35)	-4.59	(7.34)	-4.52	(7.33)	-6.56	(7.49)	-7.10	(7.41)	4.87	(7.04)	4.35	(7.08)	2.75	(9.45)
Institution	1	-15.62	(11.24)	-14.53	(11.17)	-14.25	(11.15)	-16.40	(11.41)	-17.04	(11.30)	-16.58	(9.36) *	-13.69	(9.33)	-16.59	(12.03)
Real Interest	1	-2.65	(.22) ***	-2.64	(.22) ***	-2.63	(.22) ***	-2.62	(.23) ***	-2.55	(.22) ***	-1.75	(.23) ***	-1.80	(.23) ***	-1.77	(.75) **
CA Deficits	1	1.02	(.28) ***	.98	(.28) ***	.94	(.27) ***	.77	(.27) ***	.81	(.27) ***	.85	(.24) ***	.76	(.24) ***	.77	(.37) **
	2	.57	(.16) ***	.49	(.14) ***	.45	(.13) ***	.23	(.13) *			-.10	(.16)	-.18	(.16)	-.05	(.24)
	3	.64	(.15) ***	.56	(.13) ***	.52	(.12) ***					.59	(.12) ***	.44	(.11) ***	.63	(.25) **
	4	.18	(.14)	.09	(.12)							.33	(.13) **			.38	(.15) **
	5	.14	(.14)									.22	(.13) *			.27	(.12) **
Inflation*CA Deficits	1	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.04	(.00) ***	.03	(.00) ***	.04	(.01) ***
Financial Depth*CA Deficits	1	12.76	(2.67) ***	13.18	(2.63) ***	13.21	(2.63) ***	12.25	(2.69) ***	14.03	(2.47) ***	42.46	(5.47) ***	39.03	(5.33) ***	43.02	(16.37) ***
Institution*CA Deficits	1	-8.52	(3.10) ***	-8.85	(3.08) ***	-8.86	(3.08) ***	-7.11	(3.13) **	-8.66	(2.98) ***	-4.70	(2.80) *	-5.78	(2.78) **	-4.37	(2.95)
p-value/R-Square		.00		.00		.00		.00		.00		.73		.72		.74	
Observations		354		354		354		354		354		354		354		354	
Countries		41		41		41		41		41		41		41		41	

Table 9 – Replacing Real Estate Appreciation with Real Exchange Rates.

The dynamic equation for the appreciation of real exchange rates ($y_{i,t}$; %) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. The 'Dynamic Panel' regressions (columns 1-5) use Arellano and Bond (1991)'s GMM estimators. The 'Fixed Effects' regressions use 'least squares dummy variable' (LSDV) estimation. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1990 to 2005. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Dynamic Panel Estimation										Fixed Effects				Pooled OLS	
Explanatory Variables	**Lag**	5-lag		4-lag		3-lag		2-lag		1-lag		5-lag		3-lag		5-lag	
Lagged Real Exchange Rates	1	-.47	(.05) ***	-.44	(.05) ***	-.44	(.05) ***	-.44	(.05) ***	-.44	(.05) ***	-.47	(.05) ***	-.47	(.05) ***	-.46	(.12) ***
Urban Population Growth	1	-.03	(.92)	-.04	(.95)	-.01	(.95)	-.02	(.95)	-.02	(.95)	.56	(1.04)	.58	(1.06)	.32	(.75)
Capita GDP Growth	1	-.08	(.20)	-.12	(.21)	-.10	(.21)	-.12	(.20)	-.12	(.20)	.01	(.20)	.01	(.21)	.09	(.14)
Inflation	1	-.18	(.24)	-.17	(.24)	-.13	(.24)	-.12	(.24)	-.12	(.24)	-.29	(.23)	-.14	(.23)	-.02	(.11)
Financial Depth	1	-5.25	(4.35)	-5.20	(4.49)	-5.18	(4.48)	-5.30	(4.45)	-5.28	(4.45)	-5.31	(4.44)	-4.71	(4.56)	-4.54	(2.29) **
Institution	1	10.57	(6.66)	6.97	(6.81)	6.86	(6.80)	7.23	(6.77)	7.22	(6.75)	7.89	(6.08)	4.33	(6.20)	11.01	(5.80) *
Real Interest	1	-.30	(.31)	-.30	(.32)	-.25	(.32)	-.24	(.32)	-.24	(.32)	-.56	(.31) *	-.41	(.32)	-.20	(.23)
CA Deficits/GDP	1	.03	(.17)	.15	(.18)	.19	(.17)	.17	(.17)	.17	(.17)	.10	(.16)	.21	(.16)	.13	(.09)
	2	-.12	(.15)	.00	(.16)	.02	(.16)	-.00	(.15)			-.02	(.14)	.05	(.15)	.00	(.07)
	3	-.21	(.11) *	-.02	(.11)	.02	(.10)					-.12	(.10)	.05	(.10)	-.06	(.05)
	4	-.36	(.09) ***	-.11	(.08)							-.34	(.09) ***			-.29	(.09) ***
	5	-.32	(.08) ***									-.30	(.08) ***			-.27	(.11) **
Inflation*CA Deficits	1	-.01	(.05)	.00	(.05)	.00	(.05)	.01	(.04)	.01	(.04)	-.04	(.04)	-.02	(.05)	-.04	(.03)
Financial Depth*CA Deficits	1	1.40	(4.44)	4.37	(4.53)	5.30	(4.49)	5.31	(4.46)	5.31	(4.45)	.94	(4.76)	5.70	(4.76)	.53	(2.81)
Institution*CA Deficits	1	.73	(1.87)	1.86	(1.90)	1.98	(1.90)	2.01	(1.87)	2.01	(1.87)	.75	(1.76)	1.82	(1.79)	.53	(.74)
p-value/R-Square												.15		.10		.23	
Observations		341		341		341		341		341		344		344		344	
Countries		40		40		40		40		40		40		40			

Table 10 – Replacing Real Estate Appreciation with Stock Market Appreciation.

The dynamic equation for the appreciation of stock markets ($y_{i,t}$; %change per year of stock indices/GDP deflator) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. The 'Dynamic Panel' regressions (columns 1-5) use Arellano and Bond (1991)'s GMM estimators. The 'Fixed Effects' regressions use 'least squares dummy variable' (LSDV) estimation. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1990 to 2005. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Dynamic Panel Estimation										Fixed Effects				Pooled OLS	
Explanatory Variables	Lag	5-lag		4-lag		3-lag		2-lag		1-lag		5-lag		3-lag		5-lag	
Lagged Stock Market Appreciation/GDP Deflator	1	-.32	(.05) ***	-.32	(.05) ***	-.33	(.05) ***	-.32	(.05) ***	-.32	(.05) ***	-.32	(.06) ***	-.33	(.06) ***	-.22	(.15) ***
Urban Population Growth	1	11.77	(3.69) ***	11.64	(3.69) ***	11.70	(3.69) ***	11.86	(3.68) ***	11.85	(3.67) ***	9.75	(4.31) **	9.82	(4.30) **	9.24	(4.74)
Capita GDP Growth	1	-.46	(.78)	-.47	(.78)	-.44	(.77)	-.38	(.77)	-.38	(.77)	.13	(.84)	.17	(.83)	-.41	(1.25)
Inflation	1	.21	(.21)	.17	(.21)	.20	(.20)	.16	(.19)	.13	(.14)	.67	(.49)	.68	(.48)	.60	(.78)
Financial Depth	1	-1.38	(16.72)	-1.09	(16.72)	-1.04	(16.70)	-.54	(16.69)	-.18	(16.68)	-3.52	(18.51)	-3.45	(18.46)	-7.78	(14.90) **
Institution	1	-20.83	(30.70)	-16.42	(30.10)	-18.20	(29.99)	-15.68	(29.83)	-15.61	(29.79)	14.91	(29.07)	16.08	(28.47)	4.46	(23.44) *
Real Interest	1	1.14	(.67) *	1.14	(.67) *	1.15	(.67) *	.98	(.63)	.95	(.61)	1.62	(.76) **	1.61	(.76) **	1.27	(.89)
CA Deficits/GDP	1	-1.40	(.66) **	-1.46	(.65) **	-1.39	(.65) **	-1.29	(.63) **	-1.26	(.63) **	-1.51	(.65) **	-1.49	(.65) **	-1.15	(.72)
	2	-.17	(.48)	-.28	(.48)	-.23	(.48)	-.09	(.43)			-.24	(.50)	-.25	(.49)	-.43	(.74)
	3	-.17	(.34)	-.32	(.32)	-.23	(.31)					-.31	(.37)	-.30	(.33)	-.35	(.26)
	4	-.08	(.35)	-.26	(.30)							-.16	(.36)			-.40	(.37) ***
	5	.25	(.34)									.16	(.34)			-.00	(.32) **
Inflation*CA Deficits	1	.04	(.06)	.03	(.06)	.04	(.06)	.02	(.05)	.02	(.03)	.17	(.15)	.17	(.14)	.11	(.23)
Financial Depth*CA Deficits	1	-9.34	(13.24)	-10.54	(13.07)	-8.78	(12.89)	-10.24	(12.74)	-12.06	(8.48)	-19.97	(17.08)	-19.04	(16.54)	-12.30	(20.54)
Institution*CA Deficits	1	11.55	(8.90)	10.45	(8.71)	10.80	(8.69)	9.01	(8.35)	9.19	(8.31)	3.47	(9.11)	3.01	(8.91)	3.49	(4.43)
p-value/R-Square												.09		.09		.18	
Observations		343		343		343		343		343		347		347		347	
Countries		41		41		41		41		41		41		41			

Table 11 – Adding Loan to Value Ratio to the Explanatory Variables.

The dynamic equation for the appreciation of real estate prices ($y_{i,t}$; %change per year of real estate prices/GDP deflator) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest, Loan to Value}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. Loan to Value is available as a cross-section approximate and enters as an interaction term. The 'Dynamic Panel' regressions (columns 1-5) use Arellano and Bond (1991)'s GMM estimators. The 'Fixed Effects' regressions use 'least squares dummy variable' (LSDV) estimation. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1990 to 2005. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Dynamic Panel Estimation										Fixed Effects				Pooled OLS	
Explanatory Variables	**Lag**	5-lag		4-lag		3-lag		2-lag		1-lag		5-lag		3-lag		5-lag	
Lagged Real Estate/GDP Deflator Appreciation	1	-.49	(.10) ***	-.49	(.10) ***	-.50	(.10) ***	-.41	(.10) ***	-.42	(.10) ***	-.60	(.10) ***	-.62	(.10) ***	-.55	(.13) ***
Urban Population Growth	1	2.52	(1.52) *	2.47	(1.52)	2.44	(1.52)	2.43	(1.56)	2.43	(1.54)	1.74	(1.64)	1.69	(1.65)	1.56	(1.24)
Capita GDP Growth	1	.74	(.31) **	.74	(.31) **	.75	(.31) **	.56	(.31) *	.55	(.31) *	.56	(.30) *	.62	(.30) **	.51	(.52)
Inflation	1	-.33	(.04) ***	-.33	(.04) ***	-.34	(.04) ***	-.31	(.04) ***	-.31	(.04) ***	-.21	(.04) ***	-.23	(.04) ***	-.18	(.07) **
Financial Depth	1	-4.94	(7.33)	-4.68	(7.32)	-4.61	(7.31)	-6.67	(7.47)	-7.20	(7.39)	4.99	(7.03)	4.53	(7.07)	2.84	(9.55)
Institution	1	-14.53	(11.29)	-13.44	(11.20)	-13.15	(11.18)	-15.33	(11.44)	-16.04	(11.33)	-15.81	(9.37) *	-12.98	(9.33)	-15.98	(11.91)
Real Interest	1	-2.66	(.22) ***	-2.65	(.22) ***	-2.65	(.22) ***	-2.64	(.23) ***	-2.57	(.22) ***	-1.76	(.23) ***	-1.81	(.23) ***	-1.78	(.75) **
CA Deficits/GDP	1	-2.12	(3.23)	-2.41	(3.20)	-2.50	(3.20)	-2.58	(3.28)	-2.38	(3.24)	-2.87	(3.00)	-3.66	(3.00)	-2.40	(4.16)
	2	.56	(.16) ***	.49	(.14) ***	.45	(.13) ***	.23	(.13) *			-.12	(.16)	-.20	(.16)	-.07	(.24)
	3	.63	(.15) ***	.56	(.13) ***	.52	(.12) ***					.58	(.12) ***	.44	(.11) ***	.61	(.24) **
	4	.16	(.14)	.09	(.12)							.31	(.14) **			.36	(.15) **
	5	.13	(.14)									.21	(.13)			.25	(.12) **
Inflation*CA Deficits	1	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.04	(.00) ***	.03	(.00) ***	.04	(.01) ***
Financial Depth*CA Deficits	1	12.69	(2.67) ***	13.06	(2.63) ***	13.10	(2.63) ***	12.15	(2.68) ***	13.94	(2.47) ***	42.92	(5.48) ***	39.79	(5.35) ***	43.26	(16.43) ***
Institution*CA Deficits	1	-9.19	(3.16) ***	-9.54	(3.12) ***	-9.58	(3.13) ***	-7.81	(3.18) **	-9.34	(3.03) ***	-5.69	(2.91) *	-6.89	(2.87) **	-5.16	(2.99) *
Loan to Value*CA Deficits		.05	(.05)	.05	(.05)	.05	(.05)	.05	(.05)	.05	(.05)	.05	(.04)	.07	(.04)	.05	(.06)
p-value/R-Square												.73		.72		.74	
Observations		354		354		354		354		354		354		354		354	
Countries		41		41		41		41		41		41		41			

Table 12 – Using Investable Indices by Types of Real Estate Markets.
The dynamic equation for the appreciation of real estate prices ($y_{i,t}$; % change per year of real estate prices/GDP deflator) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest, Loan to Value}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. Loan to Value is available as a cross-section approximate and enters as an interaction term. The estimation uses Arellano and Bond (1991)'s dynamic panel GMM estimators. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1995 to 2007, covering twelve countries with investable indices compiled by the Investment Property Databank (IPD). Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of Explanatory Variables	**Lag**	Dynamic Panel Estimation using Investable Indices by Types of Real Estate Markets: Total		Residential/Housing		Office		Retail		Industrial	
Lagged Real Estate/GDP Deflator Appreciation	1	-.15	(.09)	.02	(.14)	-.00	(.07)	-.37	(.13) ***	-.23	(.10) **
Lagged Real Estate/GDP Deflator Appreciation	2	-.21	(.09) **	.03	(.12)	-.23	(.07) ***	-.21	(.15)	-.11	(.09)
Urban Population Growth	1	-.27	(.88)	9.42	(4.07) **	.30	(1.01)	-.72	(1.01)	-.21	(.84)
Capita GDP Growth	1	.46	(.27) *	1.12	(.33) ***	.75	(.31) **	.42	(.31)	.38	(.25)
Inflation	1	-1.13	(.46) **	-1.09	(.59) *	-.81	(.50)	-1.41	(.56) **	-1.48	(.45) ***
Financial Depth	1	-4.35	(3.05)	-9.31	(4.08) **	-12.42	(3.33) ***	-3.99	(3.34)	-8.03	(2.82) ***
Institution	1	14.47	(10.30)	23.29	(19.36)	6.05	(11.76)	20.84	(11.87) *	3.95	(11.07)
Real Interest	1	-.65	(.38) *	-.34	(.53)	-.46	(.41)	-.88	(.46) *	-.70	(.37) *
CA Deficits/GDP	1	5.28	(1.78) ***	-2.51	(2.66)	7.64	(1.99) ***	5.92	(2.32) **	3.06	(1.68) *
	2	-2.66	(2.53)	7.35	(2.65) ***	4.68	(2.82) *	-5.07	(2.84) *	-1.49	(2.38)
Inflation*CA Deficits	1	-.36	(.15) **	-.24	(.24)	-.27	(.18)	-.32	(.18) *	-.16	(.15)
Financial Depth*CA Deficits	1	-2.84	(3.78)	-11.27	(5.96) *	2.53	(4.24)	-1.39	(4.35)	-3.27	(3.66)
Institution*CA Deficits	1	.84	(1.89)	6.08	(6.81)	1.25	(2.18)	.28	(2.23)	2.96	(2.01)
Loan to Value*CA Deficits	1	-.08	(.03) ***	.03	(.04)	-.11	(.03) ***	-.09	(.03) ***	-.05	(.02) *
Loan to Value*CA Deficits	2	.04	(.04)	-.11	(.04) ***	-.07	(.04)	.08	(.04) *	.02	(.04)
p-value		.00		.00		.00		.00		.00	
Observations		61		38		62		61		60	
Countries		12		8		12		12		12	

Table 13 – Alternative Specifications.
The top left panel applies panel Tobit regression to the sample censoring negative appreciation of the real estate prices (including only % change per year of real estate prices/GDP deflator greater than zero). The bottom two panels ignore the short- to medium-run dynamics and lagged effects of the current account deficits. The 'Average Change' sample uses n-year average %change per year of the explanatory variables. The `Cumulative Change' sample uses n-year cumulative %change per year of the explanatory variables. The sample period is 1990 to 2005. Standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Lagged Explanatory	5-lag		4-lag		3-lag		2-lag		5-lag		4-lag		3-lag		2-lag	
Appreciation/Depreciation			"Appreciation of Real Estate Prices" > 0								"Appreciation of Real Estate Prices" < 0					
of Real Estate/GDP Deflator								Panel Tobit Estimation								
Lagged Real Estate/GDP Deflator Appreciation	-.32	(.09) ***	-.32	(.09) ***	-.32	(.09) ***	-.32	(.09) ***	-.42	(.10) ***	-.45	(.08) ***	-.45	(.08) ***	-.46	(.08) ***
Urban Population Growth	.77	(1.23)	.77	(1.24)	.76	(1.24)	.77	(1.24)	1.90	(1.82)	1.53	(1.49)	1.53	(1.49)	1.55	(1.50)
Capita GDP Growth	-.70	(.24) ***	-.70	(.24) ***	-.70	(.24) ***	-.70	(.24) ***	-.24	(.47)	-.39	(.29)	-.38	(.29)	-.33	(.27)
Inflation	-.08	(.04) **	-.08	(.04) **	-.08	(.04) **	-.08	(.04) **	-1.94	(.76) **	-2.39	(.16) ***	-2.38	(.15) ***	-2.34	(.14) ***
Financial Depth	-.73	(5.37)	-.86	(5.38)	-.87	(5.39)	-.89	(5.38)	-3.50	(6.77)	-3.65	(5.89)	-3.62	(5.88)	-3.40	(5.89)
Institution	-5.16	(6.74)	-4.79	(6.76)	-4.74	(6.75)	-4.64	(6.75)	-1.45	(10.29)	-1.79	(8.30)	-1.83	(8.29)	-1.54	(8.37)
Real Interest	-.27	(.21)	-.27	(.21)	-.27	(.21)	-.26	(.21)	-3.06	(.46) ***	-3.32	(.23) ***	-3.31	(.22) ***	-3.30	(.22) ***
CA Deficits (-1)	.20	(.18)	.18	(.18)	.18	(.17)	.18	(.17)	.24	(.28)	.15	(.24)	.15	(.23)	.18	(.23)
CA Deficits (-2)	.40	(.11) ***	.39	(.11) ***	.39	(.11) ***	.38	(.11) ***	.05	(.35)	.14	(.25)	.14	(.25)	.16	(.25)
CA Deficits (-3)	.05	(.14)	.04	(.14)	.04	(.14)			.24	(.49)	-.06	(.11)	-.06	(.10)		
CA Deficits (-4)	.04	(.13)	.02	(.13)					.22	(.33)	-.01	(.10)				
CA Deficits (-5)	.09	(.10)							.22	(.26)						
Inflation*CA Deficits	.02	(.00) ***	.02	(.00) ***	.02	(.00) ***	.02	(.00) ***	.06	(.02) ***	.07	(.01) ***	.07	(.01) ***	.07	(.01) ***
Financial Depth*CA Deficits	5.66	(4.38)	5.27	(4.39)	5.14	(4.34)	5.16	(4.33)	11.59	(12.52)	4.14	(5.78)	4.30	(5.50)	4.70	(5.47)
Institution*CA Deficits	-.45	(2.09)	-.60	(2.10)	-.62	(2.10)	-.62	(2.10)	-4.36	(3.88)	-2.70	(2.25)	-2.69	(2.25)	-3.00	(2.22)
p-value	.00		.00		.00		.00		.00		.00		.00		.00	
Observations	354		354		354		354		354		354		354		354	
Countries	41		41		41		41		41		41		41		41	
Average/Cumulative Changes			Average Changes								Cumulative Changes					
of the Explanatory Variable								Dynamic Panel Estimation								
Lagged Real Estate/GDP Deflator Appreciation	-.26	(.04) ***	-.20	(.05) ***	-.08	(.05)	-.45	(.06) ***	-.27	(.04) ***	-.20	(.05) ***	-.08	(.05)	-.45	(.06) ***
Urban Population Growth	-.42	(5.55)	-.19	(6.00)	-3.07	(4.41)	.58	(2.21)	-.08	(1.10)	-.03	(1.50)	-1.01	(1.47)	.29	(1.10)
Capita GDP Growth	-2.64	(1.76)	-1.09	(1.37)	-.78	(.97)	.37	(.54)	-.53	(.35)	-.27	(.34)	-.26	(.32)	.18	(.27)
Inflation	-.46	(.13) ***	-.78	(.11) ***	-.78	(.09) ***	-.62	(.06) ***	-.10	(.03) ***	-.19	(.03) ***	-.26	(.03) ***	-.31	(.03) ***
Financial Depth	-57.25	(34.00) *	-14.92	(28.60)	8.96	(21.06)	4.26	(13.09)	-11.01	(6.74)	-3.60	(7.14)	3.01	(7.00)	2.13	(6.54)
Institution	-13.59	(37.63)	.12	(33.82)	-6.96	(25.16)	-9.14	(16.40)	-2.75	(7.46)	-.04	(8.46)	-2.37	(8.39)	-4.61	(8.20)
Real Interest	-9.53	(.74) ***	-7.91	(.71) ***	-5.85	(.52) ***	-4.80	(.31) ***	-1.94	(.15) ***	-1.98	(.18) ***	-1.95	(.17) ***	-2.40	(.15) ***
CA Deficits	-.18	(.92)	-1.93	(.70) ***	-1.06	(.77)	.13	(.42)	-.03	(.18)	-.48	(.17) ***	-.36	(.26)	.06	(.21)
Inflation*CA Deficits	.21	(.03) ***	.35	(.04) ***	.25	(.02) ***	.07	(.01) ***	.01	(.00) ***	.02	(.00) ***	.03	(.00) ***	.02	(.00) ***
Financial Depth*CA Deficits	118.71	(17.51) ***	52.37	(8.46) ***	6.65	(3.33) **	-.89	(1.15)	4.76	(.69) ***	3.27	(.53) ***	.74	(.37) **	-.22	(.29)
Institution*CA Deficits	84.41	(20.00) ***	24.06	(12.99) *	26.96	(9.46) ***	17.17	(3.76) ***	3.45	(.79) ***	1.51	(.81) *	3.00	(1.05) ***	4.29	(.94) ***
p-value	.00		.00		.00		.00		.00		.00		.00		.00	
Observations	354		354		354		354		354		354		354		354	
Countries	41		41		41		41		41		41		41		41	

Table 14 – Sign-Preserving Trend Current Accounts and GDP Size Interactions.
Countries may run current account deficits/surpluses for an extended period, followed by a brief reversal. To account for this trend pattern, the current accounts can be de-trended using the sign-preserving trend: $\operatorname{sgn}\left(CA_{i,t-1}\right) \times trend ; \operatorname{sgn}\left(CA_{i,t-1}\right) = \dfrac{CA_{i,t-1}}{\left|CA_{i,t-1}\right|}$. The GDP Size is the average over 1980-1989. The sample period for the estimation is 1990 to 2005. Standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Sign-Preserving Trend Current Accounts										GDP Size Interactions				No Variable Transformation	
Explanatory Variables	Lag	5-lag		4-lag		3-lag		2-lag		1-lag		Normal Trend		Sign-Preserving Trend		5-lag	
Lagged Real Estate/GDP Deflator Appreciation	1	-.51	(.10) ***	-.51	(.10) ***	-.51	(.10) ***	-.41	(.10) ***	-.43	(.10) ***	-.48	(.10) ***	-.49	(.10) ***	.03	(.02)
Urban Population Growth	1	2.46	(1.57)	2.40	(1.57)	2.38	(1.57)	2.46	(1.60)	2.46	(1.59)	2.55	(1.54) *	2.32	(1.52)	.03	(1.06)
Capita GDP Growth	1	.81	(.31) **	.81	(.31) **	.81	(.31) **	.65	(.32) **	.63	(.32) **	.70	(.31) **	.63	(.31) **	1.10	(.19) ***
Inflation	1	-.33	(.04) ***	-.33	(.04) ***	-.33	(.04) ***	-.30	(.04) ***	-.30	(.04) ***	-.33	(.04) ***	-.33	(.04) ***	-.04	(.06)
Financial Depth	1	-7.15	(7.52)	-6.63	(7.53)	-6.51	(7.51)	-8.59	(7.68)	-9.20	(7.61)	-4.34	(7.38)	-4.04	(7.32)	.06	(.04)
Institution	1	-16.29	(11.51)	-15.14	(11.46)	-14.96	(11.44)	-16.21	(11.73)	-16.93	(11.62)	-15.38	(11.29)	-13.08	(11.20)	-3.96	(1.37) ***
Real Interest	1	-2.76	(.23) ***	-2.75	(.22) ***	-2.75	(.22) ***	-2.73	(.23) ***	-2.66	(.23) ***	-2.64	(.22) ***	-2.63	(.22) ***	.70	(.12) ***
CA Deficits	1	.93	(.29) ***	.89	(.29) ***	.86	(.29) ***	.74	(.29) **	.85	(.29) ***	1.43	(.42) ***	1.83	(.48) ***	-1.03	(.94)
	2	.53	(.15) ***	.44	(.13) ***	.41	(.13) ***	.27	(.13) **			.65	(.21) ***	.48	(.20) **	-.54	(.19) ***
	3	.64	(.14) ***	.55	(.13) ***	.52	(.13) ***					.79	(.18) ***	.78	(.19) ***	.21	(.20)
	4	.19	(.14)	.09	(.13)							.27	(.17)	.28	(.18)	-.26	(.20)
	5	.19	(.14)									.20	(.17)	.24	(.19)	-.03	(.19)
Inflation*CA Deficits	1	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.01	(.00) ***	.07	(.02) ***
Financial Depth*CA Deficits	1	10.22	(2.79) ***	10.87	(2.74) ***	10.87	(2.73) ***	9.24	(2.77) ***	11.47	(2.55) ***	13.77	(2.83) ***	15.33	(2.80) ***	.00	(.00)
Institution*CA Deficits	1	-5.24	(3.33)	-6.01	(3.27) *	-5.98	(3.27) *	-3.19	(3.27)	-5.14	(3.12) *	-8.50	(3.13) ***	-7.73	(3.12) **	.09	(.18)
GDP Size*CA Deficits	1											-.36	(.24)	-.68	(.34) **		
	2											-.17	(.19)	-.13	(.26)		
	3											-.29	(.19)	-.38	(.26)		
	4											-.16	(.21)	-.20	(.32)		
	5											-.10	(.22)	-.15	(.33)		
p-value		.00		.00		.00		.00		.00		.00		.00		.00	
Observations		354		354		354		354		354		354		354		354	
Countries		41		41		41		41		41		41		41		41	

Table 15 – Reverse Causality.

The dynamic equation for the Current Account Deficits/GDP (%) is

$$z_{i,t} = \alpha z_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) y_{i,t-1} + \theta' \left[x_{i,t-1} \times y_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest}; y = appreciation of real estate prices ($y_{i,t}$; %change per year of real estate prices/GDP deflator); $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. The 'Dynamic Panel' regressions (columns 1-5) use Arellano and Bond (1991)'s GMM estimators. The 'Fixed Effects' regressions use 'least squares dummy variable' (LSDV) estimation. The variables are corrected for unit root; first-differenced, de-trended). The sample period is 1990 to 2005. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of		Dynamic Panel Estimation										Fixed Effects				Pooled OLS	
Explanatory Variables	**Lag**	5-lag		4-lag		3-lag		2-lag		1-lag		5-lag		3-lag		5-lag	
Lagged CA Deficits/GDP	1	-.16	(.07) **	-.15	(.07) **	-.14	(.06) **	-.13	(.06) **	-.08	(.03) ***	-.15	(.07) **	-.13	(.06) **	-.14	(.10)
Urban Population Growth	1	-.01	(.70)	.07	(.52)	.05	(.44)	-.09	(.41)	-.14	(.36)	.03	(.70)	.00	(.46)	-.07	(.20)
Capita GDP Growth	1	-.03	(.13)	.01	(.10)	.01	(.09)	-.06	(.08)	-.03	(.07)	-.03	(.13)	.02	(.09)	.01	(.08)
Inflation	1	-.12	(.19)	.01	(.03)	-.02	(.01)	-.00	(.01)	-.00	(.01)	-.12	(.18)	-.02	(.01)	-.05	(.02) **
Financial Depth	1	-.90	(2.66)	-.51	(2.43)	-.58	(2.22)	-.40	(1.85)	.23	(1.70)	-.80	(2.64)	-.54	(2.16)	-.53	(.84)
Institution	1	-5.50	(6.09)	-4.36	(5.15)	-1.02	(3.53)	-.87	(2.50)	-1.90	(2.42)	-6.44	(5.78)	-1.73	(3.45)	-5.95	(9.28)
Real Interest	1	-.24	(.26)	-.09	(.10)	-.06	(.08)	.03	(.07)	.03	(.06)	-.23	(.26)	-.05	(.08)	-.14	(.09)
Real Estate/GDP Deflator Appreciation	1	-.04	(.05)	-.01	(.03)	-.02	(.03)	-.00	(.03)	-.01	(.02)	-.03	(.05)	-.02	(.03)	-.03	(.01) **
	2	-.02	(.04)	-.01	(.03)	-.00	(.02)	.00	(.01)			-.02	(.04)	-.00	(.02)	-.02	(.01) ***
	3	-.02	(.03)	-.01	(.02)	-.00	(.01)					-.02	(.03)	-.00	(.01)	-.01	(.01) **
	4	-.01	(.02)	-.00	(.01)							-.01	(.02)			-.01	(.00)
	5	-.00	(.01)									-.00	(.01)			-.00	(.00)
Inflation*Real Estate/GDP Deflator Appreciation	1	.00	(.01)	.00	(.00)	.00	(.00)	.00	(.00) **	.00	(.00) ***	.00	(.01)	.00	(.00)	.00	(.00) ***
Financial Depth*Real Estate/GDP Deflator Appreciation	1	.12	(.52)	.04	(.46)	.10	(.39)	.43	(.14) ***	.45	(.13) ***	.13	(.51)	.10	(.39)	.06	(.13)
Institution*Real Estate/GDP Deflator Appreciation	1	.15	(.83)	.18	(.46)	-.11	(.17)	-.04	(.14)	.01	(.13)	.11	(.82)	-.05	(.17)	.12	(.39)
p-value/R-Square												-.21		-.15		-.02	
Observations		210		245		281		316		352		245		316		245	
Countries		35		36		38		39		41		36		39			

Table 16 – Simultaneous-Equations and Instrumental-Variables Estimation.
This table reports the estimation with both the Real Estate/GDP Deflator Appreciation (y) and Current Account Deficits/GDP (z) as dependent variables. Write the cross-sectional equation for each dependent variable $d = \{y,z\}$ as $d_i = \theta_d' x_{d,i} + \varepsilon_{d,i}$ where i denotes country, $x_{d,i}$ is a specific set of explanatory variables for each dependent variable; $\varepsilon_{d,i}$ an error term. $x_{y,i}$ includes Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest Rate, Loan to Value; $x_{z,i}$ includes Capita GDP Growth, Real Interest Rate, Real Exchange Rate, and Percentage of Population Age above 65 Years Old. The sample period is 1990 to 2005. The dependent variables are 2001-05 averages. The explanatory variables are 1990-2000 averages. Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Coefficient Estimates of	Zellner's Seemingly Unrelated Regression		Instrumental-Variables Estimation		Three-Stage Estimation for Simultaneous Equations	
Explanatory Variables	Real Estate/GDP Deflator Appreciation	CA Deficits/GDP	Real Estate/GDP Deflator Appreciation	CA Deficits/GDP	Real Estate/GDP Deflator Appreciation	CA Deficits/GDP
	avg. 2001-05	avg. 2001-05	avg. 2001-05	avg. 2001-05	avg. 2001-05	avg. 2001-05
avg. 1990-2000:						
Urban Population Growth	.30 (1.87)		-.69 (2.63)		1.00 (1.67)	
Capita GDP Growth	-.19 (.18)	.16 (.25)	-.31 (.25)	.18 (.27)	-.36 (.20) *	.18 (.24)
Inflation	.21 (.06) ***		.20 (.08) **		.20 (.07) ***	
Financial Depth	-.02 (.05)		-.07 (.08)		-.06 (.05)	
Institution	.05 (.04)		.06 (.05)		.04 (.03)	
Real Interest Rate	-.50 (.07) ***	.02 (.12)	-.42 (.12) ***	.22 (.20)	-.44 (.09) ***	.22 (.18)
Loan to Value	.05 (.02) **		.06 (.03) *		.04 (.02) *	
Real Exchange Rate		-.26 (.13) **		-.26 (.15) *		-.26 (.12) **
Population>65 Years Old		-.07 (.07)		-.07 (.08)		-.07 (.05)
avg. 2001-05:						
CA Deficits/GDP			.41 (.33)		.44 (.26) *	
Real Estate/GDP Deflator Appreciation				.52 (.39)		.52 (.35)
R-Square	.71	.25	.64	.25	.61	.25
Countries	32		32	32	32	

Table 17 – Granger Causality Tests on Quarterly Data of Current Account Deficits and Real Estate Appreciation.

This table reports the p-values from Granger causality tests based on the vector autoregressions of the current account deficits/GDP and the real estate appreciation/CPI inflation for the US and UK, including 16 lags (quarters): $\Delta y_t = \alpha_y + \sum_{\tau=1}^{16} \psi_y \Delta y_{t-\tau} + \sum_{\tau=1}^{16} \zeta_y \Delta z_{t-\tau} + \omega_{y,t}; \Delta z_t = \alpha_z + \sum_{\tau=1}^{16} \psi_z \Delta y_{t-\tau} + \sum_{\tau=1}^{16} \zeta_z \Delta z_{t-\tau} + \omega_{z,t}$. The full sample is April 1978 to March 2008.

			p-value under the null of no Granger causality:	
			From CA Deficits to Real Estate Appreciation	From Real Estate Appreciation to CA Deficits
United Kingdom	IPD data 1991Q3-2007Q4	Total	.010	.000
		Capital	.017	.000
		Rental	.000	.002
		Income	.000	.000
		Office	.000	.204
		Retail	.002	.020
United States	NCREIF data 1982Q2-2008Q1	Total	.371	.090
		West	.054	.000
		Midwest	.011	.949
		East	.201	.116
	Case&Shiller data 1991Q3-2008Q1	10 Cities	.195	.037

Figure 1 – Sample Distribution of Current Account Deficits/GDP and Real Estate/GDP Deflator Appreciation.

Using 1990-2005 sample, the current account deficits/GDP is in percent annual, with mean=-.03 and s.d.=4.0; the real appreciation of real estate prices in annual percentage change of real estate prices/GDP deflator, with mean=2.6 and s.d.=8.2. The top panel provides the cross-sectional sample density distribution, with the density estimates of Epanechnikov kernel function, for 1991-95 (dash line) and 2001-05 (solid line). The bottom panel provides the sample frequency distribution for the whole sample (grey bar), OECD countries (thick line) and Non-OECD countries (thin line).

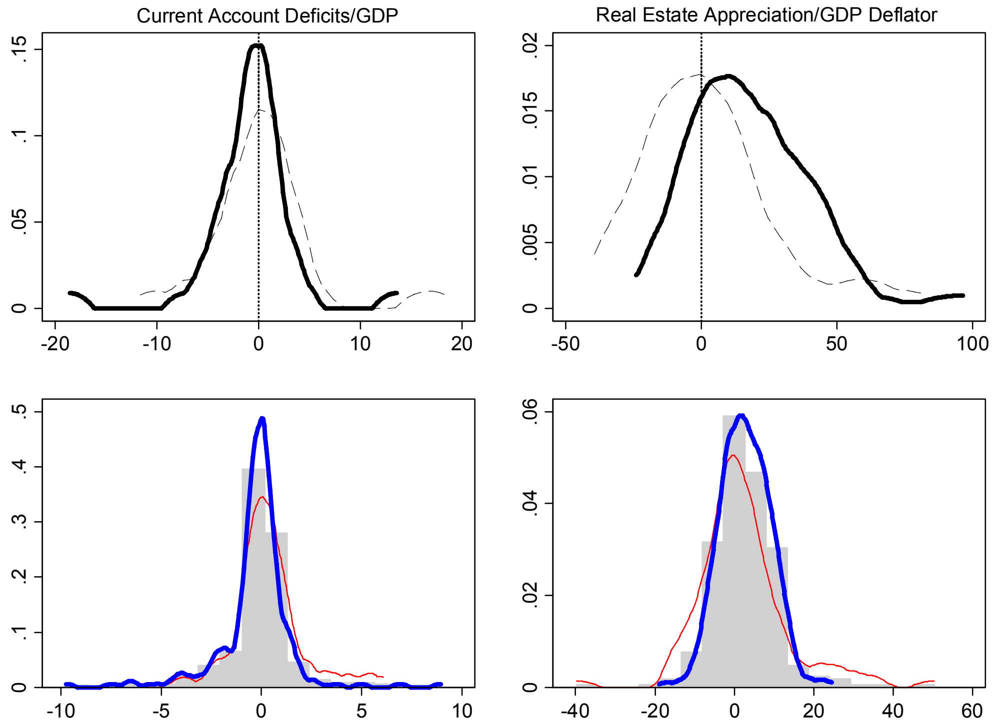
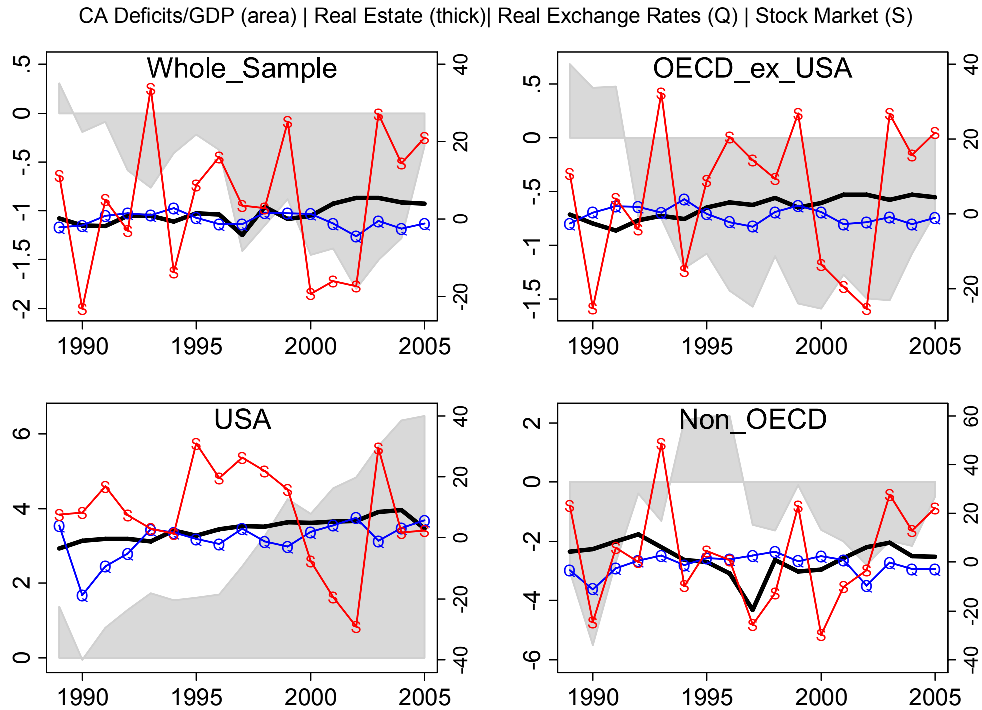


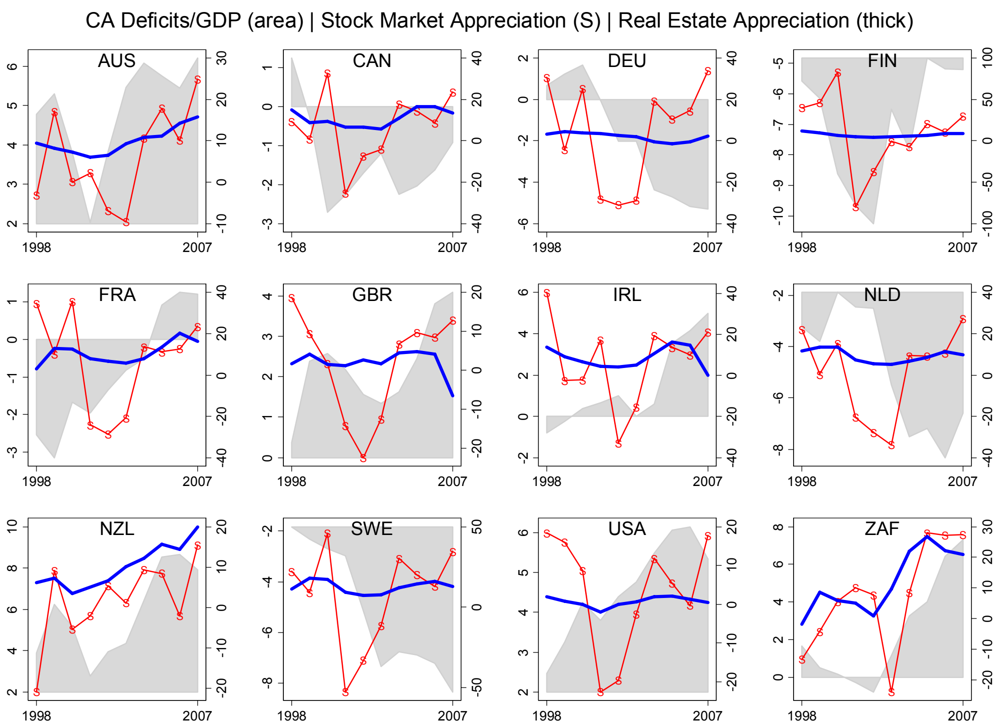
Figure 2 – Patterns of Current Account Deficits/GDP and Real Appreciation of Real Estate and Stock Markets: National Indices, Annual.
This figure depicts cross-country averages of current account deficits/GDP (grey area, % on left-axis scale), real exchange rate appreciation (connected Q, % on right-axis scale), the 'real appreciation of real estate prices'=change per year of real estate prices/GDP deflator (thick line, % on right-axis scale), and the 'real appreciation of stock markets'=change per year of stock market indices/GDP deflator (connected S, % on right-axis scale). The whole sample of 43 includes USA, 24 OECD ex-USA, and 18 Non-OECD countries.



AR(1) coefficients:	Whole Sample	OECD ex. USA	USA	Non OECD
CA Deficits/GDP	.724 (.176)***	.876 (.154)***	.959 (.025)***	.559 (.194)***
Real Exchange Rates	.435 (.248)*	.803 (.121)***	.807 (.209)***	.440 (.265)*
Real Estate/GDP Deflator Appreciation	.378 (.172)**	.357 (.166)**	.277 (.236)	.259 (.173)
Stock Market/GDP Deflator Appreciation	-.141 (.237)	-.022 (.242)	.256 (.349)	-.153 (.192)

Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Figure 3 – Patterns of Current Account Deficits/GDP and Real Appreciation of Real Estate and Stock Markets: Investable Indices, Annual.
This figure depicts current account deficits/GDP (grey area, % on left-axis scale), the 'real appreciation of real estate prices'= change per year of investable real estate prices/GDP deflator (thick line, % on right-axis scale; source: Investment Property Databank), and the 'real appreciation of stock markets'=change per year of investable stock market indices/GDP deflator (connected S, % on right-axis scale; source: MSCI). The 12 countries below have complete time series of these variables over the period of 1998 to 2007 (10 annual observations).



AR(1) Coefficients:	CA Deficits/GDP	Real Estate/GDP Deflator Appreciation	Stock Market/GDP Deflator Appreciation
AUS	0.48 (0.18)***	0.89 (0.12)***	0.09 (0.29)
CAN	0.72 (0.20)***	0.51 (0.27)*	-0.11 (0.40)
DEU	0.94 (0.04)***	0.65 (0.17)***	0.32 (0.30)
FIN	0.73 (0.29)**	0.82 (0.17)***	0.12 (0.42)
FRA	0.85 (0.11)***	0.52 (0.31)*	0.34 (0.32)
GBR	0.80 (0.18)***	-0.16 (0.52)	0.69 (0.18)***
IRL	0.95 (0.04)***	0.30 (0.30)	0.19 (0.26)
NLD	0.63 (0.16)***	0.60 (0.24)**	0.54 (0.25)**
NZL	0.61 (0.15)***	0.85 (0.09)***	-0.51 (0.25)**
SWE	0.95 (0.04)***	0.40 (0.26)	0.19 (0.36)
USA	0.94 (0.04)***	0.46 (0.22)**	0.57 (0.15)***
ZAF	0.92 (0.07)***	0.69 (0.14)***	0.39 (0.25)

Robust standard errors are in parentheses. ***, **, * signifies 1, 5, and 10 level of significance.

Figure 4 – Patterns of Different Types of Real Estate Indices.
This figure depicts cross-country averages of current account deficits/GDP (%), the 'real appreciation of stock markets'=change per year of investable stock market indices/GDP deflator (%; source: MSCI investable), and the 'real appreciation of real estate prices'=change per year of investable real estate prices/CPI inflation (%; source: Investment Property Databank) for three type of real estate markets: housing/residential (H), office (O), retail (R), and industrial (I). The sample includes 12 countries with complete time series of these variables over the period of 1998 to 2007 (10 annual observations).

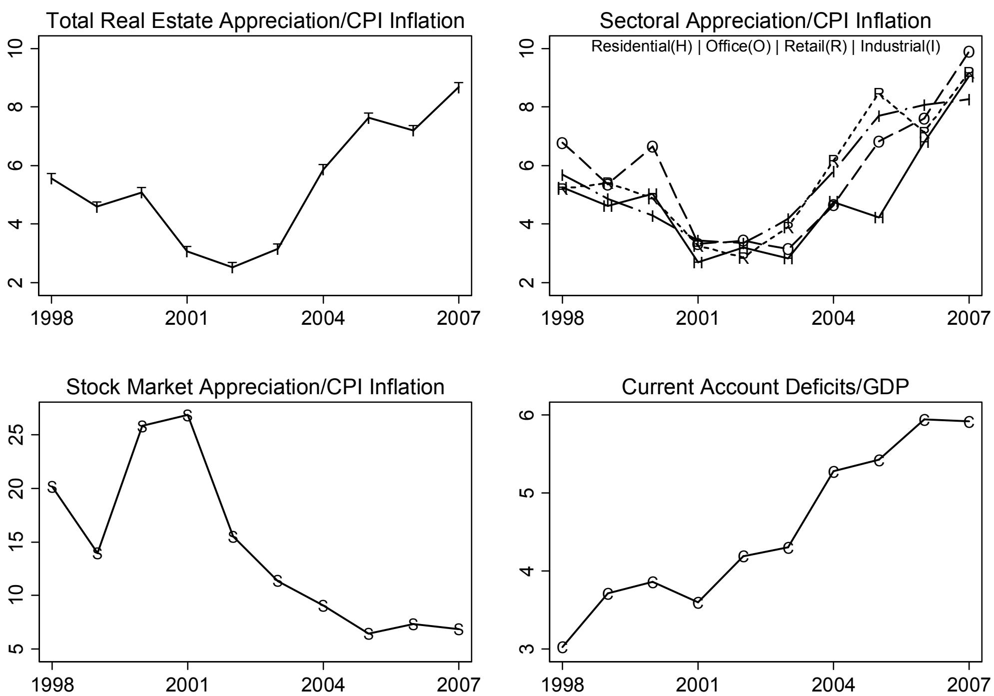


Figure 5 – Cross-Country Standard Deviation: National Indices, Annual.
This figure depicts cross-country standard deviation of current account deficits/GDP (%), real exchange rate appreciation (%), the 'real appreciation of real estate prices'=change per year of real estate prices/GDP deflator (%), and the 'real appreciation of stock markets'=change per year of stock market indices/GDP deflator (%). There are 43 countries in the whole sample (thick line), including 25 OECD (connected O) and 18 Non-OECD (connected N).

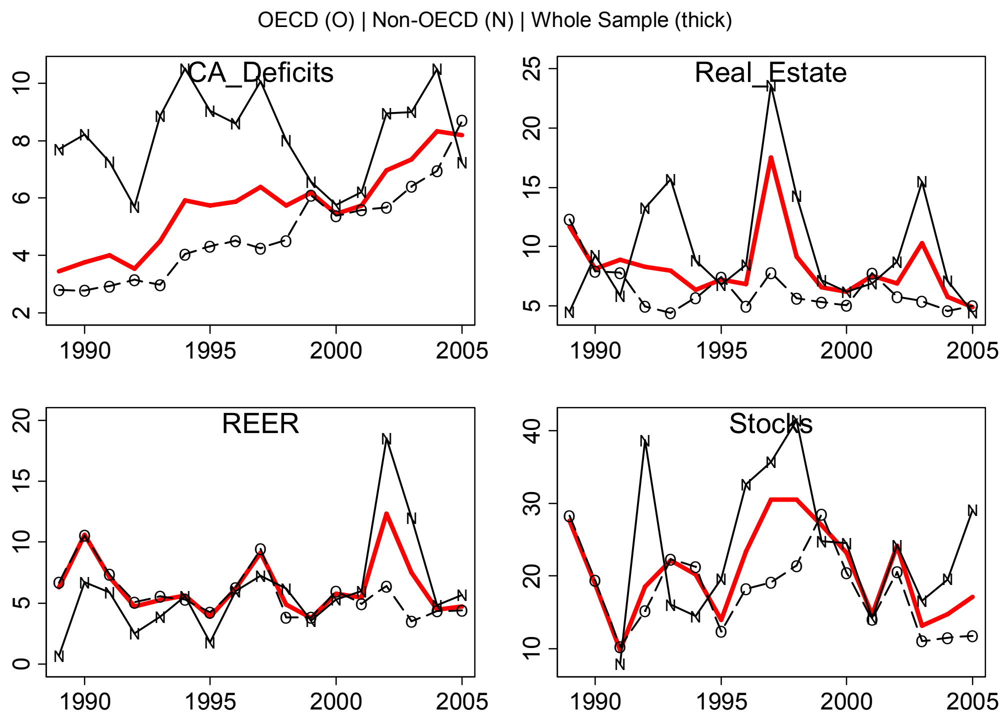


Figure 6 – Contemporaneous Correlations with Current Account Deficits/GDP: National Indices, Annual.

This figure depicts the statistical correlations (cross-country average) of each variable with current account deficits/GDP (%). The variables are real exchange rate appreciation (%), the 'real appreciation of real estate prices'=change per year of real estate prices/GDP deflator (%), and the 'real appreciation of stock markets'=change per year of stock market indices/GDP deflator (%). There are 43 countries in the whole sample (thick line), including 25 OECD (connected O) and 18 Non-OECD (connected N). The figure also provides 3-month market interest rates, including the pound-sterling LIBOR (connected x), the US Treasury Bill (connected ◊), and the Japan Financing Bill (connected Δ).

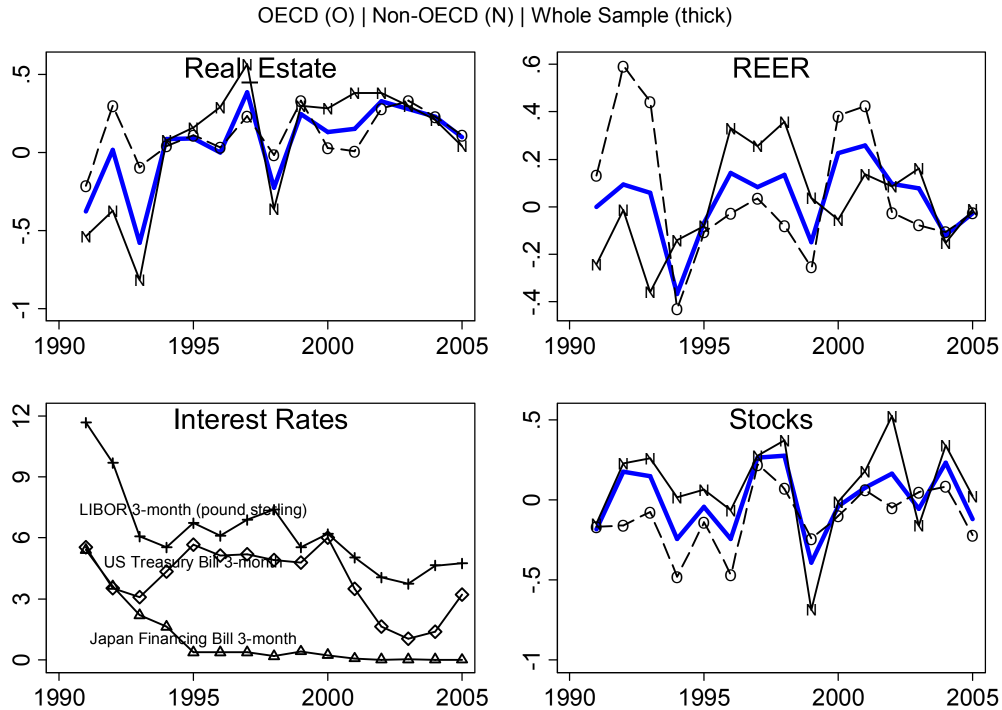


Figure 7 – Average GDP Size and Lagged 3 Years Cumulative Correlation with Current Account Deficits/GDP.
This figure plots for each country on the horizontal axis the GDP Size (constant year-2000 trillion US$), averaged over the period 1980-1989, against the correlations between the variable and the lagged current account deficits during 1990-2005. The correlations are cumulative over previous 3 years. The variables are real exchange rate appreciation (%), the ‘real appreciation of real estate prices’=change per year of real estate prices/GDP deflator (%), and the ‘real appreciation of stock markets’=change per year of stock market indices/GDP deflator (%). The top panel plots the whole sample, whereas the bottom panel excludes Canada, U.S., Japan, Germany, U.K., France, and Italy. Excluding G7 countries, R^2 from a regression of each variable on the GDP size and $(\text{GDP size})^2$ is 0.16 for the real exchange rate; 0.09 for the real estate appreciation; 0.01 for the stock markets appreciation.

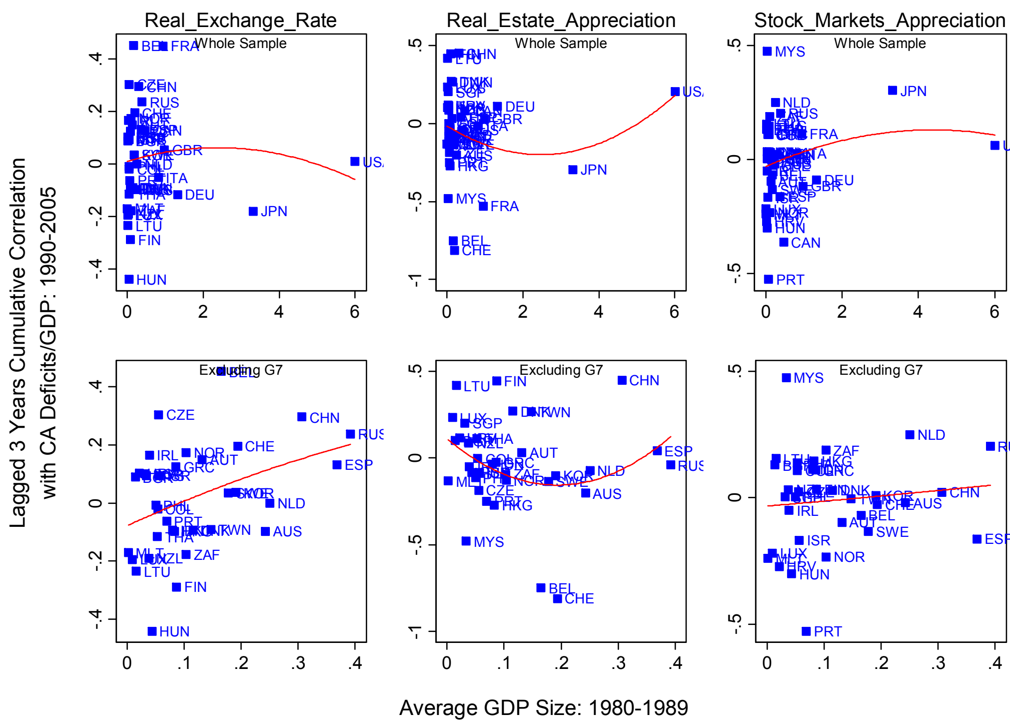


Figure 8 – Real Estate /GDP Deflator Appreciation and Macroeconomic Variables.
Based on the 'Dynamic Panel' estimation with lagged 5 years (Table 8, first column). Each bar represents the estimated response of the appreciation of real estate prices ($y_{i,t}$; %change per year of real estate prices/GDP deflator), calculated for each macroeconomic variable ($x_{i,t}$; $z_{i,t}$) by multiplying a 1-standard deviation increase (σ) of the variable with its coefficient estimate (γ, β, θ). For instance, a 10.03% CA Deficits shock is the outcome of (a one s.d. of CA Deficits = 4.0)x(coefficients of its lags) = 4.0x(1.02+0.57+0.64+0.18+0.14) ≈ 10 percent. For the economic significance of the interaction between Financial Depth*CA Deficits: (one s.d. of Financial Depth*CA Deficits = .14) x 12.76(its coefficient estimate) = .14*12.76 ≈ 1.79 percent. The sample comprises 41 countries from 1990-2005. The dynamic equation for the appreciation of real estate prices ($y_{i,t}$) is

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' x_{i,t-1} + \beta'(L) z_{i,t-1} + \theta' \left[x_{i,t-1} \times z_{i,t-1} \right] + \lambda_t + \eta_i + \upsilon_{i,t}$$

where x={Urban Population Growth, Capita GDP Growth, Inflation, Financial Depth, Institution, Real Interest}; z=Current Account Deficits/GDP; $\beta(L)$ a vector of polynomials in the lag operator; λ_t a time effect common to all countries; η_i a permanent but unobservable country-specific effect; $\upsilon_{i,t}$ an error term. All variables are stationary (no unit root; first-differenced and de-trended).