Consumer Wealth Effects in Stock and Housing Markets

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In many countries around the world, stock and real estate are the two most important asset classes in household portfolios. This is particularly the case in Australia where fund assets (very heavily weighted toward equity) in superannuation (Australia's system of compulsory private pensions) now account for some $1.3 trillion and are now third-ranked in the OECD in terms of the percentage of GDP (90.9%) after the Netherlands and Iceland and well above the OECD average of 71.6%. Of course, this excludes direct equity holdings and additional indirect equity holdings in the form of trusts. As shown in Table 1, we could conservatively argue that 82% of the Australian population hold equity holdings indirectly in the form of superannuation and 34% directly, with possibly another 3% in the form of equity trusts, potentially representing up to 65% of household financial assets and 13% of all household assets. A similar situation exists with real estate, especially given that Australians have among the world's highest rates of homeownership, with 67% of households owning or purchasing their own home and 20%

Table 1

Household Financial and Nonfinancial Assets (000s), 2012

Asset	Percent of households holding assets	Median value for households holding assets	Percent of financial and nonfinancial assets	Percent of all assets
Equity	34	16	6.1	1.3
Cash	2	60	23.0	4.8
Trusts	3	60	23.0	4.8
Deposits	98	9	3.4	0.7
Life insurance	6	40	15.3	3.2
Superannuation	82	76	29.1	6.0
Total financial		261	100.0	20.7
Primary dwelling	67	470	47.1	37.3
Other dwellings	20	400	40.1	31.8
Business assets	12	100	10.0	7.9
Vehicles	90	18	1.8	1.4
Collectibles	14	10	1.0	0.8
Total nonfinancial		998	100.0	79.3
Total assets		1,259		100.0

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owning or purchasing some other dwelling. Together, these account at the median for 87% of all nonfinancial assets and 68% of all household assets, so potentially 75% of all household assets, both financial and nonfinancial, are in stock or real estate for the median Australian household.

This concentration of household wealth in stock and real estate brings with it some concerns. It is well known that general economic conditions individually affect housing prices and stock prices. However, a wealth effect in the stock market can cause stock prices and real estate prices to move together in the long run, in the sense that a long-run cointegrating relationship exists between the two markets. For example, when the value of stock holdings increases through a positive economic shock, the increase in permanent wealth stimulates consumption and investment, at least part of which may be in real estate. Equally possible, when the value of housing increases, also through a positive economic shock, the increase in wealth could be partly directed to consumption, and partly to equity. It is definitely of interest to know exactly how much flows to consumption and how much to investment in either circumstance, given the effect on consumer resources and behaviour. Nonetheless, these close relationships also compromise the diversification benefit of household portfolios containing these assets. For example, in the case of a negative macroeconomic shock, such as that found in the US in the aftermath of the mid-2000s collapse of the residential housing market, the 2007 subprime crisis, and the ensuing declines in equity markets through the global financial crisis after 2008, households may find themselves facing simultaneous declines in both real estate and stock prices, with dire implications for household wealth and financial well-being. While in many respects the situation in housing and equity markets in Australia has not been as severe as in the US, dwellings and financial assets as a percentage of annual disposable income remain below their 2007 peaks, as shown in Figure 1. This leaves household consumers dangerously exposed to continuing or renewed deterioration in these critically important markets.

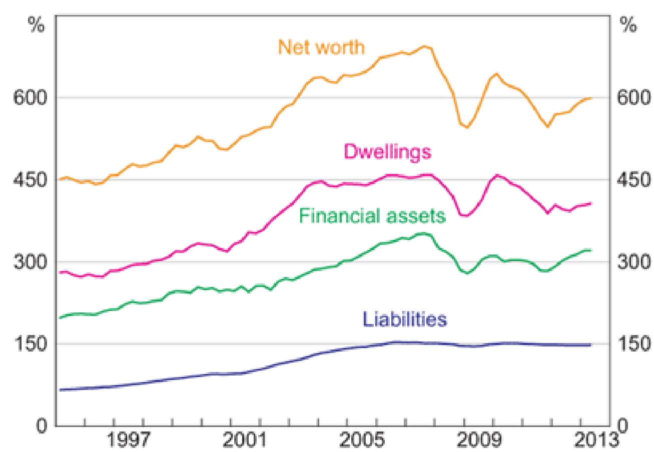

Figure 1. Household wealth as a percentage of disposable income.

The purpose of this paper is to examine whether a wealth effect (or cointegration) exists between Australian stock and housing markets, and the nature of the adjustment to this long-run equilibrium. This enables us to gain a better appreciation of the potential behaviour of households in the face of positive and negative economic shocks and the potential impact on financial well-being.

Method

This paper aims to test if the existence of the wealth effect in the stock market can cause stock and house prices to move together if they are cointegrated in the long run. We employ the TAR model and M-TAR model (Enders & Granger, 1998; Enders & Siklos, 2001) to explore the long-run equilibrium asymmetric adjustment. The long-run relationship is estimated using OLS:

$$SPI_t = \alpha_0 + \alpha_1 HPI_t + \varepsilon_t \quad (1)$$

where the stock price index (SPI) and housing price indices (HPI) are I(1), which implies that if the two price indices are non-stationary in levels and stationary in differences and the residuals, ε_t, obtained from Equation (1) are found to be stationary, then the two series are said to be cointegrated. Enders and Granger (1998) proposed the threshold autoregressive (TAR) model to take account of the long-run equilibrium asymmetric adjustment, and it is specified as follows,

$$\Delta\varepsilon_t = H_t \rho_1 \varepsilon_{t-1} + (1 - H_t)\rho_2 \varepsilon_{t-1} + v_t \quad (2)$$

where H_t is the Heaviside indicator and is defined as:

$$H_t = \begin{cases} 1 \; if \;\; \varepsilon_{t-1} \geq \tau \\ 0 \; if \;\; \varepsilon_{t-1} < \tau \end{cases} \quad (3)$$

and τ is the threshold value. The threshold value, τ, is generally unknown and often assumes $\tau = 0$ (Model 1). Equations (2) and (3) suggest that if ε_{t-1} is above the long-run equilibrium, then the adjustment is $\rho_1\varepsilon_{t-1}$, and if ε_{t-1} is below the long-run equilibrium, then the adjustment is $\rho_2\varepsilon_{t-1}$. If $-1 < \rho_2 < \rho_1 < 0$, then the positive phase of the error term tends to be more persistent than the negative phase, and investment in the long-run equilibrium is set to $\varepsilon_t = 0$. The momentum threshold autoregressive (M-TAR) cointegration test proposed by Granger and Lee (1989), Enders and Granger (1998), and Enders and Siklos (2001) established the decay rate depends on the changes in ε_{t-1} and is defined as:

$$H_t = \begin{cases} 1 \; if \;\; \Delta\varepsilon_{t-1} \geq \tau \\ 0 \; if \;\; \Delta\varepsilon_{t-1} < \tau \end{cases} \quad (4)$$

According to Enders and Siklos (2001), the specification of the Heaviside indicator Equation (4) could be more relevant when the adjustment is such that the time series data exhibit more "momentum" in one direction than the other. If $|\rho_1| < |\rho_2|$, the M-TAR model exhibits little reversion for $\Delta\varepsilon_{t-1} \geq \tau$ and substantial reversion for $\Delta\varepsilon_{t-1} < \tau$. If the two series are found to be cointegrated and the long-run relationship between the two series is symmetric, an error correction model (ECM) can be employed to investigate the short-run and long-run dynamics and the direction of the causal relationship between the two markets as follows:

$$\Delta SPI_t = \alpha_0 + \sum_{s=1}^{T} \alpha_{1s} \Delta SPI_{t-s} + \sum_{s=1}^{T} \alpha_{2s} \Delta HPI_{t-s} + \eta_1 \varepsilon_{t-1} + v_{1t}$$

$$\Delta HPI_t = \beta_0 + \sum_{s=1}^{T} \beta_{1s} \Delta SPI_{t-s} + \sum_{s=1}^{T} \beta_{2s} \Delta HPI_{t-s} + \eta_2 \varepsilon_{t-1} + v_{2t} \quad (5)$$

where ε_{t-1} is the disequilibrium error in the previous period, and η_1 and η_2 are the adjustment operators that capture the reactions of HPI and SPI to the disequilibrium error. The magnitude of η_1 and η_2 determines the speed of adjustment towards the long-run equilibrium, and the model is considered to be stable if $\eta_1 < 0$ and $\eta_2 < 0$. If the null hypothesis of symmetric effects or H_0: $\rho_1 = \rho_2$ is rejected, then the threshold effect exists between the two series and the adjustment to equilibrium is asymmetric. The threshold ECMs are defined as follows:

$$\Delta SPI_t = \alpha_0 + \sum_{s=1}^{T} \alpha_{1s} \Delta SPI_{t-s} + \sum_{s=1}^{T} \alpha_{2s} \Delta HPI_{t-s} + \eta_{11} \varepsilon_{t-1}^{+} + \eta_{12} \varepsilon_{t-1}^{-} + v_{1t}$$

$$\Delta HPI_t = \beta_0 + \sum_{s=1}^{T} \beta_{1s} \Delta SPI_{t-s} + \sum_{s=1}^{T} \beta_{2s} \Delta HPI_{t-s} + \eta_{21}\varepsilon_{t-1}^{+} + \eta_{22}\varepsilon_{t-1}^{-} + \nu_{2t} \quad (6)$$

where the superscripts + and – denote the positive part and negative part of the disequilibrium errors, and the estimated coefficients to ε_{t-1}^{+} and ε_{t-1}^{-} represent the different speeds of adjustment towards the long-run equilibrium. The estimated asymmetric ECMs can be used to determine the existence of causality and wealth effects between the two markets.

The data comprise two sets of HPI and SPI price indices. In the first analysis, the HPI is represented by residential housing prices (PRP) and the SPI is represented by the Australian All Ordinaries Index (AOI), spanning the period 1986 to 2012 at a quarterly frequency. In the second analysis, the HPI is represented by the REIT price index and SPI is represented by the ASX S&P 200 (SP200) with the monthly series ranging from December 2001 to October 2012.

Findings

Table 2 presents the estimated coefficients and *p*-values for ρ_1 and ρ_2, which measure the speed of adjustment from the long-run equilibrium of the previous ε_t or $\Delta\varepsilon_t$. First, for the AOI and PRP markets, the estimated coefficients of ρ_1 and ρ_2 are correct in sign but not significantly different from zero. For the M-TAR models, the estimated coefficients of ρ_2 are negative and significantly different from zero, while the estimated coefficients of ρ_1 are incorrect in sign and insignificant. The two cointegrated markets demonstrate that the deviation process in the M-TAR models has a faster adjustment speed in the negative regime, or when ε_t or $\Delta\varepsilon_t$ falls below zero, or the consistent estimate of the threshold value while there is no long-run adjustment when ε_t or $\Delta\varepsilon_t$ falls above zero, or the consistent estimate of the threshold value. The cointegration between the markets only exists when ε_t or $\Delta\varepsilon_t$ is less than zero.

Table 2

Estimated Coefficients for the Speed of Adjustment From the Long-Run Equilibrium

	AOI and PRP				SP200 and REIT			
	r1	r2	H0: r1 = r2 = 0 F-stat	H0: r1 = r2 F-stat	r1	r2	H0: r1 = r2 = 0 F-stat	H0: r1 = r2 F-stat
Model 1								
Estimate	-0.0748	-0.0505	1.4432	0.0868	-0.0221	-0.0168	0.8053	0.0295
p-value	0.1328	0.4439	Reject H0	0.7688	0.3408	0.4055	Reject H0	0.8638
Model 2								
Estimate	0.0621	-0.1961	7.5318	11.9391	0.0167	-0.0544	3.6885	5.7260
p-value	0.2411	0.0004	Reject H0	0.0008	0.4298	0.0105	Reject H0	0.0182
Model 3	14.3182				11.7230			
Estimate	0.0630	-0.1941	7.4779	11.8341	0.0176	-0.0514	3.5051	5.3637
p-value	0.2367	0.0004	Reject H0	0.0008	0.4191	0.0129	Reject H0	0.0221

Second, the Φ statistic of the null hypothesis of no cointegration H_0: $\rho_1 = \rho_2 = 0$ is rejected in all three models for both series. This suggests that a long-run or wealth effect exists between the Australian stock and housing markets. The F-test can be used to test the null hypothesis of symmetric adjustment H_0: $\rho_1 = \rho_2$ or H_0: $\rho_1 - \rho_2 = 0$. The TAR model indicates that the null hypothesis cannot be rejected, hence the adjustment is symmetric. As for the M-TAR models, both models significantly reject the null hypothesis, suggesting that the speed of reversion is asymmetric or the speed of adjustment to equilibrium varies when the disequilibrium errors are above or below the threshold. The ECM specified by

Equation 6 with asymmetric adjustments is estimated to determine the direction of Granger causality to ensure that these models are not misspecified. Various lags are incorporated in the ECMs, and the Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn criterion (HQC) are used to determine the best model for both data sets. We provide the results only for the best models.

Table 3 first presents the estimated coefficients, standard errors, test statistics and *p*-values for the optimal asymmetric ECMs for the changes in the AOI and PRP markets as a function of previous changes in AOI and PRP incorporating up to five lags. The change in AOI is best explained by the previous changes in AOI and PRP using two lags. The Granger causality test shows that the changes in

Table 3

Estimated Coefficients for the Optimal Asymmetric ECMs

Variable	Coef.	*SE*	t-stat.	*p*	Coef.	*SE*	t-stat	*p*
	ΔAOI				ΔPRP			
C	48.5735	39.9258	1.2166	0.2268	0.6824	0.5278	1.2928	0.1995
ΔAOI(-1)	0.1852	0.1276	1.4512	0.1500	0.0016	0.0017	0.9590	0.3402
ΔAOI(-2)	0.3099	0.1303	2.3794	0.0193	0.0016	0.0017	0.9386	0.3506
ΔAOI(-3)					0.0011	0.0017	0.6510	0.5168
ΔAOI(-4)					-0.0018	0.0017	-1.0562	0.2938
ΔAOI(-5)					-0.0020	0.0017	-1.1610	0.2489
ΔPRP(-1)	-9.1642	8.7365	-1.0490	0.2969	-0.0772	0.1126	-0.6859	0.4946
ΔPRP(-2)	-19.4917	8.7619	-2.2246	0.0285	-0.0903	0.1138	-0.7941	0.4293
ΔPRP(-3)					-0.0220	0.1154	-0.1905	0.8494
ΔPRP(-4)					0.0063	0.1167	0.0544	0.9568
ΔPRP(-5)					0.0075	0.1163	0.0648	0.9485
η_1^+	-0.0468	0.0898	-0.5216	0.6032	0.0023	0.0012	1.8073	0.0742
η_2^-	-0.0535	0.0776	-0.6898	0.4920	-0.0002	0.0011	-0.2244	0.8230
F-stat $\alpha_{2i} = 0$			3.8839	0.0239			0.2143	0.9556
F-stat $\beta_{2i} = 0$			2.9023	0.0598			1.0103	0.4167
	ΔSP200				ΔREIT			
C	-48.4613	46.5771	-1.0405	0.3001	-40.3117	19.4348	-2.0742	0.0401
ΔSP200(-1)	0.0392	0.1080	0.3628	0.7174	0.0437	0.0450	0.9693	0.3343
ΔSP200(-2)								
ΔSP200(-3)								
ΔSP200(-4)								
ΔSP200(-5)								
ΔREIT(-1)	0.6107	0.2758	2.2142	0.0286	0.1685	0.1151	1.4642	0.1456
ΔREIT(-2)								
ΔREIT(-3)								
ΔREIT(-4)								
ΔREIT(-5)								
η_1^+	0.0227	0.0261	0.8701	0.3859	0.0183	0.0109	1.6843	0.0946
η_2^-	-0.0961	0.0593	-1.6198	0.1078	-0.0528	0.0248	-2.1338	0.0348
F-stat $\alpha_{2i} = 0$			0.1316	0.7174			0.9394	0.3343
F-sttat $\beta_{2i} = 0$			4.9025	0.0286			2.1439	0.1456

the stock market cause changes in its own market with the F statistic for H_0: $\alpha_{21} = \alpha_{22} = 0$ of 3.8839 and *p*-value of 0.0239. More importantly, the Granger causality test indicates that changes in the housing market cause changes in the stock market with the F statistic for H_0: $\beta_{21} = \beta_{22} = 0$ of 2.9650 and *p*-value of 0.0563 (significant at < 10% level of significance). This suggests that capital flows from the housing market to the stock market, not the other way around as is usually suggested.

The estimated coefficients for asymmetric adjustments, η_1^+ and η_1^-, are both insignificant. This suggests that the stock price index does not react significantly to the positive or negative deviation from the threshold. As for the ECM measuring the changes in PRP as compared to previous changes in AOI and PRP, the optimal model is achieved incorporating five lags. There is no evidence of capital flow from the stock market to the housing market with the F statistic for H_0: $\alpha_{21} = \alpha_{22} = 0$ of 0.2143 and *p*-value of 0.9556. Once again, the asymmetric adjustments of η_1^+ and η_1^- are insignificant.

Implications

Our empirical results have rich implications for consumers. First is that there is a strong wealth effect between housing and stock markets. This means gains in one market are partially invested in the other. In fact, counter to existing findings outside Australia, there is greater evidence of the flow of capital from housing to stock markets than from stock to housing markets. This reinforces the position of housing (owner-occupied and investor) as the core of Australian household asset portfolios. However, there is no evidence of an asymmetry in this relationship. This implies that positive (negative) economic shocks will exhibit a doubly positive (negative) impact on household portfolios through the impact on both housing and stock assets. This dangerously exposes Australian households to possibly deteriorating conditions in both markets, a matter that could be quite adverse in the case of households nearing or in retirement where it is not possible to compensate for market downturns through readjusting household portfolios or working longer.

References

Enders, W., & Granger, C. W. J. (1998). Unit-root tests and asymmetric adjustment with an example using the term structure of interest rates, *Journal of Business and Economic Statistics*, *16*(3), 304–11. doi:10.1080/07350015.1998.10524769

Enders, W. & Siklos, P. L. (2001). Cointegration and threshold adjustment, *Journal of Business and Economic Statistics*, *19*(2), 166–176. doi:10.1198/073500101316970395

Granger, C. W. J. & Lee, T. H. (1989). Investigation of production, sales and inventory relationships using multicointegration and nonsymmetric error correction models, *Journal of Applied Econometrics*, *4*(XX), S145–S159. doi:10.1002/jae.3950040508