JOURNAL OF ACADEMIC RESEARCH IN ECONOMICS

A NOTE ON HOUSING WEALTH AND PRIVATE CONSUMPTION

ANDREAS SCHWEINBERGER
MANUEL RUPPRECHT

Frankfurt School of Finance and Management,
Frankfurt, Germany

Abstract

This paper analyses the relationship between house prices and private consumption of the US economy. Based on Granger's causality test, we ask whether this relationship is driven by causality or whether it is merely an ambiguous connection. Based on latest quarterly data, our results show that there is indeed a causal relationship with changes in house prices affecting private consumption, fundamentally supporting economic theory. Considering existing research, it is therefore suggested that the US economy is at the outset of a severe economic downturn, confirming pessimist's expectations.

Keywords*: Wealth effect; House prices; Consumption; Granger causality*

1. INTRODUCTION

Since Pigou's (1943) criticism of Keynes' *General Theory* for neglecting wealth in consumption, economic researchers dedicated increasing attention to the relevance of wealth in explaining private consumption. In this case, theoretical efforts usually rest upon life cycle theory, which argues that consumers try to smooth economic well-being (that is, consumption expenditures) over their lifetime (Lettau and Ludvigson, 2001). While young economic agents are commonly expected to borrow money for consumption purposes and hence, not to save, older persons will gradually dissave and run down wealth. In this framework, consumers are subject to inter temporal budget restrictions and try to maximise their utility by considering all expected life time earnings (Deutsche Bundesbank, 2007). However, with unexpected gains or losses in wealth, consumers are likely to increase and decrease consumption expenditures, respectively. As a consequence, considering wealth effects has not only gained significant interest in explaining the business cycle. It is also experiencing an increasing attention in monetary policy since it is inherently connected with households' saving decisions, affecting price developments and thus inflation.

As a consequence, the empirical literature dealing with wealth effects is quite vast. Pioneering work has been done by Modigliani (1971), who suggested that a dollar increase in wealth *ceteris paribus* entails an increase in consumer spending of approximately five cents. In the following years, both the level and the changes in wealth have been recurrently confirmed of being somehow connected with private consumption. For instance, Boone et al. (1998) and Poterba (2000) provide evidence for a positive relationship between financial wealth (that is, financial assets of private households in stocks, mutual funds or pension & life insurances) in major OECD countries. However, these findings are far from being universally valid. As Ludwig and Slok (2004) show, the impact of stock price changes on consumption is significantly higher in countries with a marked-based financial system, leaving marginal effects in Germany and Austria behind the extent of the UK and the US. Furthermore, Labhard et al. (2005) point out that international comparisons usually suffer from neglected country specific circumstances. As a consequence, factors like age structure, the retirement systems and others should be taking into account for cross-border comparisons. Additionally, Lettau and Ludvigson (2001) provide evidence for the impact of wealth in stocks on private consumption in the US. Their results suggest that wealth and consumption are cointegrated, indicating that there is a long-term relationship between these variables.[1]

Particular attention is usually paid to house prices. Initially, this is somewhat surprising. Economic theory suggests that wealth effects can particularly be observed at liquid assets. Unlike stocks, houses are far from being liquid at first sight. However, modern banking provides several instruments to increase the liquidity of houses such as the mortgage equity withdrawal (Greenspan and Kennedy, 2007). As a consequence, the liquidity of real estate wealth is almost similar to other asset classes. Since real estate wealth accounts for up to two thirds of the wealth of private households, changes in house prices are particularly likely to entail similar effects on consumption. Campbell and Cocco (2007) as well as O'Donnell (2007) provide recent evidence for OECD countries and Ireland, respectively.

However, all papers above restrict themselves with analysing the relationship between private consumption and wealth. Whether or not there is a causal link between these variables rather than only a – potentially ambiguous – connection cannot be concluded from the papers above. As a consequence, it is equally possible that consumption drives house prices rather than the theoretically proposed opposite.

With house prices tumbling in major economies since 2007, particularly in the US, it is the purpose of this paper to identify a clear and causal relationship between these variables. Based on latest quarterly data for the US, we analyse the causal effect of house prices on private consumption using Granger causality tests. Since our sample ranges from the 1st quarter 1975 to the 2nd quarter 2008, we are

[1] Labhard et al. (2005) provide an interesting overview of the international evidence of wealth and consumption.

able to consider the recent developments of the current financial crisis. Therefore, we may shed some light on the prospective development of the US' private consumption and its potential consequences for the economic development.

Our findings suggest that there is a clear causal relationship between house prices and consumption, inducing consumption changes due to changes in real estate wealth. Considering the elasticities of existing studies, we may therefore conclude that the US economy is likely to suffer from decreasing private consumption, further supporting the economic downturn due to the financial crisis.

The remainder of this paper is organised as follows. Section 2 briefly outlines the Granger causality test and describes the dataset. That followed, section 3 performs the econometric test. Section 4 concludes.

2. METHOD AND DATA

To analyse whether there is a causal link between house prices and consumption, we make use of the causality test developed by Granger (1969). This is an application of vectorautoregressive (VAR) models, where variables are explained by lagged values of their own and other variables in the VAR-model. In contrast to a classic, hypotheses testing regression, it is not required to distinguish between endogenous and exogenous variables a priori.

In a two variable case, the time path of one variable is affected by past realisations of its own and the second variable (and vice versa):[2]

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \cdot y_{t-i} + \sum_{i=1}^{p} \beta_i \cdot z_{t-i} + \varepsilon_{y_t} \text{ and}$$

$$z_t = \delta_0 + \sum_{i=1}^{p} \gamma_i \cdot y_{t-i} + \sum_{i=1}^{p} \delta_i \cdot z_{t-i} + \varepsilon_{z_t},$$

where it is assumed that

(1) y_t and z_t are stationary, and

(2) ε_{y_t} and ε_{z_t} have zero means, constant variances, and are individually serially uncorrelated.

The idea of Granger's test is whether the lagged values of one variable enter into the equitation for the other variable. It is said that if none z_{t-i} improve the

[2] This is called the VAR in standard form obtained form a structural VAR. For a more detailed discussion see Enders (2004), chapter 5.

explanation of y_t, then the variable Z does not Granger cause Y. Additionally, if the lagged values of Y have no significant impact on the current value of Z, then Y does not Granger cause Z. The number of lags can be determined in various ways, e.g. Akaike's information criteria.[3]

To check the causality (e.g. from Z to Y), the following null hypothesis tested:

$$H_0: \ \gamma_1 = \gamma_2 = ... = \gamma_p = 0 .$$

This is a standard F-test for linear restrictions. Hence, the appropriate test-statistic has the following form:

$$F = \frac{\left(RSS_r - RSS_u\right)/r}{RSS_u/\left(T-m-1\right)}$$

RSS_r equals the sum of squares due to residuals with restrictions, RSS_u equals the sum of squares due to residuals without restrictions. r equals the number of restrictions, T equals the number of usable observations, and m equals the number of parameters estimated in the unrestricted equitation. As already mentioned, this test-statistic is F-distributed with r and T-m-1 degrees of freedom. If the calculated F-value exceeds the critical value obtained from the F-distribution, the null can be rejected. Hence, Y is said to be Granger causal if for Z if at least one lagged value of Y has a significant influence on the current value z_t.

We obtain US house price data from the Office of Federal Housing Enterprise Oversight (OFHEO). The OFHEO house price index is a broad measure of the movement of single-family houses measuring the average price changes in repeat sales or refinancing on the same properties (Calhoun, 1996). Hence, we approximate the real estate wealth by using the house price index. From a theoretical point of view, this simplification is not entirely correct since house prices are unequal to housing wealth. Yet it is quite common in empirical research due to data availability. For the private US consumption we use the seasonally adjusted quarterly data (per prices of 2000), provided by the Bureau of Economic Analysis.

Figure 1 reveals both the US house price index and the US consumption over time from 1975 up to the 2nd quarter 2008. As it turns out, there seems to be a strong coherence between US house prices and consumption expenditures. We test for serial correlation and find a correlation coefficient of approximately 0.97, significant at a 1%-level. However, though this coefficient is very high and suggests a strong connection between the variables, it is no proof at all for a causal relationship. Hence, an increase in private consumption may go along with a similar increase in house prices rather than the theoretically proposed opposite. As

[3] For a detailed discussion of different approaches to determine the appropriate lag length see Enders (2004).

a bidirectional measure, a correlation coefficient has no information about which variable causes the other or whether there is any causal dependency at all.

To determine whether or not there is a causal effect of house prices on consumption in the US, we run Granger's causality test as proposed above.

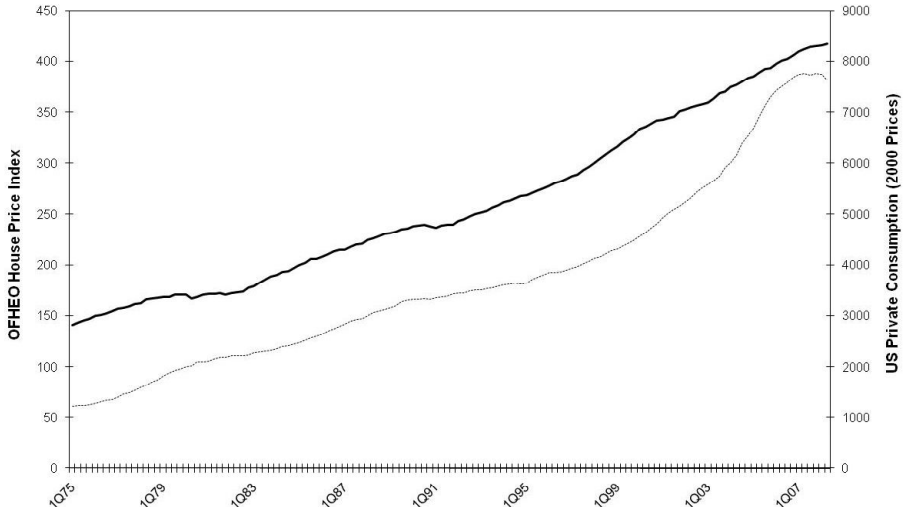

***Figure 1**: Prices and Private Consumption*

It can easily be seen that both time series seem to have a common trend and do certainly not fulfil the conditions of stationarity. However, since Granger's test assumes stationarity, we take the percentage change over the same quarter a year ago.[4] Using an augmented Dickey-Fuller test we now find that both variables are stationary (Dickey and Fuller, 1979; see appendix).

In order to find the appropriate lag length we use multivariate generalisation of Akaike's information criteria (Enders, 2004). Since the model with eight lags seems to be most appropriate, we include eight lags for both variables. For identification we use the orthogonalised innovations obtained from a Choleski decomposition. We assume that changes in house prices have an immediate effect on consumption, but changes in consumption affects house prices with a one period-lag.

[4] This is similar to Granger's and Newbold's (1974) suggestion to use the first differences in case of non-stationary levels.

3. RESULTS

Table 1 shows the calculated F-values and the corresponding p-values. As expected, the lagged values of each time series have a significant influence on their own current value. Yet the causality between house prices and consumption is unidirectional with house prices affecting consumption, but not the reverse. We also obtain the impulse-response-functions of our VAR-system (*figure 2*).

	F-value	p-value
House prices → House prices	158,7016	0,0000
House prices → Consumption	2,7704	0,0080
Consumption → Consumption	30,2980	0,0000
Consumption → House prices	1,3164	0,2433

Table 1: *Results of Granger's causality test*

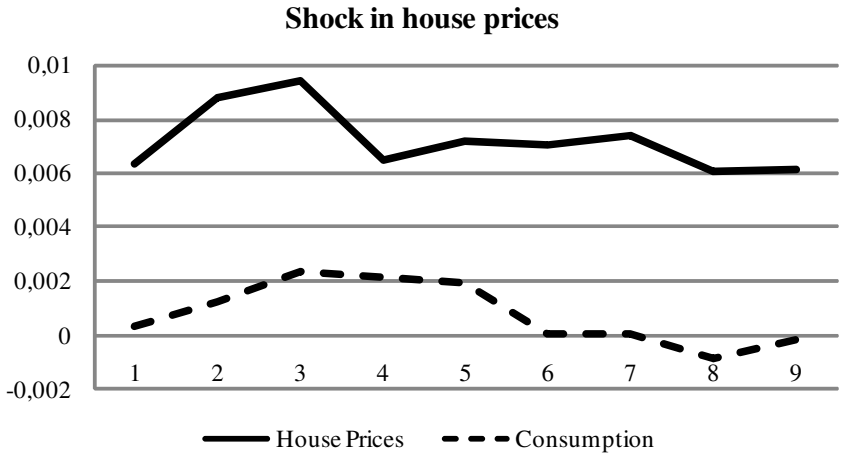

Figure 2: *Impulse-Response-Function of house prices and consumption*

As it turns out, a positive shock in US house prices has a positive impact on consumption expenditures. This holds true for falling house prices which entail a decline in consumption expenditures.

Finally, we run the Jarque-Bera-test and the Ljung-Box-test for checking the residuals' assumptions given in section 2 (Bera and Jarque, 1987; Ljung and Box, 1978). Since we cannot reject the null, both series seem to be normally distributed with constant variances and serially uncorrelated.

Our analysis shows that there is a causal relationship between house prices and consumption in the US rather than merely an ambiguous connection. Hence, rising house prices cause an increase in private consumption, contributing to economic growth. Unfortunately, the same is true for falling house prices. With house prices tumbling since summer 2007, it is therefore expected that the consumption expenditures in the US will decrease as well, further supporting the economic downturn. Since house prices have already been reduced by roughly 20%, the impact may be noteworthy serious. Although our analysis did not focus on the expected elasticities, existing research suggests that a reduction in house prices by $100 causes a decrease in consumption expenditures of at least $5, probably more. As Campbell and Cocco (2007) point out, the suggested reaction strongly depends on the age structure, disposable income and other household specific factors. Even though the average reduction in the current situation may be less than in past declines, our analysis suggests that on average there will be a significant decrease of private consumption expenditures caused by declining house prices.

4. CONCLUSION

Based on Granger's causality test, we have shown that there is a significant causal relationship between house prices and private consumption in the US economy. The results contribute to the existing literature by fundamentally supporting economic theory rather than just quantifying a potentially ambiguous relationship. As a consequence, increased household wealth due to rising house prices really entailed higher consumption, spuring economic growth. Considering the results of former research, it is suggested that the effect is far from being negligible. With house prices falling, it is therefore likely that US consumers will constrain their future expenses and rather increase their savings rate. Considering that private consumption accounts for about 70% of US GDP, economic growth is also likely to decline, supporting pessimist's expectations. Since other countries like Spain and the UK are also currently experiencing falling house prices, these results further support the bad economic outlook for major economies. However, this does not need to be the case. Since house prices almost continuously increased in the past, our results, although including the latest decreases, may proof wrong for declining prices. Nonetheless, existing evidence is basically supported, further raising questions about the relevance of asset prices in monetary policy.

5. REFERENCES

Bera, A. K. and Jarque, C. M. (1987). A test for normality of observations and regression residuals. *International Statistical Review*, 55, 163-172.

Boone, L., Giorno, C. and Richardson, P. (1998). Stock market fluctuations and consumption behaviour: Some recent evidence. *OECD Economics Department Working Papers, No. 208*.

Campbell, J. Y. and Cocco, J. F. (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics*, *54* (3), 591-621.

Calhoun, C. A. (1996). *OFHEO house price indexes: HPI Technical Description*, Washington D. C.

Deutsche Bundesbank (2007). Private consumption in Germany since reunification. *Deutsche Bundesbank Monthly Report*, *September 2007*, 41-55.

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimates for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*, 247-431.

Enders, W. (2004). *Applied Econometric Time Series*, 2nd ed., Wiley, Hoboken.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*, 424-436.

Granger, C. W. and Newbold, P. (1974). Spurious regression in econometrics. *Journal of Econometrics*, 2*,* 111-120.

Greenspan, A. and Kennedy, J. (2007). Sources and uses of equity extracted from homes. *Federal Research Board, Finance and Economics Discussion Series No. 2007*-20.

Labhard, V., Sterne, G. and Young, C. (2005). Wealth and consumption: an assessment of the international evidence. *Bank of England Working Paper No. 275*.

Lettau, M. and Ludvigson, S. (2001). Consumption, aggregate wealth and expected stock returns. *Journal of Finance, 56* (3), 815-849.

Ljung, G. and Box, G. (1978). On a measure of lack of fit in time series models. *Biometrica*, 65, 297-303.

Ludwig, A. and Slok, T. (2004). The relationship between stock prices, house prices and consumption in OECD countries. *Topics in Macroeconomics, 4* (1), Article 4.

Modigliani, F. (1971). Consumer spending and monetary policy: The linkages. *Federal Reserve Bank of Boston Conference Series, 5*, 9-84.

O'Donnell, N. (2007), Housing wealth and consumption. *Bank of Ireland Quarterly Bulletin, No. 1*, 119-136.

Pigou, A. C. (1943). The Classical Stationary State. *The Economic Journal, 53* (3), 343-351.

Poterba, J. M. (2000). Stock market wealth and consumption. *Journal of Economic Perspectives, 14* (2), 99-118.

APPENDIX

Augmented Dickey-Fuller-(ADF)-Tests

(1) $$\Delta Y_t = \mu + \alpha \cdot t + \gamma \cdot Y_{t-1} + \sum_{j=1}^{K} \beta_j \cdot \Delta Y_{t-j} + \varepsilon_t$$

(2) $$\Delta Y_t = \mu + \gamma \cdot Y_{t-1} + \sum_{j=1}^{K} \beta_j \cdot \Delta Y_{t-j} + \varepsilon_t$$

(3) $$\Delta Y_t = \gamma \cdot Y_{t-1} + \sum_{j=1}^{K} \beta_j \cdot \Delta Y_{t-j} + \varepsilon_t$$

We use Akaike's information criteria for choosing the adequate lag length.

step	eq.	H_0	test statistic	critical value	calculated value	decision
1	(1)	$\gamma = 0$	τ_τ	-3,43	-2,63	UR
2	(1) and (2)	$\gamma = \alpha = 0$	Φ_3	6,34	3,48	UR
3	(2)	$\gamma = 0$	τ_μ	-2,88	-2,57	UR
4	(2) and (3)	$\gamma = \mu = 0$	Φ_1	4,63	3,78	UR
5	(3)	$\gamma = 0$	τ	-1,95	-2,00	no UR

Table 3: *Variable IP (lags = 6)*

step	eq.	H_0	test statistic	critical value	calculated value	decision
1	(1)	$\gamma = 0$	τ_τ	-3,43	-2,88	UR
2	(1) and (2)	$\gamma = \alpha = 0$	Φ_3	6,34	4,16	UR
3	(2)	$\gamma = 0$	τ_μ	-2,88	-2,90	no UR

Table 4: *Variable C (lags = 3)*

Dependent variable	Ljung-Box (22 lags)	p-value	Jarque-Bera	p-value
House prices	21,06	0,517	5,77	0,056
Consumption	21,72	0,478	3,77	0,151

Table 5: *Residuals' tests*