

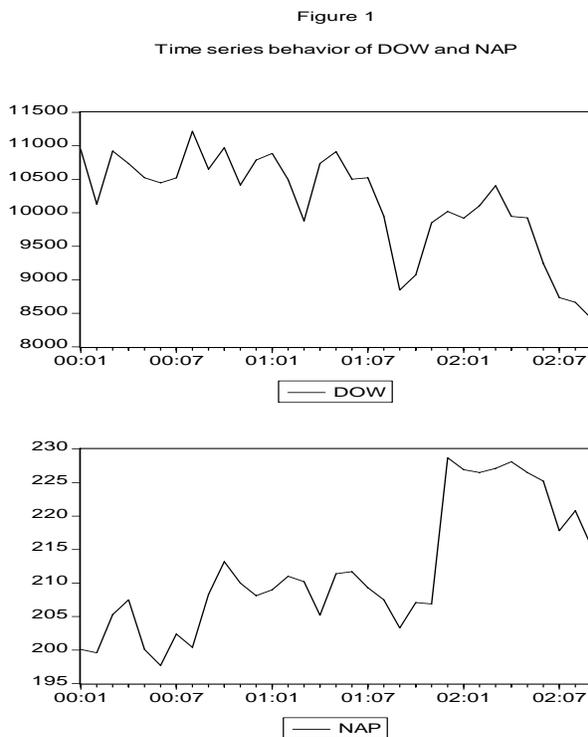
## Impact of Stock Market Decline on the Recent Housing Boom in the United States: Some Empirical Evidence

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### Abstract

*The purpose of this paper is to investigate the linkage between the recent housing market boom and the stock market decline in the United States. Tests results based on monthly data from January 2000 to September 2002 show that there is an inverse relationship between the two markets and that this relationship follows a V-curve. The findings have two implications. The inverse relationship between the two markets implies opposing wealth effects – the net impact depending on the relative strength of the two. On a micro level, the findings re-affirm the importance of portfolio diversification and asset allocation strategy. However, more tests using data for other episodes of stock market decline are needed before any definitive conclusions can be drawn.*

### I. Introduction



The US economy experienced contraction beginning in the first quarter and lasting till the end of third quarter of 2001. Many have referred to this as a profit recession or a corporate spending recession, implying that corporate sector's spending slump has been the main culprit. The stock market was rocked by a series of corporate scandals. During this period of gloom and doom, one sector, i.e., the housing sector has displayed a remarkable strength. The mortgage rates kept hitting new lows, triggering a spat of re-financing on the one hand, and purchase of new and existing homes, on the other. Refinancing of mortgages helped spur consumer spending during the downturn. Figure 1 tells the tale of the two markets. The historical prices for the stock market

(DOW) have been obtained from, and the data on average new home prices (NAP) are from the National Association of Home Builders (NAHB). The figure brings out three points: (1) there is an inverse relationship between the two markets. The stock market experienced a persistently declining trend over the sample period while the housing

market experienced a persistently rising trend; (2) The United States stock market experienced two large sell-offs, one in summer of 2001 and the other in spring of 2002. The housing market, on the other hand, experienced a large up-trend in the fall of 2001, giving up some of the gains in the summer of 2002, and (3) the stock market had a lagged impact on the housing market. When the Dow Jones went into a tailspin in the summer of 2001, the housing market took off in the fall of that year.

Table 1 presents some descriptive statistics and measures of skewness and kurtosis. The skewness is small with a value of -.89 and .53 for DOW and NAP, respectively. And kurtosis is 2.86 and 2.10 respectively, both pretty close to 3. Both measures indicate that the two series followed a normal distribution. The Jarque-Bera statistics 4.40 and 2.68 for the DOW and NAP respectively are lower than the critical value of 5.99 at the five percent level, implying normal distribution.

To obtain a better perspective on the performance of the two markets, we have computed percentage change in (DOW) and (NAP) for each year and for the entire

**Table 1**  
**Stock Market and Housing Market: Some Basic Statistics**

Variable	Mean	St. dev.	Skewness	Kurtosis	Jarque-Bera
DOW	10160.74	741.50	-.89	2.86	4.40
NAP	211.77	9.50	.53	2.10	2.68

The Jarque-Bera statistic is given by  $\frac{T-k}{6} [S^2 + \frac{1}{4}(K-3)^2]$ , where

T=number of observations k=0 for an ordinary series, S=skewness, and K=kurtosis. Under the null hypothesis of normality, the JB statistic has a chi-square distribution with two degree of freedom. The relevant critical values of chi-square at one, five and ten percent levels are, respectively, 9.21, 5.99 and 4.61.

sample period separately. The results are presented in Table 2. The stock market has recorded a decline in each of the three sub-periods and also over the entire sample period. The average monthly decline in 2002 far exceeds those in 2000 and 2001, causing a cumulative decline of 16.74 percent. Over the entire sample period, the stock market has declined by 27.25 percent.<sup>1</sup> The large size of standard deviation indicates extreme volatility in the market. The housing market, on the other hand, demonstrates a positive average monthly percentage change in both 2000 and 2001 with a decline in 2002. For the entire sample period however, the new home prices have gone up by 6.90 percent.

The declining financial market and a buoyant housing market respectively may be seen to have generated a negative and a positive wealth effect, both having a profound impact on consumer spending and the economy. The evidence on the wealth effect of the two markets is mixed. Case *et al* (2001), who have used panels of quarterly data for the U.S. states from 1982 to 1999 and panel of annual observations for 14 developed countries, have found a weak wealth effect for the stock market but a strong wealth effect for the housing market.

The purpose of this paper is to investigate the causal link between the two markets during the most recent stock market decline. More important, we intend to show that the relationship between the two markets has followed a V-curve. In other words, the impact of declining stock market on housing market has been significantly positive but relatively

**Table 2**  
**Average Monthly Percentage Change**  
**Jan. 2000-Sep. 2002**

	Stock market (DOW)			Housing market (NAP) *		
	mean	sum	st. dev.	mean	sum	st. dev.
Jan. 2000 Dec. 2000	-.42	-5.05	4.88	.22	2.66	2.26
Jan. 2001 Dec. 2001	-.45	-5.46	5.82	.84	10.08	3.41
Jan 2002 Sep. 2002	-1.86	-16.74	3.30	-.65	-5.84	1.43
Jan 2000 Sep. 2002	-.82	-27.25	4.80	.21	6.90	2.57

*Source:* The historical data on stock prices (DOW) have been taken from the Yahoo site: <http://finance.yahoo.com/q/hp?s=%5EDJI>, and the data on average new home prices (NAP) are from the National Association of Home Builders (NAHB).

small in the beginning, becoming more pronounced as the market decline continued, and gradually becoming small again as the market decline persisted. The sample period covered is from January 2000 to September 2002, which broadly coincides with the recent episode of major movements in the two markets. The rest of the paper is organized as follows. Section II presents the theory and the methodology. In section III we present our empirical findings. And section IV consists of some concluding remarks.

## II. Literature, Theory and Methodology

In the literature home ownership rates are found to depend on interest rate, income and other demographic factors on the demand side, and on several supply side factors. The role of interest rate in this context deserves a special mention. Painter and Redfearn (2001) have found that interest rates play little role as a demand-side factor but seem to play a more important role as supply-side factor by affecting housing starts, making the net impact of interest rate an empirical issue. As evidence, they point out that home ownership rates have increased during periods of both rising and falling interest rates. Kenny (1999), using multivariate cointegration techniques, has found two significant cointegration vectors for interest rates with opposite signs. This, according to him, is because high interest rates can raise the cost of home ownership while home ownership is considered as a hedge against inflation. Rising income and changing demographics, on the other hand, have been widely shown to have a significantly positive effect on home ownership. The study of the causal linkage between the two markets is immensely important for the following reason. Money spent on purchase of a home is

considered both an act of investment and consumption. A rising stock market means a rise in the proportion of wealth held by individuals in stocks, warranting a portfolio re-balancing. Individuals react by lowering stock holdings and raising investment in other assets (Markowitz, 1952). Also, a rising share of wealth following a bull market will generate a positive wealth effect and, to the extent that housing is considered consumption, there will be an increased demand for housing. Either way, a stock market boom would translate into a housing market boom. Conversely, a stock market slump should translate into a housing market slump. In both cases, the causation is expected to run from stock market to housing market.

The issue of impact of various categories of wealth on consumer spending has been extensively investigated.<sup>2</sup> Due to its macroeconomic importance; the subject continues to attract considerable attention. Benjamin *et al.* (2002), using quarterly data on aggregate consumption, income, real estate wealth, and financial wealth from 1952 to 2001, have determined the stationarity condition of the data set and tested for existence of a long run equilibrium relationship. All variables were found to be integrated of order one, i.e., they became stationary after first differencing. However, there was no evidence of cointegration. Given these results, these authors have carried out all estimations using the variables in their first differences. More important, their simulation over 2000:1 and 2001:2 showed a negative wealth effect from financial wealth and a positive wealth effect from real estate holdings. But the study has made no attempt to address the issue of causality. Has the stock market decline led to a real estate boom? If it has, is it consistent with the prediction of portfolio re-balancing postulate put forth by Markowitz?. According to portfolio re-balancing view, declining share prices would lower the proportion of stocks held by a household, triggering increased share purchase to maintain the historical balance among all asset classes. But this is not what has happened during the recent market slump. In another important study, Green (2002) has used monthly data on Russell 2000 and median house prices in California from January 1989 to July 1998. Pre-testing the data using Dickey-Fuller and Augmented Dickey-Fuller tests indicated that both series are integrated of order one. The author, then, conducted Granger causality tests using the variables in first differences. He found that stock market has indeed caused housing market in the Granger sense. The CUSUM test indicated that the estimated coefficients are indeed stable over time. Finally, he has estimated Granger equations with 2 months explicit lags to obtain measures of the impact of stock market decline on housing prices. His conclusion is that Russell 2000 is successful in predicting house prices. It is not clear why, after finding the variables to be integrated, the author did not test for the existence of cointegration. It has been shown time and again that if variables are integrated and also cointegrated, then an error-correction approach to determining causality makes a better sense (Engel and Granger representation theorem, 1987).

In this study, we test the causal linkage between two markets. But this study differs from the earlier studies in two respects. First, in order to avoid spurious results, we run cointegration tests before conducting causality tests. And second, perhaps more important, we investigate nature of the relationship, i.e., negative or positive, between the two markets

Consistent with the preceding discussion, we intend to test two null hypotheses in this study:

H<sub>0</sub>: There is no causation between stock market and housing market

H<sub>0</sub>: The slumping stock market has a negative effect on the housing market.

The fact that the sample period covered experienced a slumping stock market but a booming housing market indicates an outright rejection of the second hypothesis. The

portfolio re-balancing postulate, as put forth by Markowitz does not seem to be helpful in explaining this. We will provide an alternative explanation of this phenomenon later. We will test the first hypothesis by employing Granger causality test. In a bivariate case, the Granger causality tests whether past values of a variable,  $Y_t$ , together with past values of another variable,  $X_t$ , explain the current change in  $X_t$  better than the past values of  $X_t$  alone do. A failure to reject this null hypothesis leads the researcher to conclude that  $Y_t$  Granger causes  $X_t$ . The procedure is repeated interchanging the two variables. We estimate the following two equations for this purpose.

$$DOW_t = \sum_{i=1}^k \alpha_{1i} DOW_{t-i} + \sum_{j=1}^k \alpha_{2j} NAP_{t-j} + U_t \quad (1)$$

$$NAP_t = \sum_{i=1}^k \beta_{1i} NAP_{t-i} + \sum_{j=1}^k \beta_{2j} DOW_{t-j} + V_t \quad (2)$$

where  $DOW_t$  and  $NAP_t$  are as defined earlier in the paper and  $U_t$  and  $V_t$  are the noise terms. The following hypotheses represent the four possible causal relationships.

- (a) A unidirectional causation from  $NAP_t$  to  $DOW_t$  exists if  $\sum \alpha_{2j} \neq 0$  and  $\sum \beta_{2j} = 0$
- (b) A unidirectional causation from  $DOW_t$  to  $NAP_t$  exists if  $\sum \beta_{2j} \neq 0$  and  $\sum \alpha_{2j} = 0$
- (c) A bidirectional causality between  $NAP_t$  and  $DOW_t$  exists if  $\sum \alpha_{2j} \neq 0$  and  $\sum \beta_{2j} \neq 0$
- (d) No causality is established between  $NAP_t$  and  $DOW_t$  exists if  $\sum \alpha_{2j} = 0$  and  $\sum \beta_{2j} = 0$

It is a well-known finding that most of the macroeconomic time-series data contain unit roots, i.e. the series are found to be non-stationary in levels and therefore, they are of the order,  $I(1)$ . Non-stationary means that the moments of the series such as the mean and the variance depend on time. Economic modeling based on non-stationary data would be considered to yield spurious estimation. In the past, it has been a common practice to use variables in their first difference forms to minimize the possibility of a spurious relationship. However, differencing variables when they are actually stationary can cause loss of valuable information contained in the series. Similarly, if they are nonstationary but contain a long run equilibrium relationship, i.e., are cointegrated, differencing can result in a loss of efficiency. We have employed a Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) techniques to test stationarity condition. We have also applied Phillips-Perron (PP) test in case the series display any heteroscedastic or autoregressive behavior. The DF and ADF tests are known to suffer from power limitations, therefore, we have also reported the results from the Dickey-Fuller test with GLS detrending (DF-GLS) tests. We have employed the automatic lag selection in the DF, ADF, and the DF-GLS tests using the Schwarz Information Criterion (SIC) and a maximum lag length of 12. Numbers in the parentheses are the actual lag selection used in the estimation process.

### III. Empirical Results

Using double log transformation to eliminate scale effect, the results of the DF, ADF, (DF-GLS) and the PP tests are presented in Table 3. As Table 3 shows, the null hypothesis of the presence of a unit root is not rejected when these tests are conducted using variables in their levels, but are rejected in all tests when they are repeated in their first difference. Hence, the results of the unit root tests presented in this

**Table 3**  
**Unit root Test Results\***

**Drift but no Time Trend**

variables	ADF(0)	ADF(9)	PP(3)	DF-GLS(9)
ldow	-1.39	-1.39	-1.39	-.90
lnap	-1.72	-1.73	-1.70	-1.58
dldow	-5.85	-5.86	-6.14	-5.38
dlnap	-6.10	-6.10	-6.20	-5.60

\*The MacKinnon critical values for rejection of hypothesis of a unit root at the 1, 5, and 10 percent levels are, respectively, -3.64, -2.95, and -2.61. The critical values for DF-GLS are -2.63, -1.95, and -1.61. ADF(d):Augmented Dickey-Fuller test, null of unit root with lag(d). PP(d):Phillips-Perron test, null of unit root with lag truncation at (d=3) has been determined by the Newey-West test.

**Drift and a Time Trend**

variables	DF(0)	ADF(9)	PP(3)
ldow	-2.63	-2.64	-2.78
lnap	-2.70	-2.70	-2.77
dldow	-5.84	-5.84	-7.28
dlnap	-6.02	-6.01	-6.10

The MacKinnon critical values for rejection of hypothesis of a unit root for test with drift and a time trend, at the 1, 5, and 10 percent levels are, respectively, -4.26, -3.55, and -3.21. ADF(d):Augmented Dickey-Fuller test, null of unit root with lag(d). PP(d):Phillips-Perron test, null of unit root with lag truncation at (d=3) has been determined by the Newey-West test.

paper have determined that the variables are non-stationary in levels and therefore, they are I (1). Given that the variables are stationary in their first difference forms, we could conduct our Granger causality test using the first difference forms. However, we employed the Johansen-Juselius (1990) methodology to test for the existence of a long run equilibrium relationship between the two variables. We tried various lag structures and many different deterministic trends. A lag of three with a linear trend in data and only a drift in the cointegrating equation produced one cointegrating vector both based on trace and eigenvalue statistics, implying existence of a unique long run equilibrium relationship between the two variables. These results have not been included in the paper to conserve space. It means that the short term deviations from a long term equilibrium path will have an impact on the changes in the dependent variable in a way which will bring the relationship back to equilibrium once again. Given the results of the cointegration tests, we chose to conduct the Granger causality tests using the two variables in their levels. The results of the test using up to 10 period uniform lags, the

maximum lag length without running into a degree of freedom problem, are presented in Table 4. Judging by the size of the probability, all lags except one produced significant F-statistics, indicating causality running from the stock market to the housing market. More importantly, there is no reverse causality. The unidirectional nature of the causality means that the stock market performance has unambiguously caused housing market performance in the Granger sense. Hence, the recent housing boom can, at least partially be attributed to the recent stock market decline.<sup>3</sup>

**Table 4**  
**Results from Granger Causality Tests\***

Lags	Ho: LNAP does not Granger cause LDOW	Ho: LDOW does not Granger cause LNAP
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1	2.42 (.13)	.19 (.66)
2	1.76 (.19)	4.35 (.02)
3	1.44 (.25)	4.07 (.02)
4	1.55 (.22)	4.70 (.01)
5	1.16 (.37)	3.67 (.02)
6	1.25 (.34)	3.45 (.02)
7	.90 (.53)	4.11 (.02)
8	.62 (.74)	5.07 (.01)
9	.66 (.72)	10.60 (.00)
10	1.18 (.50)	20.54 (.01)

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\*Numbers in the parentheses are the probabilities.

Strong results from the Granger causality test support the existence of a causal link between the two markets, but they do not explain the dynamics of this relationship. In order to gain further insights, we employed lagged correlation analysis between DOW and NAP using a 12 period lag structure. The results are presented in Table 5. All coefficients have the negative sign; and nine out of ten are statistically significant. What is interesting is that the absolute size of the coefficient increases with each successive increase in lag structure, reaching a maximum value at lag of four, and then declining in magnitude. To obtain a visual appreciation of the changing size of these coefficients, we have plotted the computed coefficients in Figure 2. As the figure shows, the coefficients seem to have followed a V-curve. The negative sign of the coefficients and their changing magnitude represents an interesting phenomenon, which seems counterintuitive

and most certainly defies the portfolio re-balancing hypothesis described earlier in the paper. The following is one plausible explanation. In the early part of the stock market decline, the impact on housing prices, though significant and positive is not very large. Many investors are caught flat-footed and they refrain from putting any additional cash into the stock market. They instead begin to look for safe havens, such as buying a house either first time or moving up or buying a second house. At this stage, some investors still cling to a glimmer of hope for the market to turn around. Hence, the investors are disgruntled but not totally discouraged. Hence the flight from stock market and to the housing market is slow and gradual. As the stock market demise continues and losses

**Table 5**  
**Correlation Analysis between Stock and Housing Prices**

Variables	Coefficients
$LNAP_t, LDOW_{t-1}$	-.11
$LNAP_t, LDOW_{t-2}$	-.36 <sup>2</sup>
$LNAP_t, LDOW_{t-3}$	-.67 <sup>1</sup>
$LNAP_t, LDOW_{t-4}$	-.77 <sup>1</sup>
$LNAP_t, LDOW_{t-5}$	-.65 <sup>1</sup>
$LNAP_t, LDOW_{t-6}$	-.61 <sup>1</sup>
$LNAP_t, LDOW_{t-7}$	-.52 <sup>1</sup>
$LNAP_t, LDOW_{t-8}$	-.43 <sup>2</sup>
$LNAP_t, LDOW_{t-9}$	-.42 <sup>2</sup>
$LNAP_t, LDOW_{t-10}$	-.26 <sup>3</sup>
$LNAP_t, LDOW_{t-11}$	-.19
$LNAP_t, LDOW_{t-12}$	-.18

<sup>1</sup>Significant at the one percent level.

<sup>2</sup>Significant at the five percent level.

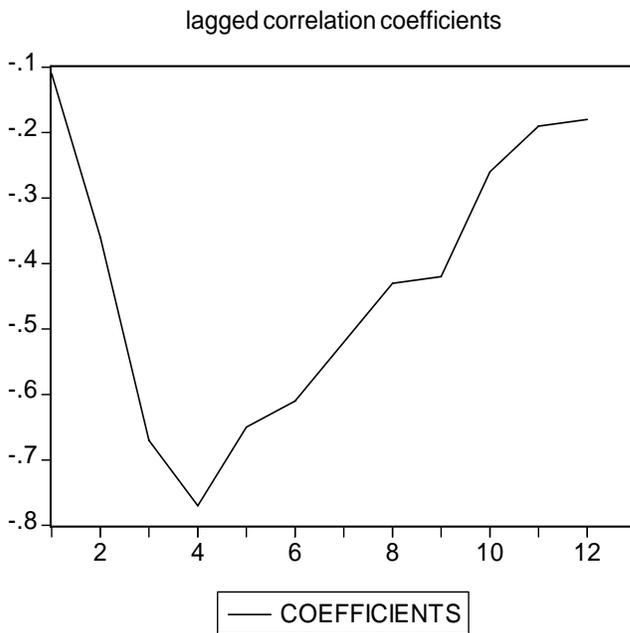
<sup>3</sup>Significant at the ten percent level.

more and more investors begin to despair and there is a hastened urgency to exit the market. Mutual fund redemption becomes quite significant. At this stage, new money-flow into the stock is at its minimum. Instead, there is a net outflow of money. The housing market becomes the main beneficiary as a result of investors rushing to substitute real assets for financial asset. All this shows up in a very large and positive impact of the continued decline in the stock market on the housing market, reflecting in an extremely large negative correlation coefficient. As the stock market decline continues, several things happen. In the wake of a prolonged market decline, negative wealth effect (consumption aspect of owning a house) sets in and housing demand slows. The fear that a falling stock market may ultimately cause a general economic slump with a loss of job and income further helps cool down the buoyant housing demand. Finally, the long and hard fall in stock prices improve valuation, giving rise to bargain hunting. Also, the portfolio re-balancing boosts the demand for financial assets. Thus, the impact of falling stock market on housing market gradually declines in magnitude.

#### IV. Some Concluding Remarks

In this paper we set out to investigate the linkage between housing market boom and the stock market decline in the United States in the most recent stock market decline. Tests results based on monthly data showed the existence of a causal relationship between the two markets. More importantly, the negative wealth effect seemed to have followed a V-curve. The phenomenon is found to be consistent with the rational behavior

Figure 2



of investors at large. The initial impact of stock market decline on housing market, though significant, is relatively small, as investors still ponder a quick turn around in the market. Nevertheless, the evidence indicating substitution of real assets for financial assets is quite unmistakable. The impact gets increasingly larger as the stock market decline becomes more pronounced and a greater degree of despair sets in. At this stage, the pace of substitution seems to accelerate between financial and real assets. Eventually, investors look at any further decline in stock market as an opportunity to bargain hunt due to improved valuation.

The portfolio re-balancing postulate also seems to play an important role at this stage. All this means a smaller impact of further stock market decline on the housing market. The inverse relationship between the two markets implies potentially two opposing macroeconomic effects - a negative wealth effect of financial market decline and a positive wealth effect of housing market boom on consumption spending and on the economy. The offsetting wealth effect poses a serious challenge for the Federal Reserve in trying to formulate an appropriate macroeconomic policy. On a micro level, the findings seem to re-affirm the importance of portfolio diversification and asset allocation strategy. A concerted effort is warranted in educating the investing public on the benefits of a properly diversified portfolio. However, more tests using data for other episodes of stock market decline are needed before any definitive conclusions can be drawn.

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## **Endnotes**

<sup>1</sup>These percentage changes for the DOW have been computed using the monthly closing figures and hide the true extent of the market declines. Using monthly, daily or intra-day highs and lows, almost certainly, will result in higher figures.

<sup>2</sup>In an earlier study Elliot (1980) found that changes in financial wealth tend to have significant effect upon consumption while those in non-financial wealth do not. Some other studies on the subject include Peek (1983), Bhatia (1987), Skinner (1999), Case (1992), Sheiner (1995), Engelhard (1996), and Levin (1998).

<sup>3</sup>These tests were repeated using variables in their levels. The results, not reported here to conserve space, did not change in any significant way.

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