MONETARY POLICY AND HOUSING MARKET: COINTEGRATION APPROACH

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ABSTRACT

There is a general consensus based upon accepted economic theory and empirical research that expansionary monetary policies will positively affect most sectors of the economy, such as the durable and non-durable good industries. Many studies have shown the responses of key economic variables (price and demand) on the housing market to such monetary policies. However, little research has been performed to observe the differentials across housing sub-markets, such as new home construction and existing home sales. Findings regarding these differentials across the two sub-markets will provide valuable insights for both economic policy makers and housing market agents. This study finds that the existing home sales market is more affected by expansionary monetary policies than is the new home construction market.

INTRODUCTION

Economists and policy makers constantly monitor the general status of the economy by weighing both aggregate data (e.g., GDP, inflation, unemployment) and sectoral data (e.g., production by industry) against proper economic policy. When economic growth is sluggish and unemployment rates are high, the central bank may need to adopt expansionary monetary policies. In theory, expansionary monetary policies stimulate production activities, increase consumer confidence, and raise employment levels. In recent years, the Federal Reserve System (FED), which is the central bank in the U.S., has adopted such expansionary monetary policies as the U.S. economy has experienced slow growth and recession since 2001. The execution of these policies has led to the lowest federal funds rate (*liquidity effect*) in the U.S. in over 40 years.

As a result, both consumers and producers can utilize these low interest rates to reduce their borrowing costs and increase their investment expenditures. This increase in expenditures should be realized in a corresponding increase in total GDP. However, numerous empirical studies, such as Christiano et al. (1997), have shown that prices of goods do not respond immediately to expansionary monetary policies. Using U.S. data, their research argues that prices remain at current levels for a substantial period of time. These results imply that the FED should maintain the expansionary monetary policies for durations sufficient to allow the lagged changes in price levels to be realized. Therefore, such expansionary monetary policies will eventually lead to lower interest rates and higher GDP, positively affecting most industries in the economy. The durable-goods industry, which produces goods such as automobiles, computers, appliances, furniture, etc., is one of the sectors affected significantly by interest rate fluctuations. Another, perhaps better, representative of a market susceptible to interest rate fluctuations is the housing market.

This paper will study the effects of changing monetary policies on the housing market by observing the response differentials between new home construction and existing home sales (two housing sub-markets) to interest rate changes. Although several previous studies (Kau and Keenan, 1980; Wheeler, M. and Chowdhury A. R., 1993; Rahman and Mustafa, 1997; He and Winder, 1999; Ahmed and Dua, 2001; Capozza and Li, 2001; Raddatz and Rigobon, 2003; Davis and Heathcote, 2004) have examined the interactions and responses between numerous economic variables on the general housing market and policy changes in the economy, little research has been performed to observe the behavior between these two housing sub-markets. It is commonly accepted that both new home construction and existing home sales are positively affected by expansionary monetary policies. However, the magnitude of the responses may differ between the two sub-markets.

Research into the identification of this response differential should be useful to various economic interests such as economic policy makers and housing market agents. Because new home construction involves construction activities while existing homes sales do not, increases in new home construction over existing homes sales will represent greater infusions to total GDP. Therefore, if new home construction is affected more than that of the existing home sales (or people prefer new homes to existing homes), then expansionary monetary policies will affect the economy more significantly as they create and induce higher construction activities and employment. Increased construction of new homes would put less inflationary pressure on the housing market thanks to increased supply levels to meet the higher

housing demand. Alternately, if expansionary monetary policies (or shock) affect existing home sales more than new home construction, relatively less construction activities and employment would result. A reduction in construction of new homes would put more inflationary pressure on the housing market due to a lack of supply to meet the higher housing demand.

To identify the relationship and the responses in these two sub-markets, this paper employs a cointegration approach, which is a commonly adopted framework in recent time-series research. The Johansen cointegration procedure (1988) is used to determine the presence of any long-term equilibrium linkage between (1) new home construction and monetary policy and (2) existing home sales and monetary policy. The cointegration vectors are then constructed in hopes of identifying any differences between the magnitude and responses of the relationships to the same economic monetary policy.

This paper finds that the demand for existing home sales is more responsive to economic monetary policies (or shock) than is the demand for new home construction. Thus, expansionary monetary policies will induce more inflationary pressure, resulting in relatively less activity in construction and employment.

EMPIRICAL METHODOLOGY

Data

The housing data used in this research were obtained from Bureau of Economic Analysis and U.S. Census Bureau. Data were obtained for total residential structures investment and new home construction, with the data for existing home sales being derived as the difference between residential structure investment and new home construction. The time period chosen is from 1972 to 2003 in quarterly measures. The interest rate data were obtained from the Federal Reserve System. Interest rate data were obtained for the federal funds rate, the 3-month Treasury bill, the 5 year Treasury note, the 10-year Treasury note, and the conventional mortgage from 1972 to 2003 in quarterly measures. An augmented Dickey-Fuller test (1981) was used to determine the existence of unit roots in the levels of the variables. According to Table 1, all the variables have unit roots (are non-stationary) in their level-form, but all are found to be stationary in their first-difference form.

Thus, all variables have single unit roots and are cointegrated in the same order, *I(1)*. Hence, the cointegration test can be performed without a problem. The

lag lengths were chosen accordingly in each model following the results of Akaike's Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) tests. In other words, each model in this study is the most parsimonious with no autocorrelation.

Table 1: Augmented Dickey-Fuller Test

Interest Rate	New Home Construction	Existing Home Sale
-1.312 (-7.506)	-1.887 (-16.801)	-1.715 (-5.942)

Note: The numbers in parenthesis indicate t-statistics for the first differenced variables and they all reject the null hypothesis of the unit root, whereas the numbers in the upper row accept the hypothesis at 5% significance level. Thus, all the variables are non-stationary in levels and have the same single unit roots, ***I***(1).

Cointegration Test

A multivariate cointegration technique proposed by Johansen [1988] and Johansen and Juselius [1990] as a system-based reduced-rank regression approach was used to determine the existence of any long-run equilibrium relationship(s) among the variables. The cointegration test was performed first because the results from that test would be used for the following cointegrating vector analysis. This Johansen and Juselius [1990] test is preferred to the simpler regression-based Engle and Granger [1987] test because it fully captures the underlying time-series properties of the data and thus provides a test statistic for the total number of cointegrating vectors and permits direct hypothesis testing on the coefficients of those cointegrating vectors. In addition, because this test makes all of the variables explicitly endogenous, the results are constant with respect to the direction of normalization that follows. For this cointegration test, the variables are new home construction, existing home sales, and interest rate. The results provide information about the relationships among these variables.

A cointegrating vector implies a long-run relationship among jointly endogenous variables. The more cointegrating vectors the model has, the more stable the system composed of the non-stationary variables will be. According to Table 2, the value of 96.23 exceeds the 95% critical value of the λ_{trace} statistic (29.68) as shown in the first panel.[1] Thus, the null hypothesis of no cointegrating vectors is rejected and the alternative hypothesis of one or more cointegrating vectors is accepted. Next the $\lambda_{trace}(1)$ statistic is used to test the null of $r \leq 1$ against

the alternative of two or three cointegrating vectors. Because the λ_{trace} (1) statistic of 27.64 is greater than the 95% critical value of 15.41, the null hypothesis is rejected. However, λ_{trace} (2) statistic of 0.20 is less than the critical value (3.76) and the null hypothesis is accepted. Therefore, it can be concluded that there are two cointegrating vectors.

Table 2: Results of Johansen Maximum Likelihood Estimation Test

Null Hypothesis	Alternative Hypothesis	95% Critical Value	λ_{trace} Value
$r = 0$	$r > 0$	29.68	96.23*
$r \leq 1$	$r > 1$	15.41	27.64*
$r \leq 2$	$r > 2$	3.76	0.2
Null Hypothesis	Alternative Hypothesis	95% Critical Value	λ_{max} Value
$r = 0$	$r = 1$	20.97	68.58*
$r = 1$	$r = 2$	14.07	27.44*
$r = 2$	$r = 3$	3.76	0.20

Notes: * denotes significance at the 5% level. *r* denotes the number of cointegrating vectors and the 5% critical values of the maximum eigenvalue and the trace statistics are obtained from Enders' RATS Handbook (1996).

Using the λ_{max} statistic, the null hypothesis of no cointegrating vectors ($r = 0$) against the specific alternative $r = 1$ is clearly rejected as the calculated value λ_{max} (0, 1) = 68.58 exceeds the 95% critical value (20.97). Testing $r = 1$ against e alternative of $r = 2$, the calculated value of λ_{max} (1, 2) is 27.44, whereas the critical value at the 95% significance level is 14.07. Therefore, it can be concluded that there are two cointegrating vectors as the test $r = 2$ against $r = 3$ is not rejected. Both tests show there are two cointegrating vectors present among the variables and it can be concluded that there are long-run equilibrium relationships among new home construction and existing home sales and interest rate (or money supply) on the U.S. housing market.

Cointegrating Vector

Table 3 displays the values of the coefficients in one of the cointegrating vectors.[2] As long as the estimated coefficients have the same direction (positive or

negative) as those predicted by economic theory, the vector does adhere to economic convention.

Table 3: Normalized Cointegrating Vector		
New Home	Interest Rate	Existing Home
1.000	-3.02	0.27
Existing Home	Interest Rate	New Home
1.000	-11.14	3.69
Note: The cointegrating vector is normalized with respect to new home and existing home sales, respectively. The signs of all the coefficients are consistent with general expectations.		

All the coefficients in Table 3 are consistent with theoretical predictions and the findings of most empirical studies. There is a negative relationship between the interest rate and both new home construction and existing home sales. The normalized cointegrating equations in vector notation in Table 3 can be expressed as follows:

New Home Construction = Constant - 3.02 Interest Rate + 0.27 Existing Home Sales: normalized with respect to new home construction *(1)*
Existing Home Sales = Constant - 11.14 Interest Rate + 3.69 New Home Construction: normalized with respect to existing home sales *(2)*

Once again, these estimates convey useful information regarding the way new home construction and existing home sales are linked to the interest rate in the long run. In order to identify which housing sub-market, new home construction or existing home sales, is more responsive to monetary policies (or shock), the coefficients of the interest rate variable need to be compared. According to equation (1), when the interest rate (short-term)[3] declines by one unit, the demand for new home construction increases by 3.02 units. However, according to equation (2), the demand for the existing home sales increases by more than eleven units to the same one unit decrease in the interest rate. Thus, this finding concludes that the demand for existing home sales is more responsive to changes in the interest rate than is the demand for new home construction. Hence, when the central bank adopts expansionary monetary policies to stimulate the general economy, the housing market is affected positively as more consumers try to take advantage of lower

financing costs. This will lead to more consumption activity in the housing market. However, as the findings in this study reveal, consumers tend to purchase existing homes more than they construct new homes. As consumers spend more on purchasing existing homes, it is expected that the price of those homes will increase substantially since the supply is fixed. In addition, as consumers invest in existing homes, less construction activities are expected compared to the demand created when consumers invest in new home construction. Hence, this study implies the following:

a) Expansionary monetary policies will affect the housing market positively as more demand for both new and existing homes is expected.
b) The demand for existing homes is greater than the demand for new homes as the coefficient of the interest rate in equation (2) is greater than that of the same interest rate in equation (1).
c) The findings may imply there will be a lower increase in employment within the housing market and relatively higher inflationary pressure in the economy.
d) Federal, state, and local government officials are advised to provide more incentives to consumers and builders to encourage more investment in new home construction.

CONCLUSION

Expansionary monetary policies have a positive affect on the housing market and the economy. Though there have been numerous empirical research studies that have shown the responses of the housing market to policy changes in the economy, few studies have attempted to show how the policies differentially affect housing sub-markets. Addressing these voids in the literature, this study reveals the effectiveness of monetary policies on the housing market by separating the market into new home construction and existing home sales. The information regarding the effectiveness on new home construction and existing home sales, respectively, may provide useful insights to both economic policy makers and housing market agents.

This study finds that the demand for existing homes is more responsive to expansionary monetary policies (or shock) than is the demand for new home construction. Though the labor market will be stimulated in general by expansionary monetary policies, the increase in employment in the housing market

sector will be smaller than if the demand for new home construction exceeds the demand for existing homes. Additionally, the inflationary pressure within the housing market will be greater due to the relatively fixed supply of existing homes.

In this case, economic policy makers should provide more motivation and tax benefits to housing producers to induce more and lower cost new home construction. In addition, economic policy makers should provide more motivation and tax benefits to home purchasers to induce increased levels of new home construction.

ENDNOTES

[1] To conserve space, the cointegration model is not described here as Johansen (1988) and Johansen and Juselius (1990) provide a detailed description of the test procedure.

[2] This paper shows only one cointegrating vector since there is no qualitative difference across the two vectors.

[3] The 3-month Treasury bill rate is used for current cointegration vectors and equations. Furthermore, the finding is robust to remaining types of interest rates with no qualitatively different results across the interest rates.

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