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**“Housing, Credit Constraints, and Macro Stability:  
The Secondary Mortgage Market  
and Reduced Cyclicity of Residential Investment”**

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## 1. Introduction

Residential construction is a volatile industry. The growth rates of production and sales of new houses and apartments have changed often and by large amounts over relatively short periods. Even though on average it comprises only about five percent of aggregate production in the United States, residential investment has often accounted for far larger shares of fluctuations in (real) GDP. Figure 1 plots residential investment as a percent of potential GDP (RESINV) for the 1968-2004 period. Over that period, RESINV ranged from about three percent to over seven percent of potential GDP, registering a standard deviation of 0.84 percentage points. Figure 1 also shows that RESINV rose and fell markedly with real income, as measured by GAP, the percentage by which actual fell short of potential GDP. After rising by about two percentage points of potential GDP during the economic expansions of the 1970s and 1980s, RESINV then fell by similar amounts around subsequent recessions.

Since then, however, RESINV seems progressively less procyclical. Despite widespread problems in the banking system and a recession during 1990-91, RESINV fell relatively little. During the vigorous and extended economic boom of the 1990s, RESINV advanced less than it had typically. It then retreated only modestly during the 2001 recession and recovered only modestly after 2001.

Since the 1960s, the volatility of GAP itself has also moderated, but not so much as has RESINV. Compared with the 1968-1987 period, during the 1988-2004 period the standard deviations of GAP and the mortgage interest rate (RMTG) were 41 and 51 percent lower, while that of RESINV declined by 64 percent. Also notable were the declines in the simple correlations of RESINV with GAP and RMTG, from 0.77 to 0.43

and from -0.74 to -0.24. Thus, it appears that the volatility of residential investment fell relative to that of the macroeconomy and that it became less correlated with it as well.

Not surprisingly, mortgages show similarly waning procyclicality. Figure 2 plots total residential mortgage balances (MORTBAL), mortgages held by mortgage pools (POOLS), and the difference between them (NONPOOLS), each as a percent of potential GDP. MORTBAL was approximately trendless until the early 1980s and afterward noticeably trended upward. MORTBAL showed a notable tendency through the 1980s to rise and fall during macroeconomic expansions and recessions. Because POOLS was small and fluctuated little, fluctuations in MORTBAL mirrored those of NONPOOLS. More recently, however, fluctuations in MORTBAL and in its components have been less apparent. The dramatic growth of the less procyclical component, POOLS, has coincided with reduced volatility of MORTBAL. During the 2001 recession, for example, while NONPOOLS retreated somewhat, POOLS rose enough to raise MORTBAL.

Here, we provide some reasons and empirical evidence that the development and growth of the secondary mortgage market may have raised the average level of residential investment and simultaneously dampened its responses to macroeconomic forces.

## **2. The Secondary Mortgage Market and the Level and Volatility of Residential Investment**

Fluctuations in residential investment result from shifts in demand for and supply of housing. Because both residential construction and purchases typically require considerable borrowing, shifts in the demand for and supply of construction loans and

purchase mortgages can also have important effects on residential investment. The magnitudes of the fluctuations in residential investment reflect, among other factors, the magnitudes of, and responses to, fluctuations in income and interest rates. In the case of residential investment, these responses are likely accentuated by nonprice credit rationing of borrowers by lenders, and accentuated further by regulatory restrictions on lenders that impinge on housing finance. Minimum down payment ratios and credit scores and maximum payment ratios, as well as (former) restrictions on interest rates and mortgage instruments, likely increased the effective responses of housing demand, in part through mortgage supply, to income and interest rates.

Financial innovation and deregulation, as well as technological advances in such areas as information processing and credit risk evaluation, have increased the efficiency of primary mortgage markets. Increased efficiencies have also fostered the growth and development of the secondary mortgage market (SMM). The SMM involves the trading both of whole mortgages and of MBS that represent either pro rata or designated portions (“tranches”) of pools of residential mortgages. The SMM allows mortgage originators, whether they are banks or nonbanks, to more cheaply and easily sell mortgages to others. They also allow investors, whether they are mortgage-originating banks or nonbanks, to buy and sell MBS. Both private sector participants and government-sponsored enterprises (GSEs) hold whole mortgages, pool mortgages and sell the associated MBS, and hold MBS in portfolios. (We use the term “bank” to refer to any depository institution.)

By reducing the credit and liquidity costs and risks associated with holding both whole mortgages and MBS, the SMM may dampen fluctuations in residential investment.

Being backed by pools of mortgages of different borrowers in different locations and market segments, MBS provide investors with geographic, occupational, and other forms of diversification. The SMM, then, allows localized lenders to swap whole mortgages for more diversified MBS. The SMM also provides other lenders, such as insurance companies, trusts, and pension funds with ready access to diversified pools of mortgages. The SMM further raises the demand for mortgages directly and indirectly by raising the demand for MBS, by reducing the costs of trading mortgages. By providing an efficient mechanism in case banks want to sell their mortgages, the SMM raises banks' supply of mortgage funds. In addition, over our sample period, GSEs apparently substantially increased their demand for holding mortgages in the form of MBS in their so-called retained portfolios.

By reducing the costs to banks of shedding mortgages, the SMM allows banks to originate more mortgages than they otherwise would in the face of tighter monetary policy. When monetary policy begins to reduce the supply of mortgage credit from banks, at least some portions of the SMM provide additional mortgage funds, which cushions declines in mortgage flows, and thereby in residential investment, during recessions. In this regard, a larger SMM would be expected to partially offset the bank lending channel of monetary policy that was emphasized by Kashyap, Stein, and Wilcox (1993), as well as the bank capital channel that was emphasized by Peek and Rosengren (1992) and by Hancock and Wilcox (1993).

Disruptions to financial markets other than those directly associated with monetary policy shocks can also affect banks' and other investors' demands for mortgages. For example, contributing to the severity of the 1990-1991 recession was the

“bank capital crunch,” during which loan losses reduced banks’ capital enough to reduce their supplies of credit, including mortgage credit.

Banks can ease their capital shortfalls by selling mortgages, or even swapping them for GSEs’ MBS. The reduced Basel capital requirements on MBS means that the SMM helps insulate the residential mortgage, and thus construction, market from adverse bank capital shocks.

The perceived credit risk of MBS is further reduced by the “conjectural” guarantees provided by the GSEs, via the federal government. The SMM also mitigates business-cycle related fluctuations in mortgage supply, and thereby in residential investment, if the perceived credit risks of MBS tend to rise less than on whole mortgages during recessions. This conjectured government guarantee lowers the costs to GSEs of non-MBS GSE debt, and thereby lowers GSEs’ costs of funds relative to others’ costs. Such increases in the relative risks and associated premiums on whole mortgages provide GSEs with incentives to act countercyclically. Thus, when housing-related GSEs increase their supplies of mortgage activities in response to recessions or financial disruptions, they serve as shock absorbers that lessen the fall-off in the supplies of home mortgages, stabilizing residential mortgage markets and residential investment.

In addition to their direct financial incentives, GSEs may sometimes engage in countercyclical purchases of mortgages and mortgage-backed securities to fulfill part of the mission implied by their federal charters. During periods of widespread stress or disruption in mortgage markets, GSEs’ public charters may encourage them to sustain their participation at levels above those of purely private enterprises. In addition, GSEs may historically have been advantaged relative to banks by being less constrained by

financial markets, by regulations, or by regulators. Such advantages might take the form of lower capital requirements, fewer disclosure requirements, and investors' perception of a government guarantee (Silverman and Wiggins 2003).

By lowering the costs and risks of holding mortgages, the SMM likely has increased the supply of mortgage credit and thereby raised the average level of residential investment. The SMM has also helped integrate local U.S. residential mortgage markets into national and even international capital markets (Devaney and Pickerill 1990, Goebel and Ma 1993, Rudolph and Griffith 1997, Federal Reserve Bank of Minneapolis 2001). This integration effectively flattens the supply curve of mortgage funds available domestically. A possible repercussion of the increasing financial integration associated with a larger SMM is that mortgage supply and residential investment would decline less in response to higher interest rates. The net effect of a larger SMM on mortgage supply and residential investment of higher incomes would reflect the offsetting effects of greater access to the capital markets and reduced intervention by GSEs. (This presumes that GSEs tend to act, if not countercyclically, at least less procyclically than other lenders.).

### **3. Specification and Data for a Model of Residential Investment**

We posit that the aggregate desired stock demand for housing depends on a number of macroeconomic factors. The considerable construction lags and the likelihood of convex adjustment speed costs suggest that the housing stock adjusts gradually, for example by a constant fraction, to discrepancies between the desired and actual housing stock. Gross residential investment is the sum of that net investment plus the depreciation of the housing stock, which we assume to be a constant fraction of the prior

period's housing stock. Thus, the current flow of residential investment depends on the determinants of the current desired housing stock and the prior period's actual housing stock. The resulting coefficient on the prior housing stock is the difference between the (low) depreciation rate of the housing stock and the (presumably much larger) adjustment speed of the housing stock. Thus, we posit, not an ECM for the flow of residential investment, but rather that residential investment is the flow that reflects the error-correction or partial adjustment of the actual to the desired housing stock.

Peek and Wilcox (1991) showed that prices of houses were detectably correlated with measures of income, interest rates, inflation, and population. Here, we focus on their effects on real quantities, using quarterly data for 1968Q1-2004Q4 to estimate the responses of RESINV to such macroeconomic factors. Following Browne (2000), to allow for the effect of income, we include the percent gap between potential and actual real GDP (GAP). Higher interest rates might not only reduce households' demand for housing, but also homebuilders' supply of housing, via financing costs and credit availability. Following Arcelus and Meltzer (1973) and McGarvey and Meador (1991), financing effects on RESINV are captured by including the nominal mortgage interest rate (RMTG). To permit the data to determine whether nominal or real mortgage interest rates (or some combination of the two) affect housing, we separately include the annualized percentage change in the GDP deflator (INFLAT).

Homeownership rates rise dramatically as young adults age. Thus, we also include a variable that measures the flow of additional potential homebuyers into traditional ages for home buying: POPGRO is the percentage change over the past four quarters of the population aged 25-44. We also construct and include a variable that

measures, relative to potential real GDP, the prior period's actual housing stock (HYPOT). We assume that the ratio of the actual real value of the (reproducible) housing stock to potential real GDP in 1952 was 0.75. We then use the perpetual inventory method and an assumed annual depreciation rate of 1.2 percent to calculate each quarter's real housing stock.

We sought estimates of whether and how much the SMM affected housing construction on average and how much it affected the fluctuations of RESINV via its effects on its responses to macroeconomic factors. As such, our estimating specification includes the income, interest rate and inflation variables individually and interacted with S, our measure of the size of the SMM. We then approximate the determinants of RESINV with the following relation that is linear in the parameters:

$$(1) \quad \text{RESINV} = a_1 + a_{s1} * S + a_2 * \text{GAP} + a_{s2} * \text{GAP} * S + a_3 * \text{RMTG} + a_{s3} * \text{RMTG} * S + a_4 * \text{INFLAT} + a_{s4} * \text{INFLAT} * S + a_5 * \text{POPGRO} + a_6 * \text{HYPOT}.$$

We considered several different time-series measures of the influence of the secondary mortgage market. Various measures included or excluded private MBS, included or excluded GSEs' holdings of MBS, and so on. Many such measures follow the general pattern of having been nearly negligible (relative to potential GDP) before the 1970s and having grown enormously since, especially during the decade of the 1990s. We report results based on S, the ratio of the total principal value of mortgages held by all mortgage pools to potential nominal GDP. We indexed S to equal one at the end of the sample period (2004Q4) for ease of interpretation, so that S rises from near zero in 1968 to one at the end of our estimation period. Thus, at the beginning of the sample period, the interaction terms add virtually nothing to the estimated total effect of the

variables on RESINV. At 2004Q4, when S was one, the total response of a variable was estimated to have changed by the size of the estimated coefficient on its interaction term. The estimated effects of the right hand side variables by 2005 equal the sums of the coefficients on the variable entered separately plus the coefficient on the variable interacted with S.

We estimate (1) using an instrumental technique. We treated income, interest rates, inflation, and the SMM as being endogenous with respect to RESINV. As instruments, we include current values of POPGRO, of HYPOT, and of the share of the population that is aged 25-44 (YOUNG). In addition, we include a dummy variable for each of the four quarters of 1980 to capture the disruptions associated with the imposition and removal of credit controls. We also include the one-period lagged values of RESINV, GAP, RMTG, INFLAT, POPGRO, HYPOT, and of the yield spread between Baa and Aaa-rated corporate bonds. The estimation procedure also allows for first-order autocorrelation of the error term.

#### **4. Regression Results**

Table 1 presents the results of estimating full and truncated versions of equation (1) for the full (1968-2004) sample period and for its second half. Column 1 of Table 1 contains the results from estimating a truncated version that omits the three interaction terms. The results for the variables entered singly confirm our expectations. A larger secondary mortgage market, higher incomes, lower mortgage interest rates, and faster growth of the numbers of potential home buyers each have significant effects on residential investment. The insignificant coefficient on the inflation rate is not an

atypical finding and suggests that nominal, rather than real, interest rates tend to affect housing.

The positive coefficient for  $S$  is particularly striking, since throughout the 1990s, when  $S$  was largest, residential investment was below its historical average. Presumably  $RESINV$  was low then because of low  $POPGRO$ . These estimates suggest that the growing secondary mortgage market averted a potentially large decline in residential investment. In both columns 1 and 2, the larger the housing stock relative to potential GDP, the lower is  $RESINV$ , as we suggested above.

Column 2 presents the results when we add the terms interacted with  $S$ . The positive coefficient in row 3s suggests that, as  $S$  rose, interest rates had less and less negative effects on residential investment. The effect is significant at the ten, but not the five, percent level. The interaction terms for both  $GAP$  and inflation are nowhere near being significant. Thus, column 2 makes for a suggestive, but not overly compelling, case that the larger SMM cushions the effects of higher interest rates on residential investment.

Column 3 then differs only using the second half of the sample period: 1988:Q2 to 2004:Q4, which omits the period when the SMM was relatively small. It also avoids periods when our estimates might be distorted by the imposition and removal of price controls, the 1980 credit controls, and the period before almost complete deregulation of interest rates. In column 3, the interaction terms for both  $GAP$  and  $RMTG$  are now both statistically significant. Thus, as the secondary mortgage market became larger, the impact of fluctuations in income and interest rates on residential investment weakened.

At low enough levels of  $S$ , the offsetting impact of any variable on residential investment would be negligible. Then column 3 indicates that lower incomes or higher mortgage interest rates reduce residential investment. As  $S$  rises, the offsetting effect of the SMM also rises, which implies that the responses of residential investment to incomes and to interest rates was dwindling as the SMM grew larger. In that regard, these results suggest that the larger secondary mortgage market tended to reduce the volatility of residential investment. The point estimates in rows 2s and 3s suggest offsets that might be implausibly large. It seems unlikely that the net effects of either income or interest rates have gone to zero or switched signs. More likely is that both effects have been tempered by the increasing size of the secondary mortgage market over the entire sample.

## **5. Summary and Implications**

We estimated to what extent the secondary mortgage market affected residential investment. The results provide some suggestive evidence that the larger secondary mortgage market, particularly more recently, tended to reduce the responsiveness of residential investment to income and interest rates. The results also suggested that the larger secondary mortgage market raised the average level of residential investment.

Considerable note has been taken of the reduced volatility of the U.S. economy. Among the reasons that have been put forth for the great moderation of the volatility of GDP are reduced volatilities of external shocks and of policy shocks. Over the same period, the secondary mortgage market grew enormously and the volatility of residential investment shrank relative to that of income and of interest rates. To the extent that the responses of residential investment to incomes and interest rates fell as the secondary

markets grew, the development of the secondary market might well have contributed importantly to the reduced volatility of the U.S. economy.

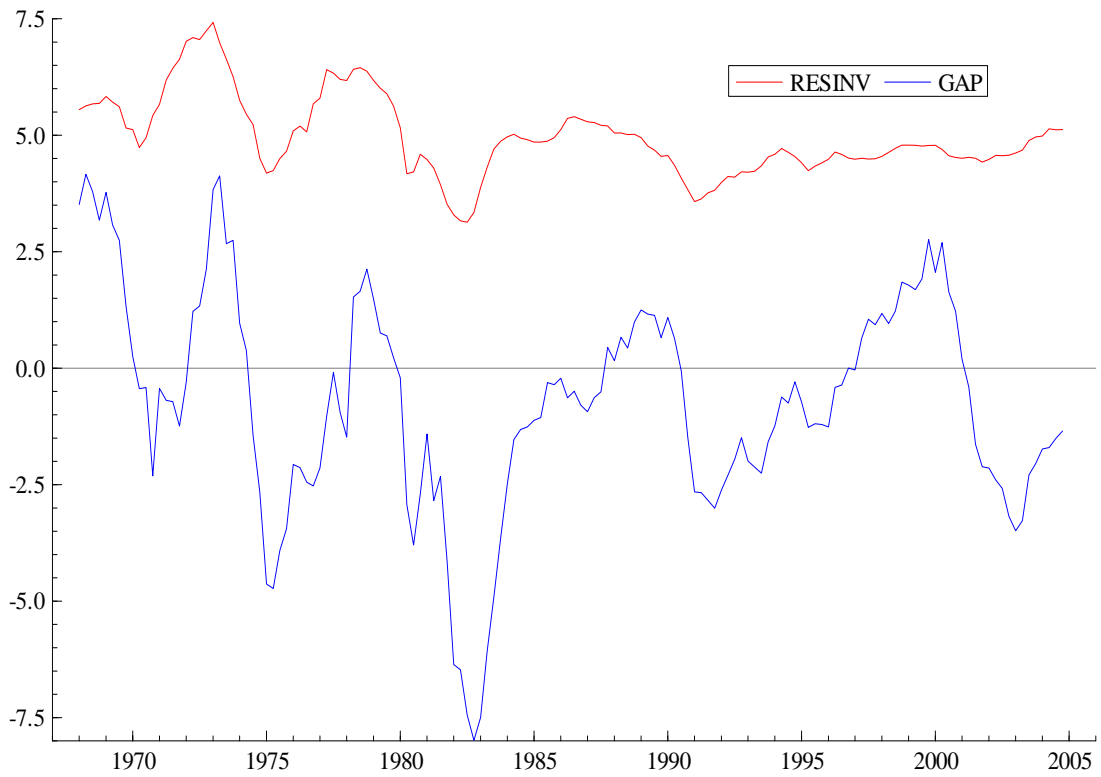
## References

- Arcelus, F. and A. H. Meltzer. "The Markets for Housing and Housing Services," *Journal of Money, Credit and Banking*, Vol. 5, Issue 1, Part 1, Feb., 1973, 78-99.
- Browne, L. E. "National and Regional Housing Patterns," *New England Economic Review*, July-August 2000, pp.31-57.
- Devaney, M. and K. Pickerill . "The Integration of Mortgage and Capital Markets," *Appraisal Journal*, Vol. 58, Issue 1, January 1990, pp. 109-114.
- FRB Minneapolis 2001, Annual Report, p. 3.
- Goebel, P. R. and C. K. Ma. "The Integration of Mortgage Markets and Capital Markets," *Journal of the American Real Estate & Urban Economics Association*, Vol. 21, Winter 1993, pp. 511-538
- Hancock, D., and J. A. Wilcox. "Was There A 'Capital Crunch' in Banking? The Effects on Real Estate Lending of Business Conditions and Capital Shortfalls." *Journal of Housing Economics*, December 1993, v.3(1), pp. 31-50
- Kashyap, A., J. C. Stein, and D. W. Wilcox. "Monetary Policy and Credit Conditions: Evidence form the Composition of External Finance," *American Economic Review*, Vol. 83, 1, March 1993, pp. 78-98.
- McGarvey, M. G. and M. Meador. "Mortgage Credit Availability, Housing Starts and the Integration of Mortgage and Capital Markets: New Evidence Using Linear Feedback," *Journal of the American Real Estate & Urban Economics Association*, Vol. 19, No. 1, 1991, pp. 25-40.
- Peek, J. and E. Rosengren. "Neither Borrower Nor Lender Be," *Journal of Money, Credit, and Banking*, 1993.
- Peek, J. and J. A. Wilcox, "The Measurement and Determinants of Single-Family House Prices," *AREUEA Journal*, Fall 1991a, pp. 353-382.
- Peek, J. and J. A. Wilcox, "The Baby Boom, "Pent-Up" Demand, and Future House Prices" *Journal of Housing Economics*, Fall 1991b, pp. 347-367.
- Rudolph, P. M. and J. Griffith. "Integration of the Mortgage Market into the National Capital Markets: 1963-1993," *Journal of Housing Economics*, Vol. 6, No. 2, June 1997, pp. 164-183.
- Silverman, Gary and Jenny Wiggins. "FHMC Crisis puts Pressure on Treasury," *Financial Times*, June 18<sup>th</sup>, 2003, P. 19.

**Figure 1**

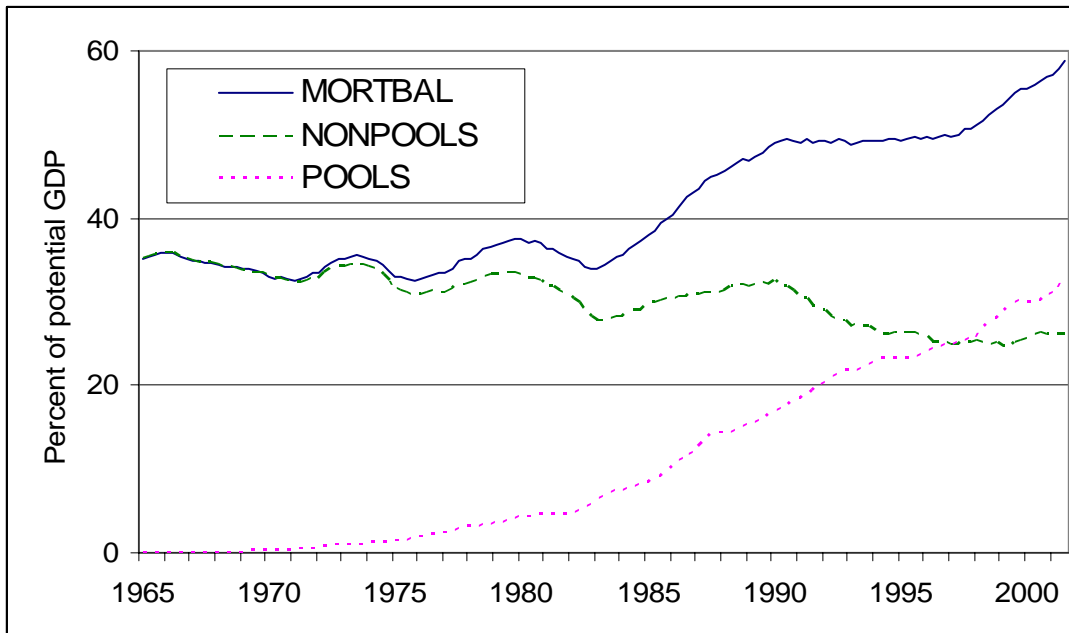
**Real Residential Investment and the GDP Output Gap**

(Percent of Real Potential GDP, Quarterly, Seasonally Adjusted, 1968Q1-2004Q4)



**Figure 2**

**Residential Mortgages:  
Total Balance, Total not Held by Mortgage Pools,  
and Total Held by Mortgage Pools**



Notes: Period: 1965Q1 to 2001Q3. End-of-quarter balances, not seasonally adjusted. MORTBAL includes single family and multiple family residential mortgages. POOLS includes outstanding principal balances of MBS including both private and federally-related. Balances are expressed as a percentage of nominal potential GDP.  
Sources: Board of Governors of the Federal Reserve System, Federal Reserve Bank of St. Louis FRED database, [www.freelunch.com](http://www.freelunch.com).

**Table 1****Impacts of the Secondary Mortgage Market on Residential Investment**

Row	Independent Variables	Sample	1968Q2-2004Q4	1968Q2-2004Q4	Period		
		1968Q2-2004Q4	(1)	(2)	1988Q2-2004Q4		
			(1)	(2)	(3)		
1	C	26.065***	(4.08)	39.841***	(4.62)	-18.257	(1.10)
1s	S	2.447**	(2.28)	0.123	(0.04)	-2.863	(1.23)
2	GAP	0.251***	(8.70)	0.240***	(5.22)	0.813***	(4.83)
2s	GAP*S	-		0.013	(0.05)	-1.076***	(3.72)
3	RMTG	-0.212***	(4.17)	-0.233***	(3.81)	-0.573**	(2.51)
3s	RMTG*S	-		0.574*	(1.75)	1.001***	(2.63)
4	INFLAT	0.011	(0.58)	0.037	(1.51)	0.008	(0.15)
4s	INFLAT*S	-		-0.036	(0.48)	0.049	(0.58)
5	POPGRO	1.190***	(4.51)	1.436***	(4.01)	0.370	(1.23)
6	HYPOT	-0.198***	(3.10)	-0.334***	(4.07)	0.215	(1.49)
7	RHO	0.877***	(20.21)	0.917***	(23.63)	0.844***	(14.94)
<b>Summary</b>							
Statistics: Number of Observations			147	147		67	
Mean of Dependent Variable			4.96	4.96		4.53	
Adj. R-squared			0.95	0.95		0.94	
Standard Error of Estimate			0.18	0.18		0.09	
Durbin-Watson			2.36	2.18		1.47	

Notes: Absolute values of t-statistics in parentheses.

\*\*\* significant at the 1 percent level

\*\* significant at the 5 percent level

\* significant at the 10 percent level