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Increased Real House Price Volatility Signals Break from Great Moderation

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The shift toward more volatile real house price growth, unaccompanied by a shift in the volatility of real GDP growth, offers evidence that house price dynamics and real output growth may have diverged beginning around the 2001 recession.

U.S. house price increases consistently outpaced the rate of inflation beginning in the mid-1990s before peaking in 2005. Residential construction accelerated in many advanced economies—not just the U.S.—with housing accounting for a larger share of real gross domestic product (GDP) as prices rose. Many investors, homeowners and even some policymakers seemed to assume that house prices would never fall.

By 2007, emerging strains in housing markets and financial turmoil plunged the world economy into a deep and protracted recession from which recovery is ongoing. In the aftermath of that recession, the growth of real (inflation-adjusted) house prices appears to have moved out of step with the growth of real economic activity—indicating a possible break with the recent past.

Our findings indicate that the 2007 global downturn wasn't strikingly different from other post-1984 recessions, based on real GDP. After 1984—a period known as the Great Moderation because of diminished macroeconomic volatility—stretches of heightened volatility in real GDP growth became shorter, roughly corresponding with U.S. recessions. Volatility increased with the 2007 downturn, as had happened in other post-1984 recessions.

The findings paint a different picture for real house prices. Volatility in house price growth decreased at the onset of the Great Moderation in the U.S. A similar decline in volatility extended more broadly to include most developed countries in the Organization for Economic Cooperation and Development (OECD), starting in the mid-1990s. However, volatility in house price growth substantially reemerged following the 2001 recession, signaling a departure from the norm under the Great Moderation.¹



Data on House Prices and GDP Growth

The findings are derived from the Federal Reserve Bank of Dallas' new database of international house prices, assembled from available national sources for 19 OECD countries on a quarterly basis from first quarter 1975 to fourth quarter 2010.² The house price index selected for each country was chosen to be comparable to the Federal Housing Finance Agency quarterly U.S. house price index for existing single-family houses (formerly the Office of Federal Housing Enterprise Oversight index).³ Each nominal index is expressed in real terms (adjusted for inflation), using the applicable country's personal consumption expenditure (PCE) deflator.

The developed-country index of real house prices aggregates the 19 country indexes, each weighted relative to that nation's 2005 GDP. Similarly, a weighted, average real GDP is calculated for the group. U.S. figures are separately investigated.⁴ House price and GDP growth rates for the aggregated 19 OECD countries and the U.S. are computed on a quarter-over-quarter, annualized basis (*Chart 1*). U.S. recessions, as designated by the National Bureau of Economic Research (NBER), are identified and appear to indicate that OECD-19 and U.S. downturns tend to be highly correlated.

Chart 1 offers some support for an OECD (2005) claim that real house prices became "strikingly out of step with the business cycle" beginning in the 1990s. Real house price growth in the OECD-19 bottomed out following the 1991 recession and began increasing in the second half of the 1990s.⁵ The house price growth rate kept climbing until around 2005, even though real GDP growth didn't similarly increase and even weakened around the 2001 recession. This apparent divergence is somewhat less evident for the U.S., but it can be argued that house price growth in the U.S. also resumed in the 1990s and outperformed real GDP growth in the first half of the 2000s.

Even so, these observations alone

cannot validate the view that real house price and real GDP growth have become more dissimilar over time. Modeling the dynamics of these series may provide more robust empirical support and clues as to what accounts for the apparent break.

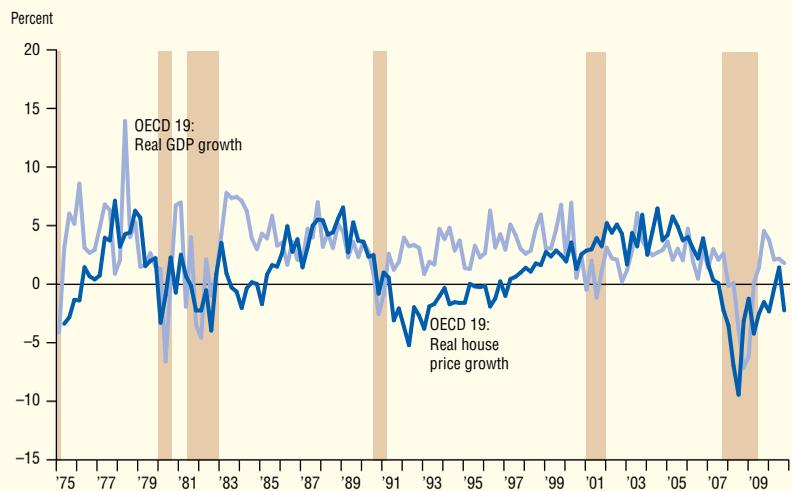
Modeling the Data

We model real house price growth as alternating between two regimes, each characterized by different dynamics. Specifically, we allow the expected rate of real house price growth and its volatility to differ across

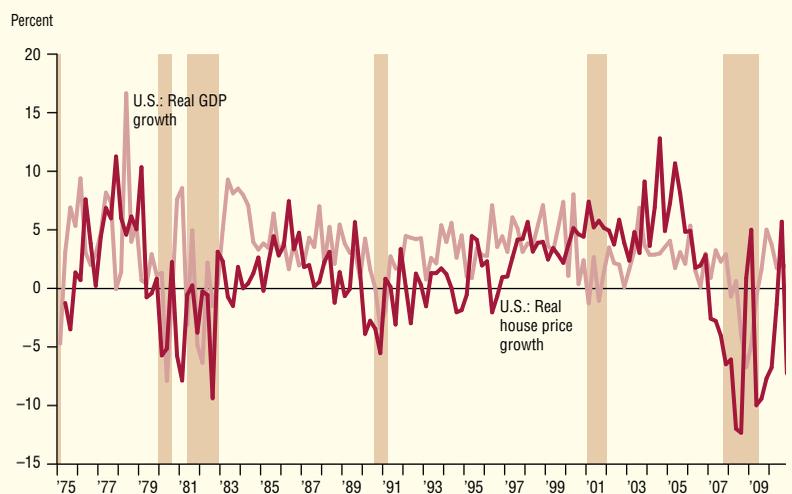
Chart 1

Real House Price Growth and Real GDP Appear to Diverge Beginning in 1990s

A. OECD-19



B. United States



NOTES: Shaded areas represent official National Bureau of Economic Research recessions for the U.S. Individual country sources and the aggregation method are detailed in the Federal Reserve Bank of Dallas international house price database. All series plotted are growth rates computed on a quarter-over-quarter, annualized basis.

SOURCES: Haver Analytics; OECD Economic Outlook 89 database; individual country sources; authors' calculations.



the two regimes. Applying this model to the data—for both the OECD-19 and U.S.—we obtain estimates of expected growth and volatility in each regime, as well as the probability of switching from one regime to the other.

Given those probabilities, we can infer for any given quarter in our sample how likely it is that real house price growth in the OECD-19 and U.S. is best characterized by one regime or the other, based on the data observed to that point.⁶ We model real GDP

growth for the OECD-19 and U.S. in an analogous way.

Our estimates show that for both real house price and real GDP growth—in the OECD-19 and U.S.—low expected growth goes hand in hand with high volatility. As it turns out, though, differences across regimes in expected growth are small compared with differences in the volatility of growth. Thus, in what follows, we focus on the differences in volatility and, for simplicity, refer to our regimes as “high volatility” and “low volatility.”

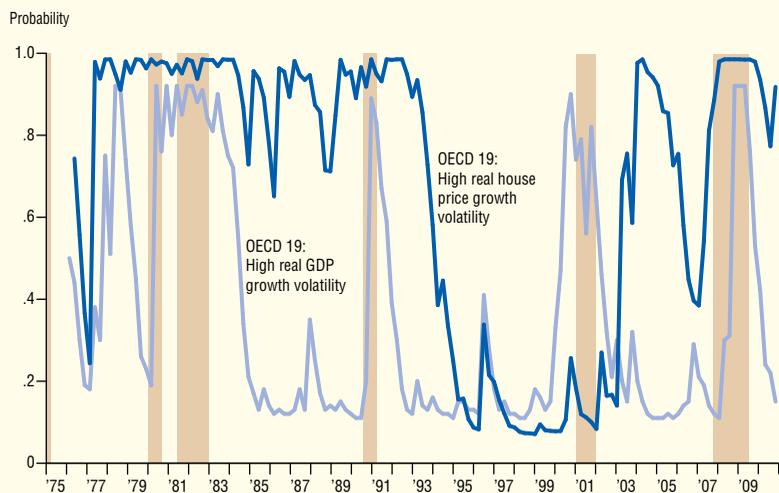
The probabilities that real house price growth and real GDP growth are in their high-volatility regimes are shown in Chart 2. The series are derived independently so that the probabilities of high volatility in real house price growth are not affected by the strength of real economic activity or by the occurrence of the high-volatility regime for real GDP growth.

How do we interpret these probabilities? For example, consider the real house price series for the U.S. From 1993 to 2003, the probability of being in the high-volatility regime is below 0.2 and is often quite a bit lower. Based on this, real house price growth was almost certainly in its low-volatility regime over that period. In contrast, throughout the most recent recession, real house price growth was almost certainly in its high-volatility regime, with implied probabilities uniformly close to 1.

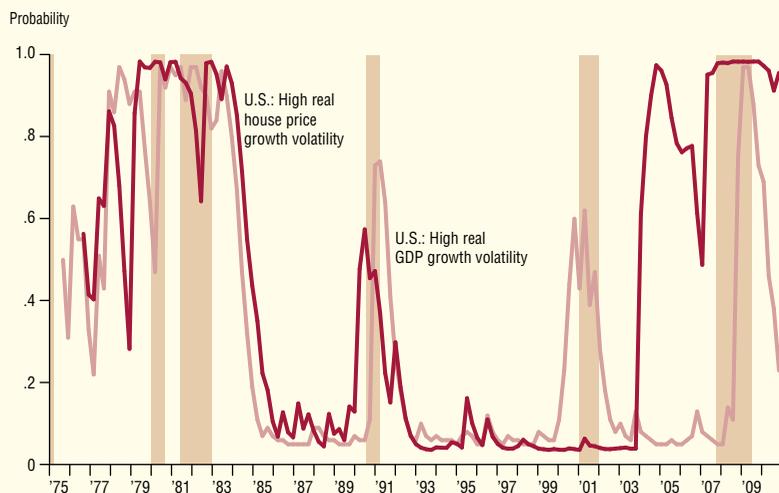
With this illustration in mind to help us interpret the empirical evidence presented in Chart 2, we see that U.S. real house price growth has been in the low-volatility regime considerably more often than OECD-19 growth has been. For U.S. house price growth, volatility fell around the mid-1980s—roughly coinciding with the onset of the Great Moderation—and remained low almost continuously through the early 2000s, interrupted only by the 1990–91 recession. For OECD-19 house price growth, the transition from high to low volatility occurred later, around the mid-1990s. However, both the U.S. and OECD-19

Chart 2
Modeling Shows High Real House Price Volatility
After 2001 Recession

A. OECD-19



B. United States



NOTES: Shaded areas represent official National Bureau of Economic Research recessions for the U.S. Individual country sources and the aggregation method are detailed in the Federal Reserve Bank of Dallas international house price database.
SOURCES: Haver Analytics; OECD Economic Outlook 89 database; individual country sources; authors' calculations.

appear to have returned to high-volatility regimes after the 2001 recession, with estimated volatility around six times greater than in the low-volatility regimes.

Real GDP growth was rather volatile in the OECD-19 and U.S. during the 1970s and early 1980s—a period when real house price growth was also very volatile. Since around 1984, occurrences of the high-volatility regime have become rare in both the OECD-19 and U.S.—this is characteristic of the Great Moderation. Moreover, occurrences of the high-volatility regime for real output growth have become closely associated with NBER-designated recessions in the U.S.

OECD-19 and U.S. probabilities and recessions are highly synchronized, especially after 1984. Thus, the corresponding probabilities of high volatility appear to be a coarse indicator of recession.

However, we fail to detect a sustained shift toward high volatility in real GDP growth preceding the 2007 global downturn similar to the one in the early 2000s for real house price growth. In fact, by this metric, the latest recession is indistinguishable from the two preceding ones, in 1990 and 2001. The shift toward more volatile real house price growth, unaccompanied by a shift in the volatility of real GDP growth, offers evidence that house price dynamics and real output growth may have diverged beginning around the 2001 recession.

Beyond the Empirical Facts

A shift in the volatility of real house price growth appears to have occurred over the last decade without a similar change in real GDP growth. Our empirical findings don't provide an economic rationale for the high- and low-volatility periods documented in the data, but they suggest a break in the low-volatility era that began after 1984 with the Great Moderation. Therefore, something other than the normal business cycle seems to have altered the growth dynamics of real house prices toward the high-volatility regime. That possibility is a promising avenue for additional research.

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Notes

¹ Interestingly, expected real house price growth has remained only slightly below the 3 percent expected real GDP expansion rate estimated for the U.S. and the OECD since the mid-1970s.

² For more on the database, see www.dallasfed.org/institute/houseprice/index.cfm. The OECD-19 are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, South Korea, Spain, Sweden, Switzerland, the U.K. and the U.S. A similar OECD database is used to investigate housing markets across the OECD-19. See “A Bird’s Eye View of OECD Housing Markets,” by Christophe André, Organization for Economic Cooperation and Development Working Paper no. 746, January 2010.

³ Each country’s house price index is extended to 1975 with historical sources whenever necessary, seasonally adjusted over the entire sample period and then re-based to 2005 = 100. For more details on country data sources and data treatment, see the appendix and methodological companion to the house price database available at www.dallasfed.org/institute/wpapers/2011/0099.pdf.

⁴ House price indexes for all 19 OECD countries are deflated using the PCE deflator and aggregated using constant, purchasing power parity-adjusted GDP weights for 2005. Real GDP in 2005 purchasing power parities is averaged across all 19 countries using the same constant weights as for real house prices.

⁵ “Recent House Price Developments: The Role of Fundamentals,” Organization for Economic Cooperation and Development *Economic Outlook*, no. 78, December 2005.

⁶ Economists and statisticians refer to this framework as a Markov-switching model. We incorporate up to six lags for each variable we estimate to account for other features of the data that cannot be fully captured by this simple two-regime Markov-switching model specification. For further details on the estimation, see the technical appendix under “Related Reading” at www.dallasfed.org/institute/houseprice/index.cfm.

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