

# US Economics Digest

## US Economics

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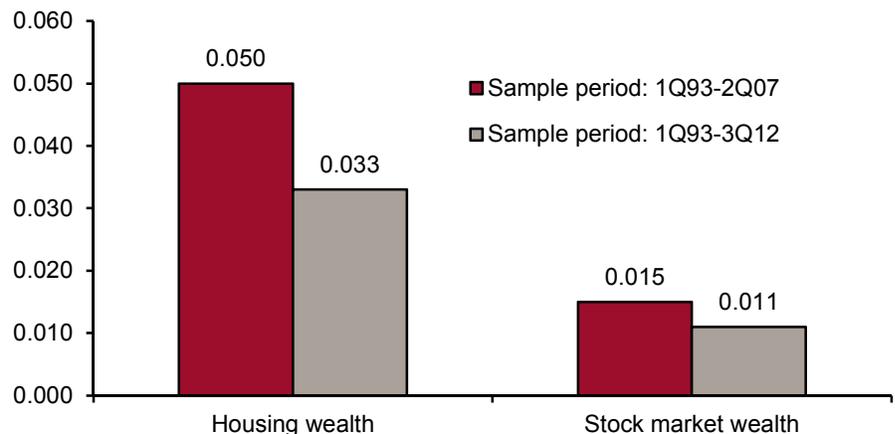
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## Honey, I Shrunk the Wealth Effect

- In this note, we estimate the changes in consumer spending associated with changes in disposable income, housing wealth and stock market wealth. We use two sample periods, Q1 1993 to Q3 2012 and Q1 1993 to Q2 2007, in order to investigate whether there is a structural break in wealth effects following the financial crisis of 2007-2008.
- Our study finds that changes in housing wealth have a greater influence on consumer spending than changes in stock market wealth. This is consistent with other researchers' findings.
- **Our most novel finding is that wealth effects appear to have shrunk since the 2007-2008 financial crisis, and more so for housing wealth than for stock market wealth.** One implication of this result is that the Federal Reserve will need to "engineer" even larger bull markets in house prices and stock prices for any given desired pick-up in economic growth. The great financial crisis is proving to have a long tail.
- The potential stimulus to consumption from increasing housing wealth could be substantial in the medium term. But given our estimation results, it is unlikely that the improvement in housing this year will spur consumption enough to fully offset the effect of lower disposable income growth associated with the restoration of the payroll tax.

### Exhibit 1: Smaller wealth effects after the financial crisis

Elasticity estimates of consumption with respect to wealth\*, percentage points



Source: BEA, Federal Reserve, Credit Suisse

\*Estimated ppt. increase in consumption due to a 1% gain in wealth

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## Honey, I Shrunk the Wealth Effect

**As the US stock market closes in on new highs and the housing market is clearly on the mend, there is more and more discussion about whether the ongoing wealth recovery is having a substantive positive effect on consumer spending.** This is especially of interest at a time when the payroll tax cut expiration will subtract 1 ppt. from real disposable personal income (DPI) growth this year and helps dampen consumer spending.

**In this note, we examine the relationships between consumer spending, disposable income, housing wealth and stock market wealth.** Specifically, we estimate the changes in consumer spending associated with changes in income and wealth with quarterly data sampling between Q1 1993 and Q3 2012. Consumers feel better (worse) off when their housing or stock market wealth rises (declines). They may be willing to spend more (less), but their behavior may differ with changes in the two forms of wealth. Additionally, economic and stock market relationships may experience structural shifts over time. In this regard, we also estimate the model based on a sub-sample period between Q1 1993 and Q2 2007 to investigate whether there is a structural break in wealth effects following the financial crisis of 2007-2008.

**We draw three important observations: (1) the sensitivity of consumption to DPI clearly dominates in both sample periods; (2) the sensitivity of consumption to housing wealth is considerably larger than to stock market wealth in both sample periods; and (3) the sensitivity estimates of consumption to wealth based on the full sample period are noticeably smaller than those on a sub-sample period before the last financial crisis, and even more so for housing wealth than for stock market wealth.**

It is no surprise to observe DPI's dominant role in our consumption model estimation, as income and consumption have moved in tandem over time. The small marginal propensity to consume (MPC) estimate for stock market wealth also helps to explain the modest consumption growth to date despite recent strong gains in the stock market.

**We offer three potential explanations for the somewhat smaller housing wealth effect following the last financial crisis:**

1. Since the housing bubble burst in early 2006, housing wealth volatility has remained elevated at levels well above its historical norm. Households will be less likely to view gains in asset prices as permanent, and their willingness to spend will thus be restrained.
2. A potential "nonlinear" relationship between consumption and wealth suggests that increases in housing wealth that simply restore previous declines would have a smaller effect on consumption than consistent gains like those before house prices began the first sustained slide in living memory in early 2006. The fact that close to one-third of mortgages are still "underwater" or "near-underwater" will only amplify this nonlinear effect and probably bias our housing wealth effect coefficient estimate upward in the post-2007 subsample period.
3. Mortgage equity withdrawals, once the main channel through which consumers generated the cash flow to spend beyond their current take-home pay, show no sign of recovery following the collapse from 2006-2008. Less cash from monetized home equity implies less purchasing power and consumer expenditures, and hence a smaller housing wealth effect.

**The potential stimulus to consumption from increasing housing wealth could be substantial in the medium term. But given our estimation results, it is unlikely that the improvement in the housing market this year will spur consumption growth enough to fully offset the effect of lower disposable income growth associated with the restoration of the full payroll tax.**

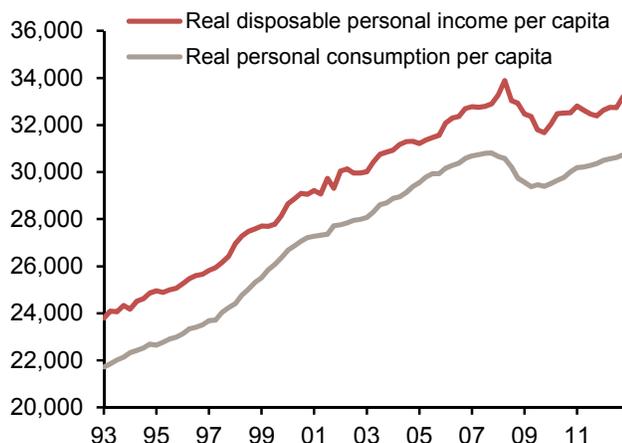
### Wealth effects on consumption: Housing vs. stock market

In assessing the relationship between consumption, income, and wealth, we estimate the changes in consumer spending that are specifically associated with the changes in disposable personal income, housing and stock market wealth. Our methodology borrows from economists James Stock and Mark Watson’s Dynamic Ordinary Least Squares (DOLS) approach<sup>1</sup> and uses quarterly data sampling between Q1 1993 and Q3 2012. Specifically, we regress the log levels of household spending against log levels of disposable income, housing and stock market wealth. The approach also includes leads and lags of the first-differenced independent variables to remove correlation between independent variables and error terms and to minimize bias.

Additionally, economic and financial relationships may experience structural shifts over time. In this regard, we also estimate the model based on a sub-sample period between Q1 1993 and Q2 2007 to investigate whether there is a structural break in wealth effect following the financial crisis of 2007-2008. The breakpoint Q3:07 was selected based on model stability diagnostics that we will discuss in detail below.

**Exhibit 2: Real DPI vs. consumption**

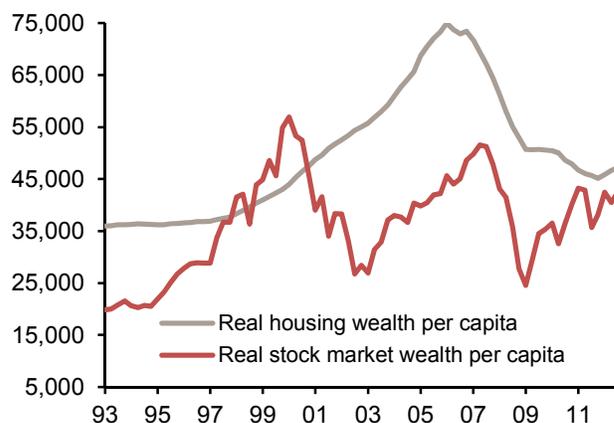
Chained 2005 dollar



Source: Bureau of Economic Analysis, Census Bureau, Credit Suisse

**Exhibit 3: Household wealth: housing vs. stock market**

Chained 2005 dollar



Source: Federal Reserve, Census Bureau, Credit Suisse

The spending and income data are personal consumption expenditures and disposable personal income from national accounts (Exhibit 2). Housing wealth and stock market wealth data are from Federal Reserve Flow of Funds accounts. Both types of wealth are gross assets at market value ignoring mortgages and other leverage. Housing wealth is defined as household held real estate assets including land. Stock market wealth computed as the sum of corporate equities directly held by the household sector and equity shares in both mutual funds and defined contribution plans held by the household sector (Exhibit 3). The latest available data on both housing and stock market wealth are Q3:12. Consumption, income and wealth are measured at constant prices in the form of per capita terms, deflated with the consumption expenditures deflator (in chained 2005 dollars).

Exhibit 4 summarizes the elasticity estimates of consumption with respect to income, housing and stock market wealth. Note that all elasticity estimates are statistically significant in both sample periods.

<sup>1</sup> Stock, James and Watson, Mark (1993): "A simple estimator of cointegrating vectors in higher order integrated systems," *Econometrica*, Vol. 61, No. 4, 783-820.

**Exhibit 4: Elasticity estimates of consumption with respect to income and wealth**

Dependent variable: Real personal consumption expenditure per capita

Independent Variable	Sample period: 1Q93-3Q12		Sample period: 1Q93-2Q07	
	Elasticity Estimate	T-Statistic	Elasticity Estimate	T-Statistic
Disposable income	0.990	46.7***	0.943	17.3***
Housing wealth	0.033	4.40***	0.050	2.62**
Stock market wealth	0.011	3.06***	0.015	2.32**

Source: Credit Suisse; \*\*\* significant at 1% level, \*\* at 5% level, \* at 10% level; Robust (White) standard errors are used in calculating T-Statistic.

We draw three important observations: (1) the sensitivity of consumption to DPI clearly dominates in both sample periods; (2) the sensitivity of consumption to housing wealth is considerably larger than to stock market wealth in both sample periods; and 3) the sensitivity estimates of consumption to wealth based on the full sample period are noticeably smaller than those on a sub-sample period before the last financial crisis, and even more so for housing wealth than for stock market wealth.

Our results suggest that, for the full sample period between Q1 1993 and Q3 2012, a 1% gain in disposable income, housing wealth, and stock market wealth on average explains 99%, 3.3%, and 1.1% of the gains in household consumption, respectively. These compare to the corresponding estimates of 94%, 5.0%, and 1.5% based the shorter sample between Q1 1993 and Q2 2007.

Given the average growth rates for disposable income (1.6%), housing wealth (1.5%), and stock market wealth (6.4%) over the Q1 1993 and Q3 2012 period, the average contribution to household spending from these three components is calculated by multiplying their elasticity estimates to the corresponding growth rates. Disposable income is by far the most important explanatory variable, explaining about 93% of the average growth of household spending. Housing and stock market wealth account for about 3% and 4% of growth in household spending, respectively. It is no surprise to observe DPI's dominant role in our consumption model estimation, as income and consumption have moved in tandem over time (Exhibit 2). In addition, the higher coefficient on disposable income in the post-crisis period implied by these calculations likely reflects the much larger role of transfer payments (which have very high consumption elasticity) in the composition of household income in the last five years.

Given our estimation results, it is unlikely that the improvement in the housing market this year will spur consumption growth enough to offset the negative impact from lower real disposable income growth associated with the restoration of the full payroll tax. Specifically, the payroll tax cut expiration will subtract 1 ppt. from real disposable income growth this year. Applying our MPC estimate for income (0.99), this suggests that consumer spending would be lowered by about 0.99 ppt. On the other hand, real housing wealth increased by about 4% lately. The December Zillow Home Price Expectations Survey reported a consensus view of about 3% home price increase in 2013. Even if we assume a major upside surprise of 10% gains in real housing wealth this year, our MPC estimate for housing wealth would suggest a 0.33 ppt. gain in consumer spending, much smaller than the loss due to lower income growth. Net, we expect real consumer spending growth to slow to 1.7% this year from 1.9% in 2012.

This is not to dispute the potential stimulus to consumption from increasing housing wealth – it could be still substantial in the medium term. Illustratively, housing wealth is about 25% below its peak in 2006 (about 35% in real terms). Eventual recovery back to the prior peak suggests about 0.83 ppt. gain in consumer spending, or about \$93 billion, although a potential “nonlinear” relationship between consumption and wealth growth that we discuss below would limit the gains by this calculation.

Our estimates on the wealth effect are broadly consistent with the empirical findings from the literature. For example, using panel data of US states between 1975 and 2012, Case, Quigley and Shiller found a larger marginal propensity to consume for housing wealth than for stock market wealth<sup>2</sup>. Depending on model specifications, their estimates of the elasticity of consumer spending to housing wealth range from 0.03 to 0.18, while those to stock market wealth vary between -0.04 and 0.09.

### Household wealth: Permanent versus transitory

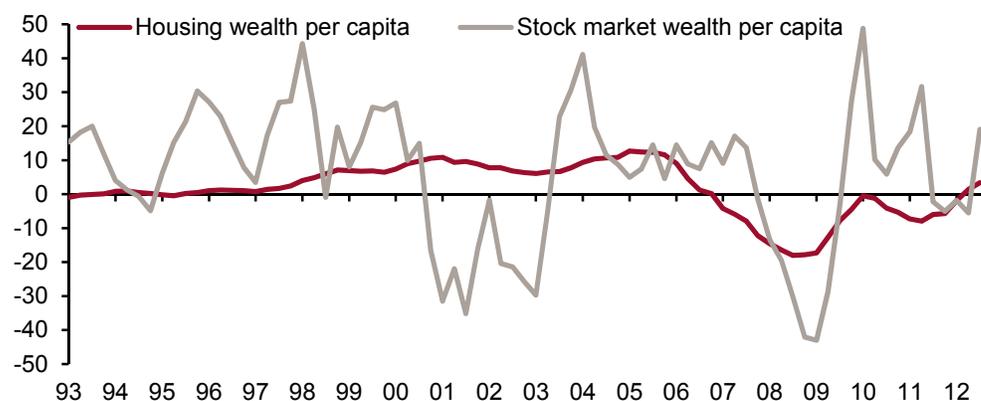
The larger sensitivity of consumption to housing wealth than to stock market wealth is an important result that underscores the difference in the dynamics of housing wealth and stock market wealth (Exhibit 5).

Some stylized facts from US history are helpful to set the stage (Exhibit 6):

- Stock market wealth accumulates faster than housing wealth.
- Stock market wealth growth is more volatile than housing wealth growth (the standard deviations are about two to three times higher than on housing wealth).
- Housing wealth growth is more persistent than stock market wealth growth (a measure of persistence, the first autocorrelation, is higher for housing wealth).

#### Exhibit 5: Household wealth per capita

YoY%, Chained 2005 dollar



Source: BEA, Federal Reserve, Credit Suisse

#### Exhibit 6: Descriptive statistics: Housing and stock market wealth per capita

YoY%, Chained 2005 dollar

Statistic	Sample period: Q1 1993-Q3 2012		Sample period: Q1 1993-Q2 2007	
	Housing wealth	Stock market wealth	Housing wealth	Stock market wealth
Average growth rate	1.5	6.4	4.9	8.8
Standard deviation	7.6	19.8	4.6	17.7
First autocorrelation	0.97	0.75	0.90	0.77

Source: Credit Suisse

The rise in housing wealth would reasonably have been perceived by households as more permanent, especially before the 2007-2008 financial crisis. Nominal house price appreciation had been the norm for many decades, and mortgage leverage tended to turn this into real appreciation as well. In contrast, the more volatile and less persistent stock market wealth may be viewed as more transitory and uncertain. A more stable and persistent housing wealth may lead consumers to spend more than otherwise would be the case relative to the less reliable ups and downs of the stock market.

<sup>2</sup> Karl Case, John Quigley, and Robert Shiller (January 2013), "Wealth effects revisited: 1975-2012", *NBER Working Paper*, No. 18667.

## Wealth effect: A structural break after the financial crisis?

It is widely documented that economic and financial relationships experience structural shifts over time, or their relation is time-varying. A recent example is the outward shift of the Beveridge Curve (a curve that plots the trade-off between unemployment and job vacancies), which signals deteriorating efficiency in the labor market and hence a structural rise in the unemployment rate following the Great Recession<sup>3</sup>.

Coming back to the wealth effect that we focus on in this note, Exhibit 4 shows that the estimates of consumption to household wealth based on the sub-period before the last financial crisis are noticeably larger than those on a full set of data that includes observations following the crisis, especially for housing wealth. A natural question to ask is whether the different estimates suggest a structural break on the wealth effect following the financial crisis.

Model stability diagnostics with the Chow forecast test suggest a breakpoint around Q3 2007. The Chow forecast test estimates the same model twice – one using the full set of data (Q1 1993 to Q3 2012 in our case), and the other using a long sub-period (say, for example, Q1 1993 to Q2 2007). We can test whether the two sets of results are “significantly” different in the statistical sense. A significant difference indicates a structural change in the relationship.

Exhibit 7 reports the test statistics for selected breakpoints between Q1 2006 and Q4 2007. Both test statistics, *F*-statistic and Likelihood ratio, are statistically significant at 5% or lower levels for the breakpoint at Q3 2007, decisively rejecting the null hypothesis of no structural change in the consumption function before and after Q3 2007.

### Exhibit 7: Model stability diagnostics with the Chow forecast test

Null Hypothesis: No breaks at specified breakpoints

Breakpoint	2006Q1	2006Q2	2006Q3	2006Q4	2007Q1	2007Q2	2007Q3	2007Q4
<i>F</i> -statistic	1.43	1.45	1.46	1.58	1.70*	1.83*	1.99**	2.16**
Likelihood ratio	57.8***	55.4***	52.9***	52.9***	52.7***	52.5***	52.4***	52.4***

Source: Credit Suisse; \*\*\* significant at 1% level, \*\* at 5% level, \* at 10% level.

Another way to investigate the model stability is to estimate the consumption model separately with the sample periods before and after the financial crisis. We can then assess model stability from the differences between the two estimation results. However, we have only limited observations following the financial crisis (less than six years of data), while our model specification has a total of 22 coefficient estimates. A regression based on such a short sample period may not yield sufficiently stable results for our model specification.

More generally, we are mindful that different model specifications and different test procedures may yield different and sometimes even conflicting results. For a simple macroeconomic structural relation as we discuss here, having more post-crisis observations will help unveil the true picture of the relationship between consumption and wealth. **Still, the three arguments below help explain a smaller housing wealth effect following the financial crisis.**

#### 1. More volatile wealth is less valuable

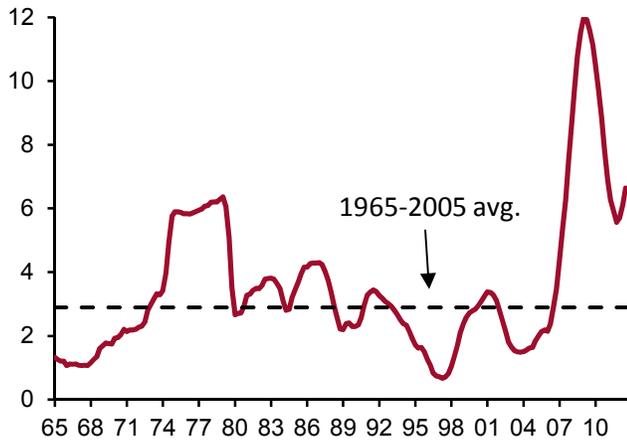
After house prices began a long and deep slide in early 2006, housing wealth volatility has remained elevated at levels well above its historical norm (Exhibit 8). As we argued back in 2010, higher volatility in housing wealth suggests muted “wealth effects,” as households

<sup>3</sup> See, for example, [US Economics Digest: How Much Unemployment Do We Need to Keep Inflation Down](#), 03 September 2009; [US Economics Digest: The case of the cyclical unemployment](#), 02 November 2010; and [US Money Matters: FOMC Meeting Preview – What’s the Point?](#) 21 January 2013.

will be less likely to view gains in asset prices as permanent (see [US Economics Digest: Five from the Flow of Funds](#) dated 06-16-2010). In contrast, stock market wealth volatility, albeit on average still higher than housing wealth volatility, has largely moved within its historical ranges. Interestingly, our estimation results of a smaller housing wealth effect after the financial crisis and the less pronounced decline in the stock market wealth effect before and after the crisis seem to verify our argument made a few years ago.

**Exhibit 8: Housing wealth volatility**

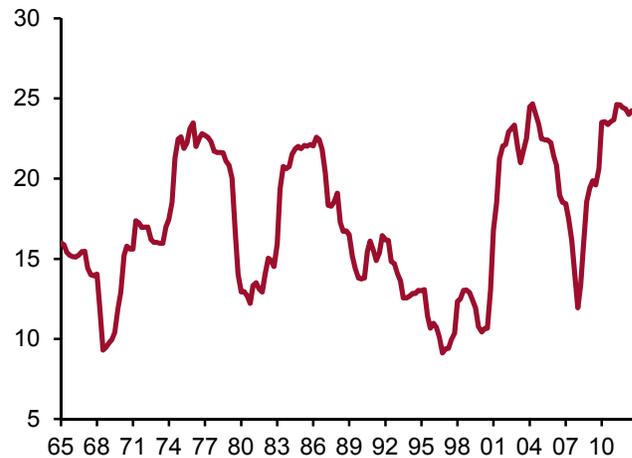
5-yr rolling standard deviation of % changes in real household wealth per capita



Source: Federal Reserve, Census Bureau, Credit Suisse

**Exhibit 9: Stock market wealth volatility**

5-yr rolling standard deviation of % changes in real stock market wealth per capita



Source: Federal Reserve, Census Bureau, Credit Suisse

**2. Nonlinear wealth effect**

Our consumption and wealth exercises are “linear” by design. However, a more complex “nonlinear” relationship may exist between consumption and wealth growth. For example, Case, Quigley and Shiller found that the housing wealth elasticity in a falling market is larger than that in a rising market. In other words, declines in housing wealth have a larger effect upon consumption than increases. This is consistent with many aspects of economic theory, including diminishing marginal utility and loss aversion.

We would go further and argue that increases in housing wealth that simply restore previous declines (like the current ongoing recovery in the housing market) would have smaller effects on consumption than consistent gains like those before the housing deflation in early 2006 (Exhibit 10). After all, increases in housing wealth from previous declines may primarily serve to repair households’ balance sheets, and if any, these increases had incurred consumption on their first way up (for the original homeowners). Consumers facing budget constraints are likely to react differently to these two types of increases in housing wealth<sup>4</sup>.

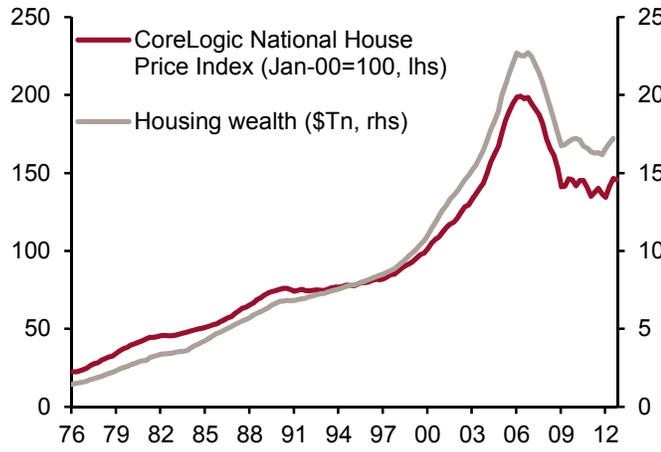
To some extent, this is similar to Professor James Hamilton’s argument on the “nonlinear” relationship between oil prices and GDP growth<sup>5</sup>. He argued that oil price increases dampen economic growth, whereas decreases do little to boost economic activity. And increases following a long period of stable prices are more disruptive than those simply recovering previous declines.

<sup>4</sup> It could be hard to quantify the nonlinear housing wealth effect in this context, as literally there has been only one “housing wealth shock” to the US over the past few decades. Housing prices were basically a one-way street before 2006.

<sup>5</sup> For an excellent review of this topic, please see James Hamilton, “Nonlinearities and the Macroeconomic Effects of Oil Prices,” *Macroeconomic Dynamics*, 2011, vol. 15, Supplement 3, pp. 364-378, and “What Is an Oil Shock?” *Journal of Econometrics*, April 2003, vol. 113, pp. 363-398. Also see US Economics Digest: When oil does – and doesn’t – matter for a simulation exercise regarding the impact on GDP from last year’s oil price increase under this nonlinear framework.

Another dimension, which is nearly inaccessible using aggregate macroeconomic data is that sub-populations may not be arbitrageable. House price rises for homeowners still “underwater” on their mortgages may have very different effects from house price rises for homeowners with positive equity. This was hardly ever empirically important before 2006, but it is now. Of note, as of Q3 2012, CoreLogic estimated that nationwide negative equity and near-negative equity mortgages still accounted for about 27% of all residential properties with a mortgage. If anything, we would expect this phenomenon to bias our housing wealth effect coefficient estimate upward in the post-2007 subsample period.

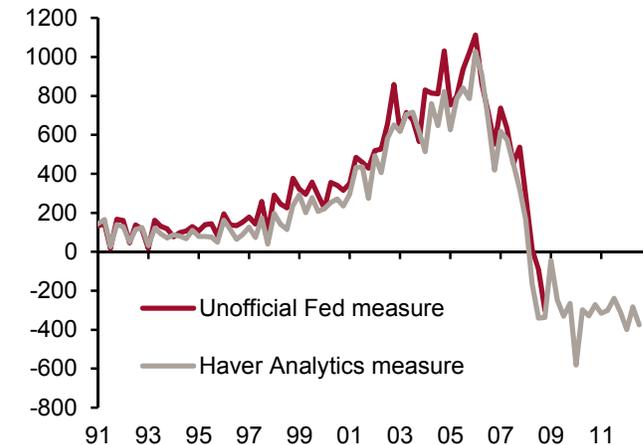
**Exhibit 10: Housing wealth vs. housing price**



Source: CoreLogic, Federal Reserve, Credit Suisse

**Exhibit 11: Mortgage equity withdrawal**

SAAR, Bil.\$



Source: Federal Reserve, Haver Analytics, Credit Suisse

**3. Less cash from monetized home equity**

The link between housing wealth and spending runs not just from the concept of housing value but also from the more tangible purchasing power extracted from housing in the form of mortgage equity withdrawal (MEW) to consumer expenditures. This is especially the case before 2006 – MEW had been the main channel through, which consumers had generated the cash flow to spend beyond their current take-home pay. Based on unofficial Federal Reserve measures<sup>6</sup>, MEW jumped to over \$1 trillion at an annual rate in early 2006, or about 11% of disposable income (Exhibit 11). In an early study<sup>7</sup>, we estimated that MEW accounted for about 11%-16% of household spending growth from 2000-2005 based on econometric evidence and survey data.

MEW took a sharp turn after its peak in Q1 2006 and quickly swung into deficit in Q3 2008, as both falling house prices and stricter lending standards dampened the activity. The unofficial Federal Reserve measure was discontinued from Q4 2008. A similar measure constructed by Haver Analytics still shows no sign of recovery. Less cash from monetized home equity implies less purchasing power and consumer expenditures, and hence a smaller housing wealth effect.

\* \* \*

<sup>6</sup> In 2005, then-Fed Chairman Greenspan and Fed economist James Kennedy released a study of MEW and published their own estimates for the period from 1990 through the first quarter of 2005. An update of that data (through Q4 2008) was furnished by the Federal Reserve in unofficial form, which we have obtained from Haver Analytics. For a detailed explanation of these series, please see "Estimates of Home Mortgage Originations, Repayments, and Debt on One-to-Four-Family Residences" by Alan Greenspan and James Kennedy, *Federal Reserve Finance and Economic Discussion Series*, September 2005.

<sup>7</sup> See [US Economics Digest: There's nothing like a paycheck](#) dated 09-15-2006.

When consumers decide how much to spend, the most important consideration is their disposable personal income. But their wealth, and the changes in that wealth, also are significant influences. This is especially true if the wealth changes are expected to be persistent.

Our study finds that changes in housing wealth have a greater influence on consumer spending than changes in financial wealth (which we proxy by using stock market wealth). This is consistent with other researchers' findings.

Our most novel finding is that wealth effects appear to have shrunk since the 2007-2008 financial crisis, and more so for housing wealth than for stock market wealth. One implication of this result is that the Federal Reserve will need to "engineer" even larger bull markets in house prices and stock prices for any given desired pick-up in economic growth. The great financial crisis is proving to have a long tail.

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## Disclosure Appendix

### Analyst Certification

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