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# Consumption Asymmetry and the Stock Market: Further Evidence

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## **Abstract**

This paper investigates the presence of asymmetric effects of stock returns on real consumption in the US. After identifying the asymmetric behavior for consumption as well as the wealth effect, the results confirm that stock returns have an asymmetric effect on real consumption, with negative 'news' affecting consumption more than positive 'news'.

**Journal of Economic Literature Classification:** E21, E44

**Keywords:** Consumption; Stock market; Wealth effect; Asymmetry

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## **Consumption Asymmetry and the Stock Market: Further Evidence**

### **I. Introduction**

High equity prices may cause higher consumption expenditures and, thus, higher aggregate demand. This link exists, because individuals consume according to the present value of their lifetime income (Mehra, 2001). When wealth easily converts to income and vice versa, unexpected rises or falls in wealth will increase or decrease consumption and, thus, aggregate demand. Equities represent an important component of overall wealth. Therefore, sound theoretical reasons support the view that increases in stock market wealth can fuel high consumption growth. Moreover, the wealth effect receives confirmation from the life-cycle consumption model. Equity prices also act as “leading indicators,” since they reflect future output growth and, thus, correlate with consumption (Morck *et al.*, 1990; Poterba and Samwick, 1995; Starr-McCluer, 2002). Theory also identifies other equity value and consumption linkages -- the expectations effect, the liquidity constraint effect, the stock option value effect, and other indirect effects (Romer, 1990). Other work concentrates on a negative wealth effect from rising inflation as well as falling personal saving (Shirvani and Wilbratte, 2002).

Hall (1978) shows that the stock of wealth plays a substantial role in affecting private spending. Temin (1976), after establishing the importance of the wealth effect, demonstrates that this effect played a crucial role in the Great Depression. Poterba and Samwick (1995) argue that the wealth effect provides a crucial link between the stock market and consumption. They find, however, weak evidence of the wealth effect in the U.S. Ludvigson and Steindel (1999), Parker (1999), Poterba (2000), and Starr-McCluer (2002) also do not find strong evidence of the wealth effect. In contrast, Shulman *et al.* (1995) claim that consumption now responds more strongly to stock market value than ever before. Campbell (2000), Davis and Palumbo (2001), Dynan and

Maki (2001) also find that stock market wealth affects U.S. consumption spending. Poterba (2000) identifies the marginal propensity to consume out of the U.S. stock wealth at 5 percent. Edison and Sløk (2002) also discover a considerable wealth effect, especially in the 1990s where stock ownership increased dramatically (40 percent of the population in 1992 to 52 percent in 1998), largely new economy stocks. Furthermore, Horioka (1996) uncovers a strong wealth effect in Japan, an economy first experiencing sharp asset price increases in the 1980s and then sharp decreases in the 1990s, signaling Japan's protracted downturn. Boon *et al.* (1998) also provide evidence that stock market wealth affects consumption in Canada, Germany, Japan, the Netherlands, and the U.K.

Patterson (1993) finds that consumption responds asymmetrically to wealth shocks primarily due to imperfect capital markets (i.e., liquidity constraints). Shea (1995) also shows that consumption exhibits asymmetric behavior, reflecting loss aversion; individuals suffer more from reduced consumption (i.e., diminishing marginal utility of wealth). Zandi (1999) also argues that consumers may react more rapidly to wealth contractions than to expansions. Carruth and Dickerson (2003) assess whether consumers behave differently under various disequilibria asymmetric errors, finding strong support for this result. Moreover, Kuo and Chung (2002) show that asymmetric consumption sensitivity to the various phases of business cycles generates those asymmetric patterns. They also conclude that liquidity constrained consumers closely link to business cycle movements. Finally, Cook (2002) uncovers highly significant asymmetric consumption patterns, largely attributed to different consumption and saving behaviors.

This paper investigates ratchet effects between the U.S. stock market value and consumption. After finding asymmetric consumption patterns, the paper examines whether a wealth effect exists, using the cointegration, error-correction methodology, and explores whether

stock market value exhibits asymmetric effects on consumption. The rest of the paper unfolds as follows. Section II presents and discusses the empirical results. Section III concludes.

## II. Empirical Results

### *Data*

The empirical analysis uses quarterly data from 1957 to 2002 on personal consumption (C), after-tax nominal labor income (Y), domestic prices measured by the consumer price index, and stock market capitalization (S).<sup>1</sup> We employ capitalization data, since this variable provides a more reliable proxy for stock market wealth due to better measurement of household wealth. We measure consumption, income, and stock market value in real per capita terms. The total (midyear) population data come from the United Nations (2000). Thus, lower case letters indicate real per capita variables expressed in natural logarithms, insuring that estimates measure elasticities of real per capita consumption with respect to real per capita stock market value.

### *Testing for Consumption Asymmetries*

Many researchers demonstrate that consumption displays asymmetry (e.g., Cook *et al.*, 1998). Such asymmetric behavior could reflect excessive cyclicality, especially in durable goods (e.g., Cook, 2000); asymmetric behavior of heterogeneous agents, who do not update their consumption patterns (e.g., Caballero, 1995); and different behavior of consumption components due to time deformation (e.g., Cook, 1998). To test for asymmetry in U.S. consumption, we employ the methodology introduced by Sichel (1993), and described more fully by Speight and McMillan (1998). In particular, we first construct the following skewness measures:

$$D(x) = [(1/T)\sum_t (x_t - \bar{x})^3] / \sigma(x)^3 \quad \text{and} \quad ST(\Delta x) = [(1/T)\sum_t (\Delta x_t - \overline{\Delta x})^3] / \sigma(\Delta x)^3$$

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<sup>1</sup> A. Vamvakidis, of the International Monetary Fund, provided all data.

where  $x$  equals a detrended variable,  $T$  equals the number of observations, a bar indicates the mean, and  $\sigma(x)$  equals the standard deviation of  $x$ . Sichel (1993) calls the former expression “deepness” and the latter “steepness.” We detrended real per capita consumption, using the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1981).

Deepness and steepness refer to the negative skewness of the distribution of  $x$  and  $\Delta x$ , respectively. Deepness means that the movement of  $x$  below its trend exhibits a larger value, on average, than its rise above trend. Steepness means that the decline in  $x$  from its peak occurs more quickly than the recovery of  $x$  from its trough. Speight and McMillan (1998) define positive skewness in  $x$  as “tallness,” meaning that the rise of  $x$  above its trend exceeds, on average, its fall below trend, and positive skewness in  $\Delta x$  as “expansionary steepness.” Thus, the “steepness” definition in Sichel (1993) becomes “contractionary steepness” in Speight and McMillan (1998).

Sichel (1993) and Speight and McMillan (1998) define the following variables:

$$z_t = (x_t - \bar{x})^3 / \sigma(x)^3 \text{ and } \Delta z_t = (\Delta x_t - \overline{\Delta x})^3 / \sigma(\Delta x)^3 .$$

Regressing  $z$  and  $\Delta z$  on a constant allows the computation of the Newey-West (1987) asymptotic standard errors that correspond to the deepness and steepness measures. The empirical results indicate that real per capita consumption exhibits tallness at the 5-percent level and contractionary steepness at the 10-percent level, respectively<sup>2</sup>. In sum, movements in consumption around its trend exhibit asymmetric patterns. Real per capita consumption rises higher above, than it falls below, its trend (tallness) and decreases more quickly from its peak than it rises from its trough (contractionary steepness).

### *Integration Analysis*

We first test for nonstationarity by using the unit-root tests proposed by Dickey and Fuller (1981). Table 1 reports the results. We cannot reject the hypothesis of a unit root for real per capita consumption, real per capita income, and real per capita stock market value at the 1-percent level. Using first differences, we can reject the hypothesis of a unit-root for all variables.

### *Cointegration Analysis: Identifying the Wealth Effect*

Before considering asymmetric wealth effects on consumption based on stock market value, we examine the wealth effect through the cointegration, error-correction methodology of Johansen and Juselius (1990). We identify a 3-lag model, using Perron and Vogelsang (1992) that generates the results reported in Table 2.

Both the eigenvalue test statistic and the trace test statistic indicate that there exists a single long-run relationship between real per capita consumption and real per capita stock market value. The following cointegration equation emerges:

$$c = 0.0867 + 0.604 y + 0.0375 s$$

(6.48)	(5.82)	(4.39)
[0.0]	[0.0]	[0.0]

$$\bar{R}^2 = 0.91; LM = 3.84[0.11]; NO = 2.44[0.16].$$

where the numbers in parentheses denote t-statistics and in brackets, p-values.

The cointegrating vector implies that a positive and statistically significant wealth effect. The long-run marginal propensity to consume out of real per capita stock market value equals 0.0375, while that out of real per capita after-tax income equals 0.604. The estimated model satisfies certain diagnostic criteria, including the absence of serial correlation (LM) and the

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<sup>2</sup> The deepness and steepness values as well as their asymptotic, heteroskedasticity and autocorrelation consistent standard errors in parentheses, and associated p-values in brackets equal 0.58 (0.23) [0.04] and -0.37 (-0.14) [0.08], respectively.



presence of normality (NO). Because of the significant wealth effect, monetary policy should monitor equity values, since dramatic changes can substantially affect consumption.<sup>3</sup>

*Is the Wealth Effect Asymmetric?*

To consider an asymmetric response of consumption to changes in stock market value, we adopt an error correction (EC) model, suggested by Terasvirta (1990) and Karras (1996):

$$\Delta c = a_0 + \sum_i^{q_1} b_{1i} \Delta c(-i) + \sum_j^{q_2} b_{2j} \Delta y(-j) + \sum_k^{q_3} [b_{3k} \Delta s^+(-k) - b_{4k} \Delta s^-(-k)] + b_5 EC(-1) + v$$

where  $\Delta s(-k)^+$  and  $\Delta s(-k)^-$  equal positive and negative movements in stock market value,  $EC$  equals the error correction term, and  $v$  equals the random error term. A 2-lag error-correction model emerges after implementing the Perron and Vogelsang (1992) methodology. The positive and negative changes in stock market value both exhibit I(0) behavior (see Table 1).

The estimation yields:

$$\begin{aligned} \Delta c = & 0.268 \Delta c(-1) + 0.091 \Delta c(-2) + 0.0236 \Delta s^+(-1) + 0.0147 \Delta s^+(-2) - 0.0285 \Delta s^-(-1) \\ & (4.57) \quad (3.71) \quad (3.64) \quad (4.11) \quad (-4.48)^* \\ & [0.0] \quad [0.0] \quad [0.0] \quad [0.0] \quad [0.0] \\ & - 0.0269 \Delta s^-(-2) + 0.586 \Delta y(-1) + 0.374 \Delta y(-2) - 0.0782 EC(-1) \\ & (-4.71) \quad (3.97) \quad (3.81) \quad (-4.55) \\ & [0.0] \quad [0.0] \quad [0.0] \quad [0.0] \end{aligned}$$

$$\bar{R}^2 = 0.76; LM = 1.23[0.22]; RESET = 1.69[0.34]; NO = 2.61[0.14]; HE = 1.93[0.35].$$

Tests (t-tests)

$$\begin{aligned} b_{31} + b_{32} &= 0.0383, & (3.74); [0.00] \\ b_{41} + b_{42} &= 0.0554, & (3.93); [0.00] \end{aligned}$$

Tests {F-tests}

$$\begin{aligned} b_{31} + b_{32} &= 0 & \{5.47\}; [0.00] \\ b_{41} + b_{42} &= 0 & \{18.92\}; [0.00] \\ b_{31} = b_{32} &= 0 & \{9.22\}; [0.00] \\ b_{41} = b_{42} &= 0 & \{12.34\}; [0.00] \\ b_{31} + b_{32} = b_{41} + b_{42} & & \{11.71\}; [0.00] \end{aligned}$$

where numbers in parentheses denote t-statistics; in braces, F-statistics; and in brackets, p-

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<sup>3</sup> Moreover, the wealth effect may explain the general fall in U.S. saving.

values. The estimated regression satisfies certain diagnostics, including the absence of serial correlation (LM), the absence of any model misspecification, the presence of normality (NO), and the absence of heteroskedasticity (HE).

The sum of coefficients of both the positive and negative stock returns prove positive and statistically significant based on t-tests. The F-tests investigate five hypotheses about the effects of positive and negative returns. The first two tests examine whether the sum of the coefficients of the positive or negative stock returns equal zero, which reject the null hypotheses. The next two tests examine whether the coefficients of the positive or negative returns jointly equal zero, which reject the null hypotheses. Finally, the last test determines whether the coefficients of the positive and negative changes in stock market values affect real per capita consumption symmetrically, which strongly rejects the symmetry hypothesis. Thus, the sum of the coefficients of negative change in stock market value significantly exceeds the sum of the coefficients on the positive change in stock market value. These findings imply that agents do respond more strongly to adverse stock market value news, than to positive news. The results support those of Kahneman *et al.* (1991) and Shea (1995), indicating strong loss aversion.

### **III. Conclusions**

This paper investigates whether asymmetric effects exist from real per capita U.S. stock market value on real per capita consumption. After identifying asymmetric consumption behavior as well as a wealth effect due to the stock market, the empirical analysis examines whether this wealth effect exhibits an asymmetric effect on consumption. The empirical results confirm that stock market value asymmetrically affects real per capita consumption, where bad news exhibits a stronger effect than good news. These findings can improve the predictive power of business cycles. In addition, these findings demonstrate the negative character that the stock market

imposes on consumption spending. Future empirical attempts can investigate the robustness of the results by incorporating more countries, by examining different components of consumption, and by exploring different time sub-periods.

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**Table 1: Unit-Root Tests**

	Without Trend		With Trend	
	Levels	Differences	Levels	Differences
<b>c</b>	1.37(4)	-6.04(3)*	-1.32(3)	-7.05(2)*
<b>s</b>	-2.18(3)	-7.34(2)*	-2.41(3)	-7.69(2)*
<b>y</b>	-1.97(3)	-5.64(2)*	-2.12(3)	-5.86(2)*
$\Delta s^+$	-4.93(3)*		-5.32(2)*	
$\Delta s^-$	-4.51(3)*		-4.78(2)*	

**Note:** The figures in parentheses denote the number of lags in the tests that ensure white noise residuals. They were estimated through the Akaike criterion.

\* significant at the 1-percent level

**Table 2: Cointegration Tests**

<b>r</b>	<b>(n - r)</b>	<b>m.λ.</b>	<b>95%</b>	<b>Tr</b>	<b>95%</b>
<b>r = 0</b>	<b>r = 1</b>	40.44	15.87	42.35	20.18
<b>r ≤ 1</b>	<b>r = 2</b>	8.61	10.57	8.94	9.16
<b>r ≤ 2</b>	<b>r = 3</b>	1.76	6.36	1.76	6.36

**Note:** r = number of cointegrating vectors, (n-r) = number of common trends, m.λ.= Maximum eigenvalue statistic, and Tr = Trace statistic.