Federal Reserve Bank Policy and Influence of US Excessive Current Consumption on International Equity Returns

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Abstract

Evidence is mounting that the current consumption and investment tradeoff by US investors predicts future equity returns, both domestically and internationally. This paper examines the reward to investors for bearing the risk associated with the consumption-investment decisions of investors. In addition, the paper finds the reward is consistent in periods of rising and falling short-term interest rates resulting from Federal Reserve Bank monetary policy. The findings confirm a positive return is associated with assuming the risk associated with the consumption and investment tradeoff in equity investments into developed markets.

Introduction

This paper examines the impact of deviations in consumption funding by US investors on international equity returns for periods of different Federal Reserve Bank monetary policy. The significance of three factors, across a broad group of developed and emerging market returns, is investigated. In addition to the world market portfolio returns and currency returns, suggested by research on the International Capital Asset Pricing Model (Dumas and Solnik 1995), this paper examines the significance of a factor that reflects the consumption funding decision of US investors. This factor is the Excessive Current Consumption measure proposed by Lettau and Ludvigson (2001) and is commonly referred to as *cay*. Consumption is funded by either current income or wealth, thus the consumption funding decision impacts flows to investments in the capital markets. *Cay* has been found to predict future US and international stock returns (Guo 2004a; Lettau and Ludvigson 2001). Lettau and Ludvigson (2005) find that *cay* is better than the dividend yield for predicting future excess returns. The impact of *cay* as the Fed adjusts monetary policy is examined, because changes in short-term interest rates, set by the Fed, are considered by US investors when making tradeoff decision between current consumption and investment. The findings indicate that foreign equity investing receives a positive reward due to a possible liquidity effect represented by *cay* in both expansive and restrictive periods of Federal Reserve Bank policy.

Excessive Current Consumption and Fed Monetary Policy

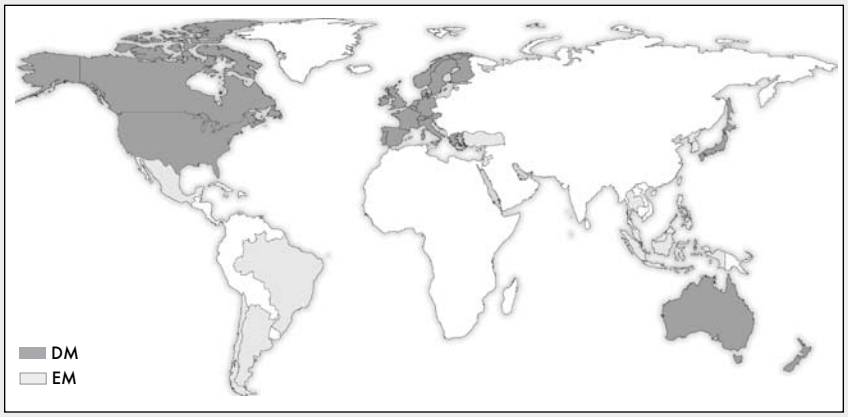
Cay is a measure of current consumption in excess of the level expected under a long run co-integrating relationship between consumption, asset wealth, and labor income. This measure is based on the premise that investors typically try to maintain a constant current consumption-to-wealth ratio. The *cay* measure is constructed to determine a deviation in consumption from that predicted from this constant relationship. For example, a negative *cay* value indicates that consumption is below that predicted given the current wealth of the investor. This measure would be consistent with individuals reducing their current consumption (and correspondingly increasing their saving

and investing) when they anticipate lower excess returns in the future. A positive *cay* measure is observed when they increase current consumption in anticipation of higher excess returns in the future. The *cay* measure might additionally be influenced by changing liquidity in the markets driven by the consumption-investment decisions of investors (Guo 2004b). Furthermore, international consumption risk sharing is shown to be time-varying (Sarkar and Zhang 2004). This paper will examine whether risk premiums for market risk, exchange rate risk, and consumption deviation risk in equity returns are related to the Federal Reserve Bank's policy cycles.

Fed policy is intended to influence the domestic (US) economy; however, it also impacts foreign economies and their stock markets. Through the impact of Fed policy on US consumption, foreign interest rates, and exchange rates, other economies and financial markets are affected. For example, the expectation that the Fed was willing to raise interest rates to offset "irrational exuberance" resulted in significant market gyrations following Fed Chairman Greenspan's famous speech of December 5, 1996. Within thirty minutes of news wire reports on the speech, futures markets began a sharp decline. The major Asia-Pacific markets fell approximately 3 percent for the day, with the European markets taking similar hits (Sicilia and Cruikshank 2000).

Restrictive policies are used by the Fed when attempting to tame inflationary pressure and expansive policies are applied when attempting to facilitate growth in the economy. Periods of increasing Federal Reserve Bank discount rates are taken to indicate a restrictive policy period and periods of decreasing discount rates are taken to indicate an expansive policy period, following Johnson, Buetow, and Jensen (1999).

Exhibit 1
Developed and Emerging Markets Investigated



Develped Markets (DM)		Emerging Markets (EM)
Austria, Belgium, Denmark, Finland, France Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom	Europe	Jordan and Turkey
Canada and United States	Americas	Argentina, Brazil, Chile and Mexico
Australia, Hong Kong, Japan, New Zealand and Singapore	Asia	Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand

Consumption adjustments, as measured with the *cay* variable, would likely alter US investment flows to foreign markets. An increased demand for foreign assets may occur when expected future returns are lower in the US. Alternatively, increased demand for foreign assets may occur when investors reduce current consumption. The impact on foreign investing may be even more dramatic as expectations of lower domestic returns may convince investors to take what is often considered additional risk and move money overseas. Fed policy will not impact the currency returns from various geographic regions similarly, so it is beneficial to separate the analysis by regions to examine the regional impact.

Global Factors and Econometric Modeling

The first two factors are based on the monthly observations of returns from the trade-weighted dollar and the Morgan Stanley Capital International (MSCI) All-Country Index. The third factor is the last observed quarterly *cay* value, based on Lettau and Ludvigson (2001), which is then used for the three months of the quarter, following the approach of Duffee (2005). The trade-weighted dollar series is from the Federal Reserve Board, and is an index of the US dollar value against the other G10 countries. Thirty-five country-level market monthly returns and regional index returns are from Morgan Stanley Capital International. Exhibit 1 provides a listing of the countries and their classification by geographic region and as a developed or an emerging market.

Estimation of an International Multi-Factor Model

The return specification for the model is:

$$R_i - R_j = (f_m + \lambda_M) b_{iM} + (f_{XR} + \lambda_{XR}) b_{iXR} + (f_{CAY} + \lambda_{CAY}) b_{iCAY} + e_i \quad i = 1,\ldots,35. \quad (1)$$

Since this model is nonlinear in the parameters and multiple countries are examined, the model for twenty-three developed and twelve emerging markets is estimated with iterated nonlinear seemingly unrelated regressions (ITNLSUR). [1] The λ_j terms are the ex-ante or expected "price of risk" (or risk premium) terms for assuming one unit of factor j risk. The factors have been "centered" (or de-meaned) to provide a measure of differences from the expected factor value. f_M is the de-meaned value of the world market return in excess of the risk-free rate, represented by the 1-month Eurodollar rate at the start of the month. f_{XR} is the de-meaned value of the return on investing in a trade-weighted portfolio of the G-10 currencies. f_{CAY} is the de-meaned value of the *cay* factor. In this paper, time variation in the coefficients is allowed by estimating the model separately for periods of expansionary and restrictive Fed policy.

Time period examined

In the fifteen year and three month period (183 months) covered in this study (January 1988 through March 2003), the Federal Reserve changed the discount rate thirty-four times with twelve increases and twenty-two decreases, including twelve in the aftermath of the September 11, 2001 terrorist attacks. Six "rate change series" result from the "directional" change in Federal Reserve policy (see Table 1 for the dates). The month of the Federal Reserve change from expansive to restrictive, or from restrictive to expansive, monetary policy is not included, consistent with previous research. Two reasons for omitting the month of policy change should be recognized. First, the focus is on longer-term trends, not on the immediate impact of this change in Fed policy. Second, the months of change include days of both restrictive and expansive policy periods. Thus the samples to be analyzed are: the complete series of 183 months (Full), the expansive periods of 108 months (Expansive), and the restrictive periods of 70 months (Restrictive).

Table 1
Discount Rate Change Series

Series	Increasing (I) or Decreasing (D)	First Rate Change in Series	Rate Changes in Series	Monthly Observations in Series
1	I	9/4/1987	3	35[a]
2	D	12/18/1990	7	40
3	I	5/17/1994	4	19
4	D	1/31/1996	3	42
5	I	8/24/1999	5	16
6	D	1/3/2001	12	26[b]

[a] Beginning with January 1988 [b] Ending with March 2003

Definitions of Factors

The first factor is based on the excess return on the MSCI All-Country index. For the full sample of 183 months, f_M is the monthly excess return minus the sample average value. For the expansive period sample, f_M is the monthly excess return minus the average value for the sample period. For the restrictive period sample, f_M is the monthly excess return minus the average value for the sample period. The return to the trade-weighted dollar is formed from the G10 trade-weighted dollar index available from FRED (Federal Reserve Economic Data). R_{XR} is the arithmetic return on the index and f_{XR} is the de-meaned value for the respective sample periods.

The *cay* variable is taken from Martin Lettau's website (Lettau 2005) and ranges from the fourth quarter of 1951 to the second quarter of 2003. This period represents the interval where the cointegrated relationship is estimated to construct *cay*. See the Appendix for additional discussion on the derivation and interpretation of *cay*. The actual *cay* variable used is consistent with the 183 month interval in this study. It is defined as follows:

$$cay_t = c_t - 0.2711\, a_t - 0.6185\, y_t - 0.7232$$

where c_t, a_t, and y_t are the log variant of quarterly measures of current consumption, asset wealth, and aggregate labor income in the US, respectively. The *cay* variable is interpreted to reflect consumers' consumption adjustment to expected increases in wealth. These wealth increases are expected to result from increases in future rates of returns on assets or increases in labor income. f_{CAY} is the de-meaned value of *cay* for the respective sample periods. For robustness, two monthly variants of the *cay* series were also examined in the ITNLSUR models, with no significant difference from the results presented here (results available from contact author).

Properties of the Factors

Descriptive statistics for the factors, in the three separate samples, are presented in Table 2. Table 3 shows the cross-correlations of the factors.

The low correlation between the world market return and the *cay* factor indicates that they are capturing different effects in the economy. The high (statistically significant) correlation between the market return and

the exchange rate factor is expected. To investigate whether changing Fed policy impacts the returns across the world's geographic regions similarly, the means, standard deviations, and correlations of returns for the geographic regions, along the traditional grouping of developed and emerging market returns are examined. For this analysis, returns for the MSCI World (representing Developed Markets (DM)) and Emerging market (EM) indices from Europe and the Middle East (Eu), the Americas (Am), and Asia (As) are examined for the full, expansive, and restrictive policy periods (see Table 4). Returns were highest for the emerging markets, with the regional returns highest in the Americas, then Europe, and then Asia. For all three samples, the excess returns from the developed markets in Asia were negative and for the restrictive policy periods the excess returns from the emerging markets in Asia were also negative. For the developed and emerging markets in Europe and the Americas, returns were higher in the restrictive policy periods, reflecting Fed policy of raising short-term rates in a strong economic environment, often coupled with rising equity values. In Asia, however, returns in the restrictive policy periods were lower.

Table 2
Descriptive Statistics for Factors (01/88–3/03)

R_M is the excess world market (MSCI All-Country) returns, R_{XR} is the return on the G-10 trade-weighted US dollar portfolio, and *cay* is the past quarter observation of *cay*

Full Sample, n=183				
Variable	Mean	Std Dev	Minimum	Maximum
R_M	0.1376%	0.04264	-14.47%	10.53%
R_{XR}	0.0738%	0.01919	-4.32%	6.22%
cay	0.7255	0.01667	0.6804	0.7531
Restrictive Policy Sample, n=70				
Variable	Mean	Std Dev	Minimum	Maximum
R_M	0.0270%	0.04300	-11.12%	10.53%
R_{XR}	0.0075%	0.02092	-4.32%	4.85%
cay	0.7285	0.01929	0.6804	0.7531
Expansive Policy Sample, n=108				
Variable	Mean	Std Dev	Minimum	Maximum
R_M	0.1702%	0.04349	-14.47%	8.83%
R_{XR}	0.0858%	0.01834	-3.73%	6.22%
cay	0.7236	0.01432	0.6920	0.7470

Source: Data for *cay* taken from Data and Technical Appendices: Updated Data based on Lettau and Ludvigson (2001)

Table 3
Cross-Correlations of the Systematic Factors

	Full	Expansive	Restrictive
$\rho(R_M, R_{XR})$	-.2828	-.2008	-.4147
$\rho(R_M, cay)$	-.0484	-.0304	-.0754
$\rho(R_{XR}, cay)$	-.0809	-.0055	-.1812

To examine the impact of changing Fed policy on the interaction between the regional returns, the correlations among the regional returns are provided in Table 5. Correlations for the expansive policy periods are given in the lower-left half of the table and the correlations for the restrictive policy periods are given in the upper-right half of the table. For the expansive policy periods, the correlations across all sets of returns are strong and are statistically significant at the 10 percent level. The highest correlation was between the developed European and American markets and the lowest correlation was between the developed Asian and emerging European markets. For the restrictive Fed policy sample, however, the return correlations are very different. The correlations between the emerging American markets and the developed markets of North America and Europe are below 20 percent and are not statistically significant at the 10 percent level. In addition, the correlation between the developed North American markets and the emerging markets of Europe was only 7.6 percent and not statistically significant. Since the benefits of diversification to reduce portfolio variance are greater the lower the correlation between assets, it appears the diversification benefits of foreign investing for US investors is greater in periods of restrictive Fed policies, generally coinciding with periods of stronger economic growth. This result complements research indicating higher correlation in volatile periods for international equity markets (Odier and Solnik 1993). The real diversification benefit for a US-based investor in the restrictive periods lies in the higher returns available in the emerging markets of Europe and the Americas. The low correlations are not sufficient to lower the portfolio standard deviation, but the stronger returns are sufficient to increase the Sharpe ratio of a portfolio diversified into those regions (authors' calculations).

Estimation of the Model

In the first case, the model is estimated over the full, expansive, and re-

Table 4
Summary Data for the Regional Returns

	Full		*Expansive*		*Restrictive*	
	Mean (n=183)	Std Dev	Mean (n=108)	Std Dev	Mean (n=70)	Std Dev
DM(Eu)	.00297	.04601	.00225	.04698	.00518	.04596
DM(Am)	.00507	.04228	.00454	.04485	.00498	.03956
DM(As)	-.00445	.06338	-.00339	.06170	-.00684	.06818
EM(Eu)	.00408	.09320	.00183	.09343	.00625	.09546
EM(Am)	.01330	.09636	.01173	.08952	.01291	.10798
EM(As)	.00114	.07461	.0008838	.07840	-.00310	.06686

Table 5
Cross–Correlations for the Regional Returns

Exp / Res	DM(Eu)	DM(Am)	DM(As)	EM(Eu)	EM(Am)	EM(As)
DM(Eu)	1	.60795	.62534	.36096	**.19387**	.56139
DM(Am)	.75375	1	.40734	**.07577**	**.19378**	.55929
DM(As)	.54218	.43491	1	.24854	.32525	.46952
EM(Eu)	.53148	.48027	.26226	1	.36018	.29217
EM(Am)	.55463	.66172	.35297	.39509	1	.33843
EM(As)	.45089	.51462	.49142	.47654	.51901	1

strictive policy periods with differing risk premiums for the developed and emerging markets for the three factors (see Table 6). To conserve space, the beta ($b_{i,j}$) estimates are not shown, as the focus of the analysis is on the risk premiums for the factor risks. For US equity returns in all analyses, the estimated risk premium for the exchange rate factor (λ_{XR}) for the US is set to zero, since the impact domestically for changes in the dollar can be expected to vary considerably from the impact on foreign returns. For the full and expansive policy periods, the results are similar, with statistically significant pricing of the market risk, the exchange rate risk, and *cay* risk for the developed markets. The emerging market returns did not exhibit consistent risk premiums for these factors. This finding indicates that the set of emerging markets is not integrated in pricing these risks. It is likely that a select set of emerging markets are integrated, however, that issue is left for other analyses.

For the restrictive policy sample, no factor risks were found to have consistent premiums across either the developed or emerging markets. The rewards for bearing investment risk are positive over the full sample and the expansive policy periods for the developed markets, suggesting these countries are integrated in an international CAPM that includes the *cay* factor. Their failure to price these risks consistently in the restrictive policy sample suggests a lack of market integration.

Building on the previous results showing lower correlations between the regions in the restrictive policy periods, it is hypothesized that the response to the Fed policy is directly linked to exchange rate adjustments and that this response will vary by geographic region, due to the close economic links within regions. To address this likelihood, the model is estimated with the risk premiums for the exchange rate factor being allowed to differ across geographic region as opposed to a developed versus emerging market distinction.

The results provided in Table 7 show the *cay* risk to be significantly priced across the developed markets in all Fed policy periods, while the market risk is not priced in either the full or the restrictive policy periods. The exchange rate risk premiums are positive and statistically significant in the expansive Fed policy periods of falling discount rates. This represents a positive reward in returns for bearing the currency risk in foreign investing when the Fed is attempting to stimulate the US economy by reducing interest rates. These results coincide with the strong returns from foreign currencies in Fed expansionary policy periods shown in Table 2, consistent with exchange rate theory. In restrictive policy periods, only countries of the Americas exhibited a significant exchange rate premium, with a negative reward in return for investing in non-US countries in the hemisphere during periods of increasing US discount rates. This result is in accord with economic theory that suggests the rising interest rates in the US will attract investment away from other currencies, facilitating a decline in the value of the foreign currencies.

Table 6
Risk Premium Estimates

	FULL (n=183)	EXPANSIVE (n=108)	RESTRICTIVE (n=70)
λ_{M}(DM)	0.001841* (1.79)	0.00296** (2.54)	0.00053 (0.74)
λ_{M}(EM)	0.00324 (0.90)	0.002879 (0.62)	0.010462 (0.12)
λ_{XR}(DM)	0.006028* (1.81)	0.011125*** (2.86)	-0.00135 (-0.68)
λ_{XR}(EM)	0.003923 (1.02)	0.005263 (1.12)	0.08322 (0.37)
λ_{cay}(DM)	0.015775** (2.75)	0.011879** (2.24)	0.003603 (1.32)
λ_{cay}(EM)	0.003312 (0.61)	-0.00021 (-0.06)	-0.25127 (-0.35)

*p<.10 **p<.05 ***p<.01

Table 7
Risk Premium Estimates

	FULL (n=183)	EXPANSIVE (n=108)	RESTRICTIVE (n=70)
λ_{M}(DM)	0.001514 (1.49)	0.002558** (2.45)	0.000478 (0.40)
λ_{M}(EM)	0.002151 (0.61)	-0.00137 (-0.30)	0.02414 (0.49)
λ_{XR}(Eu)	0.004674 (1.29)	0.010395** (2.13)	0.004266 (0.71)
λ_{XR}(Am)	0.005555 (1.25)	0.007663* (1.85)	-0.00593** (-2.02)
λ_{XR}(As)	0.008057* (1.81)	0.011088** (2.05)	0.034833 (1.16)
λ_{cay}(DM)	0.016741*** (2.73)	0.008725* (1.88)	0.011103*** (2.66)
λ_{cay}(EM)	-0.00172 (-0.30)	-0.00104 (-0.24)	-0.1176 (-0.80)

*p<.10 **p<.05 ***p<.01

The positive risk premium on *cay* indicates a positive payoff to foreign investing into developed markets possibly due to liquidity motivated foreign investing. Seeking additional returns in foreign developed markets generates a positive reward for the risk measured by *cay*. *Cay* risk is rewarded in developed market investing regardless of the Fed bank monetary policy, while the reward for equity market risk and exchange rate risk is found to be less consistent and less significant. For emerging market returns, however, the results do not significantly identify a risk factor that explains the significant and positive returns generated in those markets.

Conclusion

Strong evidence of the influence of deviations in current consumption, reflecting the tradeoff between current consumption and investment by US investors, in modeling international equity returns is found. This result holds regardless of Federal Reserve Bank expansionary or restrictive policy. When exchange rate risk premiums are allowed to vary by geographic region, the risk premium on *cay* is significant in all samples. Alternatively, the global market risk premium is not significant in periods of restrictive Fed policy. This evidence complements the findings of Lettau and Ludvigson (2001 and 2005) and Guo (2004a) that *cay* predicts future equity returns. Our findings confirm that equity investing in developed markets receives a positive reward due to the risk factor represented by *cay* in both expansive and restrictive periods of Federal Reserve Bank policy. As suggested in Guo (2004b), this influence may result from the liquidity impact of the current consumption and investment tradeoff of US investors, however, he hypothesizes that including the liquidity factor should increase the statistical significance of measures of the market risk premium. This paper's results add to a growing portfolio of findings that indicate that the consumption versus investment decision of US investors is a significant driver of domestic and international equity returns. MAJB

Notes

1. All models were also estimated including an intercept term, to ensure that the risk premiums do not result from a misspecification of the model. The results were qualitatively similar or even more supportive of the findings reported in the paper.

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Appendix: A Brief Primer on CAY

CAY is an acronym describing how closely investors' consumption fulfills the premise that they try to maintain consumption (C) at a constant proportion of their wealth (W). That is, that investors typically desire a constant consumption to wealth ratio (C/W). The US government collects quarterly aggregate consumption data as well as some broad measures that represent wealth.

Define the consumption to wealth ratio as:

$C / W = k$, then $\ln [C / W] = \ln(C) - \ln(W) = \ln(k)$.

Approximate ln(W) with ln(Assets) + ln (Labor Income) then subject to the approximation, the following would be true:

$\ln(C) - \ln(Assets) - \ln(Labor\ Income) = k^*$.

Lettau and Ludvigson (2001) model the relationship between consumption, asset wealth, and labor income as a cointegrated vector autoregression. They estimate the following cointegrated VAR:
$\ln(C) + beta_a \ln(Assets) + beta_y \ln(Labor\ Income) = beta_o$

It is recognized that the consumption to wealth ratio may deviate in any one time period as investors try to smooth consumption, or as the measure of wealth may be slightly in error. This deviation in consumption from that predicted by the data measures for wealth is what is known as "cay".

Given the coefficient estimates for the conintegrated VAR, one can determine the predicted level of consumption given the current level of Wealth at time t. Let C*(t) equal the predicted level of consumption given the current level of Wealth(t). Then,

$C^*(t) = beta_a \ln(Assets) + beta_y \ln(Labor\ Income) - beta_o$, and the deviation in consumption from the trend level would be:

$cay(t) = \ln(C(t)) - C^*(t)$.

Thus, cay(t) gives a measure of the deviation in the current level of aggregate consumption from that predicted given the current level of aggregate wealth. It could be expected to quantify the well known "wealth effect" where levels of consumption seem inconsistent with levels of income. For example, in the 1990s income growth was declining but consumption growth was increasing and the difference was attributed to increases in investment wealth.

A negative level of cay(t) for a given period could be interpreted as a rational response to either an anticipated decrease in investment asset returns in the future, or a decrease in rates of return to human capital, i.e. labor income. Lettau and Ludvigson (2001) have shown that a negative level of cay(t) is indicative of decreased investment returns in the future as opposed to decreased levels of labor income. An alternative interpretation given to cay(t) is that it is a proxy for perceived "liquidity" as investors curtail consumption in periods of low returns or anticipation of lower levels of liquidity (Guo 2004b).

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