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RISK AND RETURN: CONSUMPTION BETA VERSUS MARKET BETA

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Risk and Return: Consumption Beta versus Market Beta*

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Abstract

Much recent work emphasizes the joint nature of the consumption decision and the portfolio allocation decision. In this paper, we compare two formulations of the Capital Asset Pricing Model. The traditional CAPM suggests that the appropriate measure of an asset's risk is the covariance of the asset's return with the market return. The consumption CAPM, on the other hand, implies that a better measure of risk is the covariance with aggregate consumption growth. We examine a cross-section of 464 stocks and find that the beta measured with respect to a stock market index outperforms the beta measured with respect to consumption growth.

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I. Introduction

The link between asset markets and product markets is central to a variety of macroeconomic models. In IS-LM models, such as those discussed by Tobin [1980,1982] and Blanchard [1981], asset prices affect wealth and thus aggregate demand. In models based upon intertemporal substitution, such as the one Lucas [1978] considers, asset prices adjust to equate desired expenditure with the endowment of the economy. The important role given to the stock market in these very different models is not surprising. As Fischer and Merton [1984] document, there is a close empirical connection between stock market movements and the subsequent behavior of the economy.

Recent work by Breeden [1979], Grossman and Shiller [1981,1982], and others emphasizes the joint nature of the consumption decision and the portfolio allocation decision.[1] This integration is natural, since the economic agents who make consumption decisions are also deciding how to allocate their savings among the various assets in the economy. The implied model, which is often called the "consumption CAPM," provides an intuitive and empirically tractable framework for examining the interaction between asset returns and the macroeconomy.

The purpose of this paper is to compare the consumption CAPM to the traditional Capital Asset Pricing Model. Both versions of the CAPM

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[1]See also Campbell [1984], Hall [1982], Hansen and Singleton [1983], Mankiw [1981,1983], Mankiw, Rotemberg and Summers [1982], Runkle [1982], Shapiro [1984], Shiller [1982], and Summers [1982].

relate the expected return on an asset to its systematic risk. Traditional tests of the CAPM use the covariance with a stock market index to measure systematic risk. The consumption CAPM, however, suggests that a better measure of systematic risk is the covariance with aggregate consumption.

Tests of the traditional CAPM produce mixed results. Fama and MacBeth [1973], for example, examine the returns on a cross-section of stocks and conclude that the data confirm the theory. Other researchers, such as Douglas [1969], Miller and Scholes [1972], Levy [1978], and Gibbons [1982], report evidence contradicting the model. One possible objection to these cross-sectional tests is that the true market portfolio is much larger than the one used in practice. Most studies use a stock market index as the market portfolio. In the theoretical model, however, the market portfolio includes all assets: bonds, land, residential structures and, most important, human capital. It is possible that any empirical failure of the theory is attributable to the exclusion of many relevant assets from the market portfolio.

The inability to measure the market portfolio is a major obstacle for both testing and using the traditional CAPM. Roll [1977] concludes that, because of this problem, the CAPM is untestable. Acceptance of Roll's nihilistic conclusion would render the CAPM useless as a positive theory of how investors do behave. Moreover, since practical applications of the CAPM typically require knowing the market portfolio, it would also diminish the usefulness of the CAPM as a

normative theory of how investors should behave. Thus, empirical application of the model requires identification of the market portfolio.

The consumption CAPM may offer a solution to this problem. This version of the CAPM relates the expected return on an asset to the covariance of its return with the growth in consumption (its consumption beta). Intuitively, the growth in consumption is the return on all assets; only risk correlated with consumption risk should be rewarded. Thus, our ability to measure consumption can potentially circumvent the problem of explicitly identifying the market portfolio.[2] Moreover, Grossman and Shiller [1982] show that the consumption beta can be a valid measure of risk even in the presence of non-traded assets.

In this paper we examine whether the consumption CAPM provides a more empirically useful framework for understanding cross-sectional stock returns. We address two questions. First, do high consumption beta stocks earn a higher return? Second, does the consumption CAPM outperform the traditional CAPM in explaining the cross-section of stock returns? By considering these questions, we hope to learn whether the traditional CAPM or the consumption CAPM is more consistent with the data.

Our study of the consumption CAPM parallels previous studies of

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[2]An alternative approach to this problem is taken by Stambaugh [1982], who attempts to measure the market return explicitly by including a broad range of assets. Such explicit measurement of the market return, however, does not easily permit including the return to human capital, which appears the primary source of risk for a typical

the traditional CAPM. Thus we can directly compare the two models. While some recent work reports rejections of the consumption CAPM, we believe the empirical usefulness of the model is not fully settled. Hansen and Singleton [1983], for example, report that the over-identifying restrictions implied by the consumption CAPM are overwhelmingly rejected. It is difficult, however, to judge the economic significance of this finding. In particular, it is possible that in economic terms the model is approximately true, but the strict tests of over-identification fail (Fisher [1961]). It is therefore essential to construct a test that nests an alternative hypothesis motivated by economic theory. Specifically, in our formulation, it is possible to tell from the results whether the consumption CAPM is more or less consistent with the data than is the traditional CAPM.

Our examination of cross-sectional stock returns provides little support for the consumption CAPM. We find that the beta measured with respect to a stock index outperforms the beta measured with respect to consumption growth. In particular, when we regress return on both the market beta and the consumption beta, the coefficient on the consump-

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person. Even though the aggregate "dividend" to human capital (labor income) can be measured, the capital gain or loss reflecting changes in expected returns cannot. The use of the consumption CAPM obviates the need for such measurement. Moreover, using the consumption CAPM allows us to avoid other issues involving the definition of wealth. For example, we need not decide whether government bonds are net wealth (Barro [1974]), as consumers have already made that decision implicit in their optimal plans.

tion beta is statistically insignificant and very small while the coefficient on the market beta is statistically significant and comparatively large. We conclude that the consumption CAPM is not a more empirically useful model for explaining cross-sectional variation in stock returns.

Section II presents the theoretical framework for the tests. Section III describes the data, while Section IV discusses some issues concerning estimation. Section V presents the empirical results. Section VI discusses the results and suggests some possible explanations.

II. Theory

In this section, we present the two formulations of the Capital Asset Pricing Model. We first briefly review the traditional CAPM. We then discuss the consumption CAPM.

A. The Traditional CAPM

The traditional CAPM is a static model of portfolio allocation under uncertainty and risk aversion. As Brealy and Myers [1981], Fama [1976], and other textbooks show, the model relates the return R_i on asset i to the risk-free return R_F and the market return R_M. The relation is

$$(1) \qquad ER_i = R_F + (ER_M - R_F)\beta_{Mi}$$

where E denotes the expectation operator, and

$$(2) \qquad \beta_{Mi} = Cov(R_i, R_M)/Var(R_M).$$

The term β_{Mi} is a measure of the systematic risk of asset i. For an asset with a certain real return, $\beta_{Mi} = 0$. For the market portfolio, $\beta_{Mi} = 1$. In general, β_{Mit} can take any positive or negative value.

To test the model, we write equation (1) as

$$(3) \quad R_i = a_0 + a_1\beta_{Mi} + u_i$$

where $a_0 = R_F$,

$a_1 = ER_M - R_F$,

R_i = the realized return on asset i over our sample, and

u_i = the expectational error $R_i - ER_i$.

The model thus relates the return on asset i to its systematic risk β_{Mi}.

If the β_{Mi} for each stock were directly observable, we could run the regression (3) on a cross-section of stocks. The β_{Mi}, however, are not observable. In practice, we use the sample estimates. That is, for each stock i, we use the time series of returns R_{it} and R_{Mt} to estimate β_{Mi}. We then use the estimated β_{Mi} as the variable in

equation (3). We discuss the problem of sampling error in β_{Mi} below.

B. The Consumption CAPM

Much recent work in finance stresses the joint nature of the consumption decision and the investment decision. Empirical studies, which typically concentrate on the time series properties of consumer spending and asset returns, do not provide a clear verdict as to whether the consumption CAPM is consistent with the data.[3] Few studies examine returns on a large cross-section of assets.[4] In this section we briefly review the model and discuss its implications for cross-sectional stock returns.

Consider the optimization problem facing the representative consumer. Each period he chooses a level of consumption and an allocation of his portfolio among various assets. His goal is to maximize the following utility function:[5]

$$(6) \qquad E_t \sum_{s=0}^{\infty} (1+\rho)^{-s} U(C_{t+s})$$

where E_t = expectation conditional on information available at time t,

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[3]See the papers cited in note 1.

[4]Campbell [1984], Hansen and Singleton [1983], and Marsh [1983] examine the returns of a handful of assets or portfolios. The consumption CAPM, however, has not been subject to test on a large cross-section of stocks, as has the traditional CAPM.

[5]This utility function, which is standard in the consumption CAPM

ρ = rate of subjective time preference,

C_{t+s} = consumption in period t+s of a nondurable good,

U = one-period, strictly concave utility function.

Consider some asset i for which the representative consumer holds a positive amount. Along any proposed consumption path, C_t, C_{t+1},..., the consumer can consider a small feasible perturbation in C_t and C_{t+1}. Suppose he reduces consumption in period t by dC_t, invests the saving asset i, and then consumes the return in period t+1. He increases his period t+1 consumption by $dC_{t+1}=(1+R_{it})dC_t$, where R_{it} is the real return on asset i. The change in total utility (4) due to this feasible perturbation is

$$(5) \quad -U'(C_t)dC_t + (1+\rho)^{-1}(1+R_{it})U'(C_{t+1})dC_t.$$

At an optimum, no feasible perturbation should increase expected utility. Hence, the change in expected utility (7) due to this marginal change is zero. That is,

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literature, entails several assumptions. In particular, consumption of the good measured by C is additively separable from other goods, including durables and leisure. The utility function is also additively separable through time. Another possible problem with the utility function is that it assumes aggregation across consumers is permissable. Breeden [1979] and Grossman and Shiller [1982] show conditions under which this aggregation can be rigorously justified. Their theorems, however, are strictly applicable to infintessimal intervals in continuous time, not to the discrete intervals we consider.

$$(6)\quad E_t\,[((1+R_{it})/(1+\rho))(U'(C_{t+1})/U'(C_t))] = 1,$$

$$\text{or}\quad E_t\,[(1+R_{it})S_t] = 1,$$

where $S_t = U'(C_{t+1})/U'(C_t)(1+\rho)$ is the marginal rate of substitution. The first order condition (6) is the now standard relation between the return on an asset and the marginal rate of substitution between current and future consumption.

From (6), we wish to derive a relation between an asset's expected return and its covariance with consumption. First note that equation (6) also holds in unconditional expectation by the law of iterated projections. Straightforward manipulation of (6) next leads to the following equivalent form:

$$(7)\quad E[1+R_{it}] = [ES_t]^{-1}(1-\mathrm{Cov}(R_{it},S_t))$$

where E denotes the unconditional expectation and Cov denotes the unconditional covariance.

We assume the consumer's one-period utility function U(.) has constant relative risk aversion. That is,

$$(8)\quad U(C) = C^{1-A}/1-A$$

where A is the Arrow-Pratt measure of relative risk aversion. With

this utility function, we can approximate the covariance in (7) as:[6]

$$(9)\quad \mathrm{Cov}(R_{it},S_t) \cong [-A/(1+\rho)]\mathrm{Cov}(R_{it},C_{t+1}/C_t)$$

We can now derive the consumption-beta relation. We combine the relation (7) with the approximation (9) to obtain the following equation, which parallels equation (3) in the previous section:

$$(10)\quad R_i = a_0 + a_2\beta_{Ci} + u_i$$

where R_i is the realized return on asset i over our sample,

$$a_0 = [ES_t]^{-1} - 1$$

$$a_2 = A\ \mathrm{Cov}(R_{Mt},C_{t+1}/C_t)/[(1+\rho)ES_t]$$

and

$$(11)\quad \beta_{Ci} = \mathrm{Cov}(R_{it},C_{t+1}/C_t)/\mathrm{Cov}(R_{Mt},C_{t+1}/C_t).$$

As in the traditional CAPM, the model thus relates the return on asset i to its systematic risk β_{Ci}. The measure of an asset's systematic risk, however, is its covariance with consumption growth C_{t+1}/C_t. For an asset with a certain real return, $\beta_{Ci} = 0$. We have normalized the β_{Ci}'s so that the β_{Ci} for the stock market is one. In general, the

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[6]This approximation is exact in continuous time if consumption and stock prices follow diffusion processes. This approximation is also accurate over quarterly intervals, since C_{t+1}/C_t is highly correlated with $(C_{t+1}/C_t)^{-A}$. For A as high as four, for example, this correlation

consumption beta, β_{Ci}, can take on any positive or negative value.

We can easily nest the traditional CAPM and the consumption CAPM in one equation. In particular, we can regress the return on asset i on its market beta and its consumption beta to see which measure of risk is a better explanator of return. That is, we estimate

$$(12) \quad R_i = a_0 + a_1\beta_{Mi} + a_2\beta_{Ci} + u_i.$$

This regression can shed light on the empirical usefulness of the consumption CAPM as compared to the traditional formulation.

In all of the possible regressions above--(3), (10) and (12)--the constant term a_0 has a natural interpretation. For an asset that earns a constant risk-free return, all of the risk measures are equal to zero. Therefore, each equation implies that this risk-free asset earns a return equal to the constant a_0. (If there is no such asset, then a_0 is the unconditionally expected return on a zero-beta asset.) One way to judge the reasonableness of the results is to examine whether the estimated constant accords with other estimates of the risk-free return.

We can also easily interpret the coefficients on systematic risk (β_{Mi} and β_{Ci}). We have normalized these risk measures so that the beta for the stock market index is one. Therefore, since the constant a_0 is

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exceeds 0.99.

the real risk-free return (R_F), each CAPM implies that the coefficient on the relevant beta is the spread between the market return and the risk-free return ($ER_M - R_F$). When we estimate equation (12), we can compare the coefficients a_1 and a_2 to gauge the relative success of the two CAPM formulations. The traditional CAPM implies $a_1 = ER_M - R_F$ and $a_2 = 0$, while the consumption CAPM implies $a_1 = 0$ and $a_2 = ER_M - R_F$.

III. Data

The cross-section of stocks, which is from the CRSP tape, includes all those companies listed on the New York Stock Exchange continuously during our sample period; they number 464. We use quarterly data from 1959 to 1982 to calculate the return and covariances for each stock. The return is from the beginning of the quarter to the beginning of the following quarter.

The market return we use is the return (capital gain plus dividends) on the Standard and Poor composite. The consumption measure is real consumer expenditure per capita on non-durables and services during the first month of the quarter. We use the comparable consumer expenditure deflator to compute real returns for all the stocks and for the market index. All these NIA data are seasonally adjusted.

The consumption CAPM strictly relates an asset's return between two points in time to consumption growth between the same two points in time. In practice, we observe average consumption over an interval. Thus, we are using measured consumption during the first month of the

quarter to proxy the consumption flow on the first day of the quarter. Since we examine quarterly returns, this approximation is probably accurate. That is, consumption growth between January (average) and April (average) is highly correlated with consumption growth between January 1 and April 1. The time-aggregation problem would, however, become more severe if we examined monthly returns.

Although data choices are always partly arbitrary, we can ensure that our results are somewhat robust by trying other comparable data. Although we do not report the results below, we have tried using annual rather than quarterly return data. The results were largely the same as those we report. We have also tried using alternative measures of consumption--in particular, expenditure on nondurables (i.e., not including services) and expenditure on food (an item that is most clearly non-durable). These alternative consumption measures produce results even less favorable to the consumption CAPM than those we report below.

IV. Estimation

There are at least two potential problems when estimating equations such as those we consider. The first issue concerns the assumption regarding the variance-covariance matrix of the residuals. The second issue involves the measurement of risk.

A. The Variance-Covariance Matrix

Previous studies that examine the relation between risk and return, such as Douglas [1969], Miller and Scholes [1972] and Fama and MacBeth [1973], and Levy [1978], use ordinary least squares to estimate equations such as (3). Although the coefficient estimates are consistent under very general assumptions, the estimates are efficient and the computed standard errors are correct only if the variance-covariance matrix of the residuals is spherical. That is, implicit in the OLS standard errors is the assumption that the returns of all stocks have the same own variance and do not covary together at all.

One simple improvement upon the use of ordinary least squares is to allow for heteroskadasticity across stocks. In particular, we can assume that the variance-covariance matrix is diagonal with elements proportional to γ_i, where γ_i is defined as $\text{Var}(R_{it})/\text{Var}(R_{Mt})$. This straightforward application of weighted least squares (WLS) is likely to produce more efficient estimates and more reliable standard errors than OLS.

Even this assumption regarding the variance-covariance matrix, however, is not fully satisfactory, because stock returns do covary. Unfortunately, finding a tractable alternative is difficult. We do not have enough data to estimate freely a 464 by 464 variance-covariance matrix.[7] Some parameterization of the matrix is necessary if we are to

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[7]This problem is inherent in many tests of the CAPM. Gibbons [1982], for example, freely estimates such a variance-covariance matrix by restricting the number of assets he considers.

estimate using generalized least squares. One simple parameterization is to assume a macroeconomic shock ν, which affects stock i with some factor k_i, and a stock-specific shock η_i, which is uncorrelated across stocks.[8] That is,

$$(15) \qquad u_i = k_i \nu + \eta_i$$

where $Cov(\eta_i, \eta_j) = 0$ if $i \neq j$ and $Cov(\nu, \eta_i) = 0$.
Under this assumption, we can show that $k_i = \beta_{Mi}$ and that Eu_iu_j is proportional to γ_i if $i = j$ and to $\beta_{Mi}\beta_{Mj}$ if $i \neq j$.[9] In Section V below, we compare the results using ordinary least squares and weighted least squares to those using generalized least squares with this parameterization of the variance-covariance matrix.[10]

The estimates under alternative assumptions regarding the variance-covariance matrix provide a statistical test of model specifi-

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[8]Our cross-section tests should not be confused with time-series, factor-analytic approaches to asset pricing. We are assuming here a one-factor model of returns. It is important to note, however, that neither the validity of the underlying theory nor the consistency of the estimates depends on this one-factor model. For purposes of statistical efficiency and inference, this parameterization appears better than the zero-factor model assumed by others.

[9]This result is demonstrated by noting that, since the return on the market portfolio is a weighted average of individual stock returns, the (demeaned) market return is a weighted average of the u_i. Since each stock is a small part of the market portfolio, the η_i average to zero. Without loss of generality, we can now normalize the k_i so that the (demeaned) market return is ν.

[10]Inversion of this 464 by 464 matrix may at first seem compuationally difficult. This matrix, however, can be written as $D + VV'$, where D is a diagonal matrix and V is a vector. Its inverse is $D^{-1} - D^{-1}VV'D^{-1}/(V'D^{-1}V)$. See Rao [1973, p.33].

cation. Under the null hypothesis that the model is correctly specified, both OLS and GLS produce consistent estimates, although only GLS is efficient. If the model is mis-specified, however, then the estimates generally do not converge in probability. Following procedures similar to those suggested by Hausman [1978] and White [1980], we can thus formally test the model specification.[11]

B. Measurement of Risk

The second issue concerns the estimates of the risk measures β_{Mi} and β_{Ci}. The simplest approach is to use the sample estimates. Implicit in this approach is the assumption that the sample covariances are good measures of the covariances of the subjective distribution of the representative investor. This assumption appears a useful starting point for exploring the consistency of the data with the two models.

One possible source of measurement error would seem to be the error in measuring aggregate consumption. Measurement error in consumption, however, need not lead to measurement error in the consumption betas. If the measurement error in consumption is classical errors-in-variables, then our estimated consumption betas are consistent. We define the consumption beta as a ratio of two regression coefficients and both coefficients are biased equally.[12] Put dif-

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[11]The test statistic is

$$(a_{OLS} - a_{GLS})'(V(a_{OLS}) - V(a_{GLS}))^{-1}(a_{OLS} - a_{GLS}).$$

For this test, $V(a_{OLS})$ is calculated taking into account the structure on the variance-covariance matrix of the residuals given in (15). This test statistic is distributed as chi-squared with degrees of freedom equal to the dimension of a.

[12]In particular, β_{Ci} is the ratio of the coefficient from regressing

ferently, one can view our estimates of β_{Ci} as instrumental variables estimates, where the return on the stock market is used as an instrument for aggregate consumption growth. Thus, the fact that the consumption data suffers from errors-in-variables does not preclude consistent estimation of the consumption betas.

Another potential errors-in-variables problem is that the estimates of both betas include sampling error. To examine whether our results are attributable to this sort of measurement error, we follow an instrumental variables procedure. We divide the sample of T observations per stock into the T/2 odd quarters and the T/2 even quarters. For each subsample, we compute the two betas. We then regress the odd quarter return on the odd quarter beta using the even quarter beta as an instrumental variable. Alternatively, we can reverse the procedure. The sampling error in the odd sample is uncorrelated with the sampling error in the even sample if stock returns and consumption changes are serially independent, an assumption approximately consistent with the data (Fama [1976], Hall [1978]). This procedure can thus produce consistent estimates despite sampling error in the betas. Below we compare the results using this instrumental variable procedure to those using the sample estimates of the betas without instrumenting.

R_{it} on C_{t+1}/C_t and the coefficient from regressing R_{Mt} on C_{t+1}/C_t. The bias in both coefficents depends on the signal to noise ratio in consumption growth and enters multiplicatively.

V. Results

For each of our 464 stocks, we compute its mean return over our sample and the two risk measures: its market beta (β_{Mi}) and its consumption beta (β_{Ci}). We also compute its normalized own variance of return (γ_i). Table 1 contains some sample statistics. Note that all the various risk measures are positively correlated. That is, stocks that are risky according to one concept of risk tend to be risky according to the other concepts as well. The risk measures are not, however, very highly correlated. Thus, we expect to be able to discern the empirical usefulness of the alternative measures.[13]

A. Do High Market Beta Stocks Earn Higher Returns?

A primary implication of any version of the CAPM is that assets with high systematic risk earn high average return. We therefore begin our exploration of the cross-section by examining whether this positive association holds true. The regressions in Table 2 demonstrate that

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[13]Two other sample statistics are of interest. First, the time-series correlation between quarterly consumption growth and the stock market return is 0.29. It is therefore not surprising that the two betas have a cross-sectional correlation of only 0.58.

Second, the time-series covariance between consumption growth and the market return is 0.000125. The consumption CAPM (equation 10) implies that if the risk-free return equals the rate of subjective time preference, then the equity premium ($ER_M - R_F$) equals the product of this covariance and the coefficient of relative risk aversion (A). An annual equity premium of about six percent implies A is over 100. Mehra and Prescott [1983] point out that unless one is ready to accept extreme degrees of risk aversion, the high equity premium is indeed puzzling.

the traditional CAPM passes this first test.[14] Under all estimation procedures, there is a positive relation between a stock's return and its market beta. The estimated constant, which should be the risk-free return, is always insignificantly different from one or from zero.[15] The slope coefficient, which should be the spread between the market return and the risk-free return, is always positive, significant, and of reasonable size. These results are thus broadly consistent with the theory.

B. Do High Consumption Beta Stocks Earn Higher Returns?

We next examine the empirical relation between return and consumption beta. In Table 3, we report results analogous to those in Table 2 for the consumption-based model. The results here are less supportive of the theory. When we estimate using GLS, the coefficient on the consumption beta is insignificant. When we use OLS or WLS, the constant term in the regressions in Table 3 is higher than the theory suggests it would be. Remember that the constant a_0 is the implied risk-free return. Regression (2b) implies a high risk-free real return of four percent. When we estimate using our instrumental variables procedure, the consumption beta has a negative sign, although with a very large standard error. Unlike the results for the traditional CAPM, the

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[14]All the coefficients and standard errors have been multiplied by 400 and can therefore be interpreted as annual percentages.

[15]Fama [1975] reports an annual risk-free real return of about one percent for the period between 1953 and 1971. Mehra and Prescott [1983] report a real risk-free return of 0.75 percent for the period between 1889 and 1978. These estimates are based upon examination of the

results here provide no support for the theory.

The formal specification test rejects both formulations of the CAPM at very high levels of significance (< .001). This finding means that the coefficient estimates change "too much" under the alternative assumptions regarding the variance-convariance matrix. The point estimates for the regressions in Table 2, however, appear far more stable than those for the regressions in Table 3. That is, the estimates using the market beta appear less sensitive to the variance-covariance matrix than do the estimates using the consumption beta. Although both models are formally rejected, this observation suggests that the traditional CAPM is more consistent with the data than is the consumption CAPM.

C. Which Beta is More Related to Returns?

Since a stock market index excludes many assets that are in the "true" market portfolio, we would expect a priori that measured consumption is a better proxy for the market portfolio than is a stock market index. That is, theoretical considerations suggest that a consumption beta is a better measure of systematic risk than is a beta measured using a stock market index. We now examine more directly whether the data support this presumption.

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returns on Treasury bills and other assets with little risk and are not based upon a particular asset pricing model.

The regressions in Table 4 compare the consumption beta and the more common market beta. The results do not at all support the consumption CAPM. The coefficient on the market beta is always far larger and far more significant than is the coefficient on the consumption beta. Many of our estimation strategies, in fact, produce a negative coefficient on the consumption beta. The market rewards systematic risk with higher return, but the relevant measure of systematic risk appears to be the market beta rather than the consumption beta.[16]

VI. Conclusion

The data we examine in the paper provide no support for consumption CAPM as compared to the traditional formulation. A stock's market beta contains much more information on its return than does its consumption beta. Since the consumption CAPM appears preferable *a priori* on theoretical grounds, the empirical superiority of the traditional CAPM is indeed a conundrum.

Our results are predicated on the existence of a stable utility function for the representative consumer. As Garber and King [1983] point out, this assumption is often critical for identification in Euler equation estimation. The same is true here. The consumption CAPM may perform poorly because shocks to preferences are an important

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[16]Following Douglas [1969], Miller and Scholes [1972] and Levy [1978], we tried including the stock's own variance of return as a measure of risk. As previous authors, we find that it has a statistically significant coefficient, although the size of the

determinant of consumer spending. Indeed, Hall [1984] argues that such taste shocks may be a central driving force of the business cycle.

Even if the utility function of the representative consumer is stable, our results may be attributable to a misspecification of that utility function. The utility function may not be additively separable among non-durables, durables and leisure, as we implicitly assume.[17] Alternatively, adjustment costs in consumption may be important, or the goods called non-durable may be in fact largely durable.

It is possible that the consumption CAPM performs poorly because many consumers do not actively take part in the stock market. For whatever reason--transaction costs, ignorance, general distrust of corporations, or liquidity constraints--many individuals hold no stock at all.[18] For these individuals, the first order condition relating consumption to stock returns is not likely to hold.[19] Furthermore, if the consumption of these consumers constitutes a large fraction of

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coefficient does not always appear large. This rejection of the model is particularly pronounced using the consumption beta, confirming that the traditional CAPM appears more consistent with the data.

[17]Previous work that considers this non-separability across different goods typically finds that it does not affect the results. See, for example, Bernanke [1983] on non-separability between non-durables and durables and Mankiw, Rotemberg and Summers [1982] on non-separability between non-durables and leisure.

[18]When one considers implicit ownership via pension funds, stock ownership is, however, more widespread than it first appears.

[19]Runkle [1982] and Zeldes [1984] examine panel data and find some evidence that the first order condition holds only for individuals with high wealth.

total consumer expenditure, it is less reasonable to expect the first order condition to hold with aggregate data. In other words, it seems possible that the consumption CAPM holds for the minority of consumers that hold stock and that our stock market index is a better proxy for the consumption of this minority than is aggregate consumption.

Table 1

Sample Statistics

	R_i	β_{Mi}	β_{Ci}	γ_i
Mean	7.53	1.20	1.01	5.50
Median	7.12	1.14	0.91	4.34
Standard Deviation	4.78	0.38	0.70	3.91
Correlation with:				
R_i	1.00			
β_{Mi}	0.47	1.00		
β_{Ci}	0.27	0.58	1.00	
γ_i	0.55	0.74	0.42	1.00

R_i = Average Return (percentage at annual rate)

β_{Mi} = Market Beta

β_{Ci} = Consumption Beta

γ_i = Own Variance (normalized by the variance of the return on the stock market index)

Table 2

Do High Market Beta Stocks Earn Higher Returns?

Dependent Variable: R_i

	(1a)	(1b)	(1c)	(1e)	(1f)
Estimation	OLS	WLS	GLS	GLS-IV	GLS-IV
Subsample of Variable				ODD	EVEN
Subsample of Instrument				EVEN	ODD
Constant	0.35	-0.38	-0.72	-0.01	0.94
	(0.66)	(0.58)	(0.56)	(1.10)	(1.50)
Market Beta	5.97	6.12	6.27	12.32	7.57
	(0.52)	(0.53)	(2.19)	(1.38)	(2.16)
s.e.e.	4.23	3.47			
R^2	0.22	0.22			

Standard errors are in parentheses.

OLS = Ordinary Least Squares

WLS = Weighted Least Squares

GLS = Generalized Least Squares

IV = Instrumental Variables Estimation

Table 3

Do High Consumption Beta Stocks Earn Higher Returns?

Dependent Variable: R_i

	(2a)	(2b)	(2c)	(2e)	(2f)
Estimation	OLS	WLS	GLS	GLS-IV	GLS-IV
Subsample of Variable				ODD	EVEN
Subsample of Instrument				EVEN	ODD
Constant	5.66	4.43	-0.31	-7.77	-3.10
	(0.37)	(0.32)	(0.55)	(4.69)	(7.08)
Consumption Beta	1.85	1.87	0.36	-51.17	-19.80
	(0.31)	(0.32)	(0.34)	(44.07)	(16.03)
s.e.e.	4.60	3.80			
R^2	0.07	0.07			

Standard errors are in parentheses.

Table 4

Which Beta Is More Related To Returns?

Dependent Variable: R_i

	(3a)	(3b)	(3c)	(3e)	(3f)
Estimation	OLS	WLS	GLS	GLS-IV	GLS-IV
Subsample of Variable				ODD	EVEN
Subsample of Instrument				EVEN	ODD
Constant	0.35	-0.37	-0.67	2.08	-9.44
	(0.66)	(0.58)	(0.57)	(5.39)	(10.07)
Market Beta	5.97	6.05	6.05	24.14	11.49
	(0.64)	(0.63)	(2.22)	(11.78)	(8.35)
Consumption Beta	-0.01	0.07	0.21	-56.09	-22.65
	(0.34)	(0.34)	(0.34)	(48.58)	(18.83)
s.e.e.	4.23	3.47			
R^2	0.22	0.22			

Standard errors are in parentheses.

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