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The CAPM is Wanted, Dead or Alive

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ABSTRACT

Kothari, Shanken, and Sloan (1995) claim that βs from annual returns produce a stronger positive relation between β and average return than βs from monthly returns. They also contend that the relation between average return and book-to-market equity (BE/ME) is seriously exaggerated by survivor bias. We argue that survivor bias does not explain the relation between BE/ME and average return. We also show that annual and monthly βs produce the same inferences about the β premium. Our main point on the β premium is, however, more basic. It cannot save the Capital asset pricing model (CAPM), given the evidence that β alone cannot explain expected return.

FAMA AND FRENCH (FF 1992) PRODUCE two negative conclusions about the empirical adequacy of the capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965): (i) when one allows for variation in CAPM market βs that is unrelated to size, the univariate relation between β and average return for 1941–1990 is weak; (ii) β does not suffice to explain average return. Size (market capitalization) captures differences in average stock returns for 1941–1990 that are missed by β. For the post-1962 period where we have book equity data, BE/ME (the ratio of book to market equity) and other variables also help explain average return.

Kothari, Shanken, and Sloan (KSS 1995) have two main quarrels with these conclusions. First, they claim that using βs estimated from annual rather than monthly returns produces a stronger positive relation between average return and β. Second, KSS contend that the relation between average return and BE/ME observed by FF and others is seriously exaggerated by survivor bias in the COMPUSTAT sample.

We argue (Section II) that survivor bias does not explain the relation between BE/ME and average return. We also show (Section III) that annual and monthly βs produce the same inferences about the presence of a β premium in expected returns. But our main point on the β premium (Section I) is more basic: It cannot save the CAPM, given the evidence that β alone cannot explain expected return.

I. The Logic of Tests of the CAPM

As emphasized by Fama (1976), Roll (1977), and others, the main implication of the CAPM is that in a market equilibrium, the value-weight market port-

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folio, M, is mean-variance-efficient. The mean-variance-efficiency of M in turn says that:

(i) β, the slope in the regression of a security's return on the market return, is the only risk needed to explain expected return;
(ii) There is positive expected premium for β risk.

Our main point is that evidence of (ii), a positive relation between β and expected return, is support for the CAPM only if (i) also holds, that is, only if β suffices to explain expected return. Confirming Banz (1981), however, and like FF (1992), KSS find that size adds to the explanation of average return provided by β. Moreover, size is no longer the prime embarrassment of the CAPM. Variables that (unlike size) do not seem to be correlated with β (such as earnings/price, cashflow/price, BE/ME, and past sales growth) add even more significantly to the explanation of average return provided by β (Basu (1983), Chan, Hamao, and Lakonishok (1991), FF (1992, 1993, 1996), and Lakonishok, Shleifer, and Vishny (1994)).

The average-return anomalies of the CAPM suggest that, if asset pricing is rational, a multifactor version of Merton's (1973) intertemporal CAPM (ICAPM) or Ross' (1976) arbitrage pricing theory (APT) can provide a better description of average returns. The excess market return of the CAPM is a relevant risk in many multifactor alternatives, like the ICAPM and Connor's (1984) equilibrium version of the APT. Thus, evidence of a positive relation between β and expected return does not favor the CAPM over these alternatives.

The three-factor model in Fama and French (1993, 1994, 1995, 1996) illustrates our point. The model provides a better description of average returns than the CAPM, and it captures most of the average-return anomalies missed by the CAPM. Because of its strong theoretical standing, the excess market return is one of the three risk-factors in the model, and our tests confirm that it is important. It captures strong common times-series variation in returns, and the market premium is needed to explain the large differences between the average returns on stocks and bills. Moreover, as in the CAPM, the market premium in our multifactor model is just the average return on M in excess of the risk-free rate. Tests on long sample periods say that this premium is reliably positive. In short, our tests of the CAPM against a multifactor alternative illustrate that a positive β premium does not in itself resuscitate the CAPM, or justify using it in applications.

KSS are not misled on this basic point. But their focus on the univariate β premium may confuse some of their readers. Indeed, because the CAPM is such a simple and attractive tool, we think that many of our colleagues *want* to be confused on this point. Otherwise, we can't explain the strong interest in the KSS β tests, given that, like many others (including Amihud, Christensen, and Mendelson (1992) and Jagannathan and Wang (1996)), KSS consistently find that β does not suffice to explain expected return.

II. Survivor Bias and BE/ME

KSS argue that survivor bias in COMPUSTAT data is important in the strong positive relation between average return and book-to-market-equity (BE/ME) observed by FF (1992) and others. COMPUSTAT is more likely to add distressed (high-BE/ME) firms that ultimately survive and to miss distressed firms that die. The survivors are likely to have unexpectedly high returns in the turnaround years immediately preceding their inclusion on COMPUSTAT. Since COMPUSTAT typically includes some historical data when it adds firms, there can be positive survivor bias in the returns of high-BE/ME firms on COMPUSTAT.

There are counter arguments. In the most detailed study of the issue, Chan, Jegadeesh, and Lakonishok (1995) conclude that survivor bias cannot explain the strong relations between average return and BE/ME observed by Lakonishok, Shleifer, and Vishny (1994) and FF (1992) in tests on the post-1968 and post-1976 periods. After 1968, and certainly after 1976, almost all the traded securities on Center for Research in Security Prices (CRSP) that are not on COMPUSTAT are missing for reasons that have nothing to do with survivor bias. Many of the missing firms are closed-end investment companies, REITs, ADRs, primes, and scores that produce no accounting information or produce information that is not comparable to that of other firms. Many financial companies are also missing because, judging that their accounting data are different from that of other firms, COMPUSTAT limited its coverage of financials for many years. These omissions, which are the result of COMPUSTAT's ex ante policy decisions, are not a source of survivor bias. Finally, some of the securities that seem to be on CRSP but not COMPUSTAT in fact appear on both, but with different identifiers.

There is other evidence that survivor bias cannot explain the relation between average return and BE/ME. Lakonishok, Shleifer, and Vishny (1994) find a strong positive relation between average return and BE/ME for the largest 20 percent of NYSE-AMEX stocks on COMPUSTAT, where survivor bias is not an issue. FF (1993) find that the relation between BE/ME and average return is strong for value-weight portfolios of COMPUSTAT stocks formed on BE/ME. Since value-weight portfolios give most weight to larger stocks, any survivor bias in these portfolios is probably trivial. In three different sets of comparisons (Table VII), KSS themselves find that the relation between average return and BE/ME is strong and strikingly similar for value-weight and equal-weight portfolios of COMPUSTAT stocks formed on BE/ME. KSS concede that survivor bias cannot explain the results for value-weight portfolios.

To support their survivor-bias story, KSS make much of the fact that stocks on CRSP but not COMPUSTAT have lower average returns than stocks on COMPUSTAT. When they risk-adjust returns using a three-factor model like that in FF (1993), however, only the smallest two size deciles of the NYSE-AMEX stocks missing from COMPUSTAT have strong negative abnormal returns (Table IV). This suggests that survivor bias is limited to tiny stocks; the average market cap of the stocks in the second decile is $13 million, while the average for the first decile is between $3 million and $7 million. The remaining 80 percent of the stocks missing on COMPUSTAT, which account for almost all the combined value of the missing stocks, have three-factor abnormal returns that are close to zero and random in sign. In other words, these missing stocks behave like stocks that are on COMPUSTAT. Similarly, Chan, Jegadeesh, and Lakonishok (1995) fill in missing COMPUSTAT book equity (BE) data for the largest 20 percent of the NYSE-AMEX firms on CRSP. The survivor-bias story says that the relation between BE/ME and average return should be weak for the firms missing on COMPUSTAT. They find that it is as strong for the missing firms as for the included firms.

KSS also speculate that the positive relation between book-to-market-equity and average return is the result of data dredging and so is special to the post-1962 COMPUSTAT period. Using a hand-collected sample of large firms that is not subject to survivor bias, however, Davis (1994) finds a strong relation between BE/ME and average return in the 1941–1962 period.

In the end, the KSS survivor-bias story rests on their evidence that there is little relation between average return and BE/ME for the rather limited industry portfolios in the *S&P Analyst's Handbook*. Their results for the S&P industries are strange since FF (1994) document a strong positive relation between average return and BE/ME for value-weight industry portfolios that include *all* NYSE, AMEX, and Nasdaq stocks on CRSP. (We use COMPUSTAT firms only to estimate industry BE/ME.)

KSS do not say that the relation between average return and BE/ME is entirely the result of survivor bias. They push so hard on the survivor-bias story, however, that serious readers are led to strong conclusions. For example, in the lead article to volume 38 of the *Journal of Financial Economics*, MacKinlay (1995, p. 5) concludes,

> *"Their analysis suggests that deviations from the CAPM such as those documented by Fama and French (1993) can be explained by sample selection biases."*

III. Minor Points

KSS claim that using βs estimated from annual rather than monthly returns explains why they measure somewhat stronger relations between β and average return than FF (1992). They also claim that although the explanatory power of size is statistically reliable, for practical purposes, size adds little to the explanation of average return provided by β. The tests that follow explore these issues.

A. Portfolios Formed on β

Table I summarizes returns for 1928–1993 on β deciles of NYSE stocks. Like KSS, we weight the stocks equally. We form the portfolios in June of each year,

Table I

Summary Statistics and Cross-Section Regressions for Postformation Equal-Weight Returns on NYSE β Deciles: 1928–1993

Starting in 1927, ten portfolios of NYSE stocks on CRSP are formed in June of each year based on VW-S βs, the sum of the slopes from regressions of monthly returns on the current and one lag of the value-weight NYSE market return. The formation period βs use 24 to 60 months of past returns (as available), except for 1927, where 18 months are used. Equal-weight monthly postformation returns on the β deciles are calculated from July to June of the following year, yielding time-series of postformation returns for July 1927 to December 1993. The equal-weight monthly decile returns are compounded to get annual returns. The βs shown in Panel A are estimated using all postformation monthly (VW, VW-S, EW, EW-S) or annual (VWA, EWA) returns for 1928–1993 and the value-weight (VW, VW-S, VWA) or equal-weight (EW, EW-S, EWA) NYSE market portfolio. VW-S and EW-S βs are the sums of the slopes from the regressions of the monthly postformation decile returns on the current and one lag of the market return. VW, VWA, EW, and EWA βs use only the contemporaneous market returns. Average Ln (Size) is the average across postformation months of the average monthly value of the natural log of size (price times shares) of the stocks in a β decile. Panel B shows the average slopes (Means) and the t-statistics for the average slopes from univariate cross-section regressions of postformation monthly or annual returns on the ten β portfolio on each of the six different estimates of their postformation βs.

Panel A: Summary Statistics

	Low β	2	3	4	5	6	7	8	9	High β
	Monthly Postformation Returns: 792 Months									
Mean	1.10	1.16	1.23	1.34	1.39	1.32	1.33	1.44	1.45	1.39
Std	5.12	5.76	6.30	6.99	7.66	7.98	8.31	9.50	9.84	11.10
	Annual Postformation Returns: 66 Years									
Mean	14.91	15.53	16.43	17.73	17.98	17.03	17.19	18.44	18.44	17.40
Std	25.69	26.39	28.25	29.85	29.52	30.76	32.04	35.96	36.03	40.55
	Postformation β Estimates									
VW	0.80	0.95	1.05	1.16	1.27	1.32	1.35	1.52	1.57	1.73
VW-S	0.91	1.03	1.14	1.24	1.36	1.41	1.44	1.63	1.70	1.87
VWA	1.06	1.13	1.23	1.33	1.33	1.37	1.43	1.56	1.60	1.71
EW	0.61	0.72	0.80	0.90	0.99	1.03	1.07	1.23	1.26	1.41
EW-S	0.65	0.73	0.81	0.89	0.98	1.02	1.06	1.21	1.26	1.41
EWA	0.78	0.82	0.89	0.96	0.95	0.99	1.02	1.16	1.14	1.27
	Average Ln (Size)									
Mean	12.70	12.76	12.74	12.50	12.36	12.16	12.03	11.73	11.36	11.00

Panel B: Cross-Section Regressions, $R = a + b\beta + e$

	Monthly Dependent Returns, R						Annual Dependent Returns, R					
	VW	VW-S	VWA	EW	EW-S	EWA	VW	VW-S	VWA	EW	EW-S	EWA
	Means						Means					
a	0.86	0.85	0.63	0.90	0.90	0.67	12.94	12.89	10.85	13.37	13.32	11.24
b	0.36	0.34	0.50	0.41	0.42	0.65	3.28	3.07	4.56	3.72	3.78	5.88
	t-Statistics for Means						t-Statistics for Means					
a	4.78	4.53	1.94	5.57	5.28	2.14	3.81	3.72	2.27	4.13	4.04	2.45
b	1.31	1.29	1.29	1.29	1.27	1.25	1.03	1.00	1.01	1.01	0.98	0.98

using βs on the NYSE value-weight market portfolio estimated with two to five years of past monthly returns (as available). Panel A of the table shows that average monthly and annual postformation returns initially increase with post-formation βs, but the relation between average return and β is rather flat from the fourth to the tenth β decile. This pattern in average returns on β portfolios is similar to KSS' Table I. The spread in average returns for their β portfolios is larger than ours, but including AMEX stocks also makes their β sort more like a sort on size than ours.

Panel A of Table I confirms KSS' evidence that βs estimated from monthly and annual returns are different. For the purposes of inferences about the average slopes from cross-section Fama-MacBeth (FM 1973) regressions of return on β, however, the important fact is that postformation βs estimated on annual or monthly returns, and using either an equal-weight or value-weight NYSE market, are near perfect linear transforms of one another. Rounded to two decimals, the correlations between the different βs range from 0.98 to 1.00.

Panel B of Table I shows that in univariate FM regressions of return on β, different βs produce different average slopes. In particular, the average slopes for the regressions that use annual βs to explain returns are about 50 percent larger than the averages for the regressions that use monthly βs. Why? The spread in the monthly βs is about 50 percent larger than the spread in the annual βs. Since the regressions are asked to explain the same dependent returns, and since the different βs are almost perfectly correlated, the smaller spreads in the annual βs lead to larger average slopes. However, although the average slopes in the annual-β regressions are larger, the near-perfect correlation among the βs leads to t-statistics for the average slopes that are nearly identical. (Jegadeesh (1992) reports similar results. See also Chopra, Lakonishok, and Ritter (1992), and Chan and Lakonishok (1993)).

In their cross-section regressions, KSS explain monthly returns with βs from regressions of annual returns on an equal-weight market return. One can argue that this combination is far from the spirit of the CAPM. In light of the recent articles of Roll and Ross (1994) and Kandel and Stambaugh (1995), however, we doubt that there is much future in debates about which approach produces bigger β premiums in cross-section regressions. Kandel and Stambaugh (1995) show that if the market proxy is not exactly mean-variance-efficient *with respect to parameters computed from the sample data*, it is possible to form portfolios that produce essentially any univariate β premium in ordinary-least-squares cross-section regressions. This conclusion about β premiums also applies to cross-section regressions that use β and other variables to explain average return. Moreover, generalized-least-squares (GLS) regressions, like those in Amihud, Christensen, and Mendelson (1992), are no cure. Roll and Ross (1994) note that a positive β premium in univariate GLS cross-section regressions simply says that the market proxy has a higher expected return than the global-minimum-variance portfolio.

B. Portfolios Formed on Size and β

Kandel and Stambaugh (1995) and Roll and Ross (1994) teach us to be wary of inferences about β premiums from FM cross-section regressions. Cross-section regressions can, however, be useful in judging whether β suffices to explain expected return. Like KSS, we address this issue by testing whether size adds to the explanation of average return provided by β. Summary statistics and FM cross-section regressions for 100 portfolios formed yearly first on size (deciles) and then on β are in Tables II and III.

The KSS cross-section regressions (their Table II) consistently show that, on a statistical basis, size improves on β's explanation of average return. This evidence is inconsistent with the CAPM, but KSS argue that the errors of β's predictions of average return are not large. The message from our Tables II and III, however, is that size does make a large incremental contribution to the explanation of average return.

Table II shows that the size sort produces a strong spread in both post-formation β and average return. The average return for 1928–1993 on the smallest decile of NYSE stocks exceeds that for the largest decile by 1.31 percent per month; the spread in βs is a healthy 0.93. Table II also shows that the second pass sort on preformation βs produces large spreads in postformation βs that are independent of size. As in FF (1992), however, the β sorts do not produce much spread in average return.

It seems safe to predict that a single average premium for β cannot capture both the strong positive relation between β and average return produced by the size sort in Table II and the weak relation between β and average return in the β sorts. Table III confirms this prediction. Like KSS, our univariate regressions of return on β produce positive average premiums that are more than 2.0 standard errors from 0.0. But the univariate β regressions leave an unexplained size effect. The spread in the average residuals from the smallest to the largest size decile is 0.66 percent in the regressions for monthly returns and 7.02 percent in annual returns. There is an even more systematic pattern in the average residuals for the β sorts, which are large and positive for low-β portfolios and strongly negative for high-β portfolios. The spread in the average residuals from the lowest to the highest β deciles of NYSE stocks is 0.56 percent in the regressions for monthly returns and 7.25 percent in annual returns.

In short, for portfolios formed on size and β, the average β premiums from univariate regressions of return on β underestimate the positive relation between β and average return produced by the size sort and overestimate the relation between β and average return produced by the β sort. For the extreme size and β deciles, these CAPM pricing errors are large. These results suggest that β alone cannot explain average return. As in KSS, the bivariate regressions of return on β and size in Table III confirm that size always adds substantially to β's description of average stock returns.

Table II

Summary Statistics for 100 Equal-Weight NYSE Portfolios Formed on Size and Then β: 1928–1993, N = 792

Starting in 1927, ten portfolios of the NYSE stocks on CRSP are formed in June of each year based on size (market capitalization, price times shares outstanding). Each size decile is then subdivided into β deciles using βs for individual stocks that are the sum of the slopes from regressions of monthly returns on the current and one lag of the value-weight NYSE market return. The formation period βs use 24 to 60 months of past returns (as available), except for 1927, where 18 months of returns are used. Equal-weight monthly returns on the 100 portfolios are calculated from July to June of the following year, yielding time-series of returns for July 1927 to December 1993. The VW-S βs shown are the sums of the slopes from regressions of monthly postformation returns for the February 1928 to December 1993 period on the current and one lag of the value-weight NYSE market return. Average Ln (Size) is the average across postformation months of the average monthly value of the natural log of size for the stocks in each portfolio. The Ave column of each block is the average across β deciles of the parameter values for a size decile. The Ave row of each block is the average across size deciles of the parameter values for a β decile.

	Low β	2	3	4	5	6	7	8	9	High β	Ave
				Panel A: Average Monthly Postformation Returns							
Small	2.15	2.30	2.20	2.66	2.16	1.89	2.27	2.12	2.23	1.82	2.18
2	1.43	1.65	1.55	1.54	1.65	1.91	1.64	1.63	1.41	1.31	1.57
3	1.42	1.53	1.30	1.56	1.56	1.39	1.51	1.48	1.53	1.26	1.45
4	1.15	1.23	1.40	1.31	1.46	1.41	1.10	1.42	1.26	1.24	1.30
5	1.14	1.37	1.35	1.45	1.22	1.46	1.33	1.39	1.13	1.21	1.31
6	1.24	1.20	1.05	1.15	1.34	1.31	1.29	1.10	1.32	1.27	1.23
7	0.93	1.20	1.06	1.14	1.38	1.08	1.08	1.01	1.28	1.15	1.13
8	1.11	1.12	1.08	1.15	1.11	1.21	1.21	0.79	1.25	1.16	1.12
9	0.84	0.94	1.07	1.12	1.17	1.22	1.01	1.14	1.05	0.95	1.05
Big	0.80	0.82	0.85	0.85	0.91	0.97	0.92	0.84	0.86	0.84	0.87
Ave	1.22	1.34	1.29	1.39	1.40	1.38	1.33	1.29	1.33	1.22	
				Panel B: Postformation VW-S βs							
Small	1.47	1.90	1.56	2.03	2.06	1.69	1.97	1.99	2.21	2.15	1.90
2	1.45	1.43	1.71	1.59	1.52	1.74	1.89	1.84	1.76	1.89	1.68
3	1.29	1.33	1.21	1.49	1.58	1.52	1.68	1.70	1.81	1.91	1.55
4	1.16	1.20	1.16	1.32	1.49	1.41	1.49	1.51	1.76	1.92	1.44
5	0.97	1.13	1.22	1.34	1.36	1.50	1.38	1.70	1.47	1.75	1.38
6	0.74	1.01	1.09	1.30	1.22	1.36	1.37	1.60	1.59	1.77	1.31
7	0.72	0.93	1.03	1.08	1.32	1.25	1.31	1.39	1.47	1.83	1.23
8	0.64	0.76	0.93	1.10	1.17	1.25	1.24	1.26	1.52	1.58	1.15
9	0.63	0.78	0.92	1.11	1.10	1.08	1.14	1.29	1.30	1.53	1.09
Big	0.61	0.81	0.76	0.88	0.93	0.98	1.05	1.11	1.15	1.42	0.97
Ave	0.97	1.13	1.16	1.32	1.38	1.38	1.45	1.54	1.60	1.78	
				Panel C: Average Ln (Size)							
Small	8.59	8.61	8.62	8.59	8.57	8.55	8.54	8.54	8.55	8.42	8.56
2	9.40	9.42	9.41	9.42	9.40	9.41	9.39	9.40	9.38	9.36	9.40
3	9.94	9.93	9.93	9.92	9.90	9.91	9.92	9.91	9.89	9.88	9.91
4	10.33	10.34	10.34	10.34	10.34	10.35	10.33	10.34	10.31	10.32	10.34
5	10.73	10.75	10.75	10.76	10.74	10.75	10.74	10.73	10.72	10.73	10.74
6	11.16	11.14	11.13	11.14	11.14	11.15	11.14	11.12	11.13	11.12	11.14
7	11.57	11.57	11.57	11.58	11.58	11.56	11.55	11.54	11.56	11.55	11.56
8	12.09	12.09	12.08	12.08	12.08	12.08	12.09	12.05	12.05	12.06	12.08
9	12.71	12.73	12.73	12.71	12.74	12.72	12.71	12.71	12.70	12.69	12.71
Big	14.17	14.18	14.15	14.14	14.31	14.27	14.24	14.10	14.07	13.76	14.14
Ave	11.07	11.08	11.07	11.07	11.08	11.08	11.07	11.04	11.04	10.99	

V. Conclusions

Confirming Banz (1981), sorts on size and β like those in KSS or our Tables II and III consistently reject the central CAPM hypothesis that β suffices to explain expected return. Moreover, in recent years the size effect has been displaced as the prime embarrassment of the CAPM. There is much evidence

Table III

Cross-Section Regressions for 100 Equal-Weight Size-β Portfolios: 1928–1993, $R = a + b\beta + s\text{Ln (Size)} + e$

In June of each year beginning in 1927, NYSE stocks on CRSP are sorted into size deciles, which are then subdivided into β deciles (see Table II). Equal-weight monthly returns on the 100 portfolios are calculated from July to June of the following year. Annual returns are obtained by compounding the equal-weight monthly returns. Panel A shows the average slopes (Means) and their t-statistics from univariate cross-section regressions of monthly and annual postformation simple returns on the 100 size-β portfolios on six estimates of their 1928–1993 postformation βs, and bivariate regressions of the 100 size-β portfolio returns on their βs and Ln (Size), the natural log of the average size of the stocks in each of the 100 portfolios at the end of the previous month or year. The βs are estimated using all postformation monthly (VW, VW-S, EW, EW-S) or annual (VWA, EWA) returns for 1928–1993 and the value-weight (VW, VW-S, VWA) or equal-weight (EW, EW-S, EWA) NYSE market portfolio. VW-S and EW-S βs are the sums of the slopes from the regressions of the monthly postformation size-β portfolio returns on the current and one lag of the market return. VW, VWA, EW, and EWA βs use only the contemporaneous market returns. The average slopes in the cross-section regressions of returns on Ln (Size) alone (not shown) are -0.19 ($t = -3.60$) for monthly returns and -2.67 ($t = -3.23$) for annual returns. Panel B shows the average residuals from the univariate regressions of monthly (annual) returns on the VW-S (VWA) βs. The Ave column of each block in part B is the average across β deciles of the average residuals for a size decile. The Ave row of each block is the average across size deciles of the average residuals for a β decile.

Panel A: Regression Coefficients

	Monthly Dependent Returns: 792 Months						Annual Dependent Returns: 66 Years					
	VW	VW-S	VWA	EW	EW-S	VWA	VW	VW-S	VWA	EW	EW-S	EWA
	Means						Means					
a	0.50	0.36	0.17	0.43	0.43	0.38	7.26	4.68	0.58	5.61	5.33	3.47
b	0.65	0.70	0.84	0.89	0.88	0.94	7.83	9.13	12.08	11.56	11.84	13.73
	t-Statistics for Means						t-Statistics for Means					
a	2.55	1.72	0.68	2.26	2.28	1.84	2.69	1.71	0.16	2.23	2.16	1.24
b	2.18	2.64	2.98	2.67	2.86	3.27	2.13	2.58	2.76	2.62	2.77	2.89
	Means						Means					
a	3.01	2.86	2.76	2.83	2.68	2.30	45.50	43.46	37.27	43.41	40.97	29.30
b	0.10	0.15	0.18	0.20	0.26	0.37	−0.75	0.29	2.71	0.37	1.48	6.29
s	−0.18	−0.17	−0.16	−0.17	−0.15	−0.13	−2.75	−2.65	−2.28	−2.64	−2.48	−1.69
	t-Statistics for Means						t-Statistics for Means					
a	5.92	5.73	5.33	5.66	5.40	4.98	4.61	4.58	4.82	4.50	4.43	4.33
b	0.40	0.62	0.72	0.65	0.83	1.46	−0.27	0.11	0.79	0.11	0.43	1.43
s	−4.16	−4.12	−3.99	−4.02	−3.78	−3.47	−3.63	−3.67	−3.88	−3.61	−3.56	−3.63

Table III

Continued

Panel B: Average Residuals from Univariate β Regressions

	Low β	2	3	4	5	6	7	8	9	High β	Ave
					Monthly Returns: VW-S βs						
Small	0.76	0.61	0.75	0.87	0.36	0.34	0.52	0.37	0.31	−0.05	0.49
2	0.06	0.29	−0.01	0.06	0.22	0.33	−0.04	−0.03	−0.18	−0.38	0.03
3	0.15	0.24	0.09	0.16	0.10	−0.04	−0.03	−0.07	−0.09	−0.44	0.00
4	−0.02	0.03	0.23	0.03	0.05	0.05	−0.31	−0.00	−0.33	−0.47	−0.07
5	0.10	0.22	0.14	0.16	−0.09	0.06	0.00	−0.16	−0.27	−0.38	−0.02
6	0.36	0.13	−0.08	−0.12	0.12	−0.00	−0.03	−0.37	−0.16	−0.32	−0.05
7	0.07	0.19	−0.01	0.03	0.09	−0.16	−0.20	−0.32	−0.11	−0.49	−0.09
8	0.30	0.23	0.07	0.02	−0.08	−0.03	−0.02	−0.45	−0.18	−0.31	−0.04
9	0.04	0.04	0.06	−0.02	0.04	0.10	−0.15	−0.12	−0.22	−0.48	−0.07
Big	0.01	−0.11	−0.03	−0.13	−0.10	−0.08	−0.18	−0.30	−0.31	−0.51	−0.17
Ave	0.18	0.19	0.12	0.11	0.07	0.06	−0.04	−0.14	−0.15	−0.38	
					Annual Returns: VWA βs						
Small	5.88	7.95	9.85	11.66	6.12	2.37	7.68	4.97	4.21	−2.90	5.78
2	1.51	1.74	−0.31	−0.00	2.33	3.56	−1.53	−3.07	−6.10	−5.37	−0.72
3	2.24	2.42	2.25	2.28	0.60	−1.21	−1.00	−1.20	−1.97	−5.93	−0.15
4	0.20	−0.38	3.56	−0.31	0.52	0.40	−3.33	−0.58	−5.47	−5.75	−1.11
5	0.37	3.16	1.47	2.48	0.44	0.79	−0.28	−1.20	−3.66	−4.55	−0.10
6	4.91	1.94	−0.72	−1.06	0.58	0.00	−0.89	−5.07	−1.80	−3.97	−0.61
7	1.40	4.06	0.41	−0.34	0.28	−1.66	−3.16	−3.83	−1.33	−5.68	−0.99
8	4.97	2.77	1.19	0.45	−0.93	0.29	−0.20	−5.92	−3.10	−3.00	−0.35
9	1.31	1.07	0.75	0.65	1.08	1.59	−1.80	−1.31	−2.59	−5.85	−0.51
Big	0.96	−0.33	0.87	−0.61	−0.38	−0.73	−0.67	−2.62	−3.11	−5.77	−1.24
Ave	2.37	2.44	1.93	1.52	1.06	0.54	−0.52	−1.98	−2.49	−4.88	

that other variables (like earnings/price, cashflow/price, BE/ME, and past sales growth), add even more significantly to the explanation of average return (Basu (1983), Chan, Hamao, and Lakonishok (1991), FF (1992, 1993, 1996), and Lakonishok, Shleifer, and Vishny (1994)). Unlike size, these other variables (especially BE/ME) show little relation to estimates of market βs (FF (1992, 1993, 1994), Lakonishok, Shleifer, and Vishny (1994)), so a CAPM β-proxy story for their role in average returns is unlikely.

It is, of course, possible that the apparent empirical failures of the CAPM are due to bad proxies for the market portfolio. In other words, the true market is mean-variance-efficient, but the proxies used in empirical tests are not. In this view, revival of the CAPM awaits the coming of M. The true market portfolio will cast aside the average return anomalies of existing tests and reveal that β suffices to explain expected return.

This bad-market-proxy argument, however, does not justify the way the CAPM is currently applied, for example, to estimate the cost of capital or to evaluate portfolio managers. The bad market proxies used in tests of the CAPM are similar to those used in applications of the model. If the common market proxies are inefficient, then applications that use them rely on the same flawed estimates of expected return that undermine empirical tests of the CAPM. Like the redemptive empirical tests, valid applications of the CAPM await the coming of M.

In our view, the evidence that β does not suffice to explain expected return is compelling. And the average-return anomalies of the CAPM are serious enough to infer that the model is not a useful approximation. Our bet, made concrete in FF (1993, 1994, 1995, 1996), is that the payoffs in empirical asset pricing are in showing that the failures of the CAPM can be explained by multifactor ICAPM or APT alternatives—or that they are consistent with specific irrational-asset-pricing stories.

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