Beta and Return

"Announcements of the 'death' of beta seem premature."

Fischer Black

Eugene Fama says (according to Eric Berg of *The New York Times*, February 18, 1992) "beta as the sole variable explaining returns on stocks is dead." He also says (according to Michael Peltz of *Institutional Investor*, June 1992) that the relation between average return and beta is *completely* flat.

In these interviews, I think that Fama is misstating the results in Fama and French [1992]. Indeed, I think Fama and French, in the text of that article, misinterpret their own data (and the findings of others).

Black, Jensen, and Scholes [BJS, 1972] and Miller and Scholes [1972] find that in the period from 1931 through 1965 low-beta stocks in the United States did better than the capital asset pricing model (CAPM) predicts, while high-beta stocks did worse. Several authors find that this pattern continued in subsequent years, at least through 1989. Fama and French extend it through 1990.

All these authors find that the estimated slope of the line relating average return and risk is lower than the slope of the line that the CAPM says relates expected return and risk. If we choose our starting and ending points carefully, we can find a period of more than two decades where the line is essentially flat.

How can we interpret this? Why is the line so flat? Why have low-beta stocks done so well relative to their expected returns under the CAPM?

Black [1972] shows that borrowing restrictions

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(like margin requirements) might cause low-beta stocks to do relatively well. Indeed, Fama and French refer often to the Sharpe-Lintner-Black (SLB) model that includes these borrowing restrictions. This model predicts only that the slope of the line relating expected return and beta is positive.

Fama and French claim to find evidence against this model. They say (for example, on p. 459) that their results "seem to contradict" the evidence that the slope of the line relating expected return and beta is positive.

This is a misstatement, in my view. Even in the period they choose to highlight, they cannot rule out the hypothesis that the slope of the line is positive. Their results for beta and average return are perfectly consistent with the SLB model.

Moreover, if the line is really flat, that implies dramatic investment opportunities for those who use beta. A person who normally holds both stocks and bonds or stocks and cash can shift to a portfolio of similar total risk but higher expected return by emphasizing low-beta stocks.

Beta is a valuable investment tool if the line is as steep as the CAPM predicts. It is even more valuable if the line is flat. No matter how steep the line is, beta is alive and well.

DATA MINING

When a researcher tries many ways to do a study, including various combinations of explanatory factors, various periods, and various models, we often say he is "data mining." If he reports only the more successful runs, we have a hard time interpreting any statistical analysis he does. We worry that he selected, from the many models tried, only the ones that seem to support his conclusions. With enough data mining, all the results that seem significant could be just accidental. (Lo and MacKinlay [1990] refer to this as "data snooping." Less formally, we call it "hindsight.")

Data mining is not limited to single research studies. In a single study, a researcher can reduce its effects by reporting all the runs he does, though he still may be tempted to emphasize the results he likes. Data mining is most severe when many people are studying related problems.

Even when each person chooses his problem independently of the others, only a small fraction of research efforts result in published papers. By its nature, research involves many false starts and blind alleys. The results that lead to published papers are likely to be the most unusual or striking ones. But this means that any statistical tests of significance will be gravely biased.

The problem is worse when people build on one another's work. Each decides on a model closely related to the models that others use, learns from the others' blind alleys, and may even work with mostly the same data. Thus in the real world of research, conventional tests of significance seem almost worthless.

In particular, most of the so-called anomalies that have plagued the literature on investments seem likely to be the result of data mining. We have literally thousands of researchers looking for profit opportunities in securities. They are all looking at roughly the same data. Once in a while, just by chance, a strategy will seem to have worked consistently in the past. The researcher who finds it writes it up, and we have a new anomaly. But it generally vanishes as soon as it's discovered.

Merton [1987, pp. 103-108] has an excellent discussion of these problems. He says (p. 108) "although common to all areas of economic hypothesis testing, these methodological problems appear to be especially acute in the testing of market rationality."

The "size effect" may be in this category. Banz [1981] finds that firms with little stock outstanding (at market value) had, up to that time, done well relative to other stocks with similar betas. Since his study was published, though, small firms have had mediocre and inconsistent performance.

Fama and French [1992] continue studying the small-firm effect, and report similar results on a largely overlapping data sample. In the period since the Banz study (1981-1990), they find no size effect at all, whether or not they control for beta. Yet they claim in their paper that size is one of the variables that "captures" the cross-sectional variation in average stock returns.

Fama and French also give no reasons for a relation between size and expected return. They might argue that small firms are consistently underpriced because they are "neglected" in a world of large institutional investors. But they do not give us that reason or any other reason. Lack of theory is a tipoff: watch out for data mining!

Fama and French also find that the ratio of book value to the market value of the firm's equity helps capture the cross-sectional variation in average stock returns. They favor the idea that this ratio captures some sort of rationally priced risk, rather than market overreaction to the relative prospects of firms. But they say nothing about what this risk might be, or why it is priced, or in what direction.

They mention the possibility that this result is due to "chance," which is another way to describe data mining, but they don't consider that plausible, because the result appears in both halves of their period, and because the ratio predicts a firm's accounting performance.

I consider both those arguments weak. Given that an "effect" appears in a full period, we expect to find it in both halves of the period. We are not surprised when we do.

We know that when markets are somewhat efficient, stock prices react before accounting numbers to events affecting a firm's performance. Thus we are not surprised when firms with high ratios of book-to-market equity show poor subsequent accounting performance. I don't think this is evidence of a priced risk factor at all.

Thus I think it is quite possible that even the book-to-market effect results from data mining, and will vanish in the future. But I also think it may result in part from irrational pricing. The ratio of book-to-market equity may pick up a divergence between value and price across any of a number of dimensions. Thus the past success of this ratio may be due more to market inefficiencies than "priced factors" of the kind that Fama and French favor.

If the subsequent convergence of price and value is gradual, people seeking profit opportunities may not fully eliminate the effect. To capture the gains, they have to spend money on active management, and they must bear the risks of a less-than-fully diversified portfolio.

BETA THEORY

I think most of the Fama and French results are attributable to data mining, especially when they reexamine "effects" that people have discussed for years. Even they note that the ratio of book-to-market equity has long been cited as a measure of the return prospects of stocks.

I especially attribute their results to data mining when they attribute them to unexplained "priced factors," or give no reasons at all for the effects they find.

Strangely, the factor that seems most likely to be priced they don't discuss at all: the beta factor. We can construct the beta factor by creating a diversified portfolio that is long in low-beta stocks and short in smaller amounts of high-beta stocks, so that its beta is roughly zero. The returns to all such portfolios tend to be highly correlated, so we don't have to worry about the details of the "right" way to create the beta factor.

The empirical evidence that the beta factor had extra returns is stronger than the corresponding evidence for the small-stock factor or the book-to-market equity factor. The first evidence was published in 1972, and the factor has performed better since publication than it did prior to publication.

Moreover, we have some theory for the beta factor. Black [1972] showed that borrowing restrictions might cause low-beta stocks to have higher expected returns than the CAPM predicts (or the beta factor to have a higher expected return than interest at the short-term rate). Borrowing restrictions could include margin rules, bankruptcy laws that limit lender access to a borrower's future income, and tax rules that limit deductions for interest expense.

These restrictions have probably tightened in the United States in recent decades. Margin rules have remained in effect, bankruptcy laws seem to have shifted against lenders, and deductions for interest expense have been tightened. Many countries outside the United States seem to have similar restrictions. If they help explain the past return on the beta factor, they will continue to influence its future return.

Moreover, many investors who can borrow, and who can deduct the interest they pay, are nonetheless reluctant to borrow. Those who want lots of market risk will bid up the prices of high-beta stocks. This makes low-beta stocks attractive and high-beta stocks unattractive to investors who have low-risk portfolios or who are willing to borrow.

We can see some evidence for this in the market's reaction to a firm that changes its leverage. An exchange offer of debt for equity generally causes the firm's stock price to increase, while an offer of equity for debt causes it to decrease. This may be because of the tax advantages of debt; or because more debt transfers value from existing bondholders to stockholders; or because buying equity signals manager optimism.

I believe, though, that an important reason is reluctance to borrow: in effect, a firm that adds leverage is providing indirect borrowing for investors who are unwilling to borrow directly. These investors bid up its stock price.

BJS [1972] discuss another possible reason for beta factor pricing: mismeasurement of the market portfolio. If we use a market portfolio that differs randomly from the true market portfolio, stocks that seem to have low betas will on average have higher betas when we use the correct market portfolio to estimate them. Our betas are estimated with error (even in the final portfolio), and we select stocks that seem to have low betas. Such stocks will usually have positive alphas using the incorrect market portfolio. The portfolio method does not eliminate this bias.

Perhaps the most interesting way in which the market portfolio may be mismeasured involves our neglect of foreign stocks. World capital markets are becoming more integrated all the time. In a fully integrated capital market, what counts is a stock's beta with the world market portfolio, not its beta with the issuer country market portfolio. This may cause low-beta stocks to seem consistently underpriced. If investors can buy foreign stocks without penalty, they should do so; if they cannot, stocks with low betas on their domestic market may partly substitute for foreign stocks. If this is the reason the line is flat, they may also want to emphasize stocks that have high betas with the world market portfolio.

Can't we do some tests on stock returns to sort out which of these theoretical factors is most important? I doubt that we have enough data to do that.

We have lots of securities, but returns are highly correlated across securities, so these observations are far from independent. We have lots of days, but to estimate factor pricing what counts is the number of years for which we have data, not the number of distinct observations. If the factor prices are changing, even many years is not enough. By the time we have a reasonable estimate of how a factor was priced on average, it will be priced in a different way.

Moreover, if we try to use stock returns to distinguish among these explanations, we run a heavy risk of data mining. Tests designed to distinguish may accidentally favor one explanation over another in a given period. I don't know how to begin designing tests that escape the data mining trap.

VARYING THE ANALYSIS

While the BJS study covers lots of ground, I am especially fond of the "portfolio method" we used. Nothing I have seen since 1972 leads me to believe that we can gain much by varying this method of analysis.

The portfolio method is simple and intuitive. We try to simulate a portfolio strategy that an investor can actually use. The strategy can use any data for constructing the portfolio each year that are available to investors at the start of that year. Thus we can incorporate into our selection method any "cross-sectional" effects that we think are important.

However, the more complex our portfolio selection method is, the more we risk bringing in a data mining bias. I must confess that when we were doing the original BJS study, we tried things that do not appear in the published article. Moreover, we were reacting to prior work suggesting a relatively flat slope for the line relating average return to beta. Thus our article had elements of data mining too.

To minimize the data mining problem, BJS used a very simple portfolio strategy. We chose securities using historical estimates of beta, and we used many securities to diversify out the factors not related to beta.

But this method does have flaws. For example, beta is highly correlated with both total risk and residual risk across stocks. So what we call the "beta factor" might better be called the "total risk factor" or the "residual risk factor." I can't think of any reliable way to distinguish among these.

When doing the BJS study, we considered estimating the entire covariance matrix for our population of stocks, and using that to improve the efficiency of our test. We realized that this would require us to deal with uncertainty in our estimated covariances. We decided that the potential for improved efficiency was small, while the potential for error in our econometric methods was large. So we did not pursue that route.

Others have used different methods to update our study. My view is that in the presence of data mining and estimate error and changing risk premiums, none of these methods adds enough accuracy to warrant its complexity. I view most of these methods as our method expressed in different language.

For example, Fama and MacBeth [1973] start with cross-sectional regressions of return on beta, and look at the time series of regression intercepts. The time series is very similar to the BJS time series of returns on the beta factor. Stambaugh [1982] extends the analysis through 1976, and considers broader possible definitions of the market portfolio, but finds similar results. Lakonishok and Shapiro [1986] update the analysis to 1981, and include firm size to help explain average portfolio return. They conclude that the risk measures were unrelated to average return in the period 1962-1981.

Gibbons, Ross, and Shanken [GRS, 1989] contrast their "multivariate" tests with the series of univariate tests that they say BJS use. In fact, though, the key test in BJS is the portfolio method used to construct the beta factor. This method implicitly uses all the covariances that GRS estimate explicitly. The single BJS portfolio takes account of the covariances in a way that leaves relatively little scope for data mining. Thus I feel our portfolio method has about as much power as the GRS method, and may have less bias.

Malkiel [1990, pp. 238-248] studies the relation between beta and return for mutual funds in the 1980-1989 period. Stocks generally did well in this period, so we'd expect high-beta funds to outperform low-beta funds. But beta and fund performance seem utterly unrelated.

We can even interpret Haugen and Baker [1991] as showing for the 1972-1989 period that return and beta were not related as the CAPM leads us to expect. They say the market portfolio is not efficient, but the way it's inefficient is that low-risk stocks seem to have abnormally high expected returns.

Kandel and Stambaugh [1989] give a general mean-variance framework for likelihood ratio tests of asset pricing models, taking account of estimate error in both means and covariances, but assuming that the covariances are constant. In the real world, I doubt that their method adds precision to the single portfolio BJS test of the pricing of the beta factor.

Shanken [1992] has a comprehensive discussion of methods for estimating "beta-pricing models." He discusses such problems as estimate error in beta when using methods like Fama and MacBeth's [1973]. For some reason, he does not discuss the BJS and Black-Scholes [1974] portfolio method. Black and Scholes estimate beta for the final portfolio as they estimate alpha. Thus I believe they avoid the bias due to estimate error in beta.

EXHIBIT 1
Number of Stocks in the Sample

Year	Number of Stocks	Year	Number of Stocks	Year	Number of Stocks
1931	592	1951	954	1971	1182
1932	678	1952	979	1972	1238
1933	699	1953	1003	1973	1286
1934	693	1954	1011	1974	1363
1935	688	1955	1018	1975	1429
1936	685	1956	1009	1976	1479
1937	673	1957	1004	1977	1484
1938	699	1958	1010	1978	1470
1939	722	1959	1008	1979	1466
1940	752	1960	1033	1980	1452
1941	754	1961	1026	1981	1435
1942	767	1962	1034	1982	1405
1943	782	1963	1066	1983	1394
1944	784	1964	1089	1984	1400
1945	783	1965	1104	1985	1380
1946	798	1966	1128	1986	1361
1947	820	1967	1152	1987	1329
1948	847	1968	1152	1988	1325
1949	900	1969	1122	1989	1340
1950	934	1970	1126	1990	1415
				1991	1505

UPDATING THE BLACK-JENSEN-SCHOLES STUDY

I want to illustrate the portfolio method by updating the BJS [1972] study. I follow the BJS procedure closely, except that at the very end I adopt the Black-Scholes method of estimating portfolio beta, alpha, and residual risk at the same time.

I use monthly data from the Center for Research in Security Prices at the University of Chicago for the period 1926-1991. The portfolio method is especially useful when analyzing data over such a long period, since the stocks in the portfolio are constantly changing. Even when the stocks don't change, the portfolio method adapts in part to changes in their covariances.

I do not try to estimate changes in residual risk through time. In principle, this might let me improve the efficiency of the BJS "significance tests." But the significance tests are more seriously compromised by data mining than by heteroscedasticity, in my view. So I stick to the use of an average residual volatility for the whole period to keep the method simple.

I use New York Stock Exchange listed stocks, as BJS did. Exhibit 1 shows the number of stocks in

EXHIBIT 2
Monthly Regressions: 1931 to 1965

Item	Black-Jensen-Scholes Study Portfolio Number										
	1	2	3	4	5	6	7	8	9	10	M
1. β	1.56	1.38	1.25	1.16	1.06	0.92	0.85	0.75	0.63	0.50	1.00
2. α	-0.01	-0.02	-0.01	0.00	-0.01	0.00	10.01	0.01	0.02	0.02	
3. $t(\alpha)$	-0.43	-1.99	-0.76	-0.25	-0.89	0.79	0.71	1.18	2.31	1.87	
4. $\rho(\tilde{R}, \tilde{R}_m)$	0.96	0.99	0.99	0.99	0.99	1.98	0.99	0.98	0.96	0.90	
5. $\rho(\tilde{e}_t, \tilde{e}_{t-1})$	0.05	-0.06	0.04	-0.01	-0.07	-0.12	0.13	0.10	0.04	0.10	
6. $\sigma(\tilde{e})$	0.14	0.07	0.06	0.05	0.04	0.05	0.05	0.05	0.06	0.08	
7. μ	0.26	0.21	0.21	0.20	0.17	0.16	0.15	0.14	0.13	0.11	0.17
8. σ	0.50	0.43	0.39	0.36	0.33	0.29	0.25	0.24	0.20	0.17	0.31

Item	Current Study Portfolio Number										
	1	2	3	4	5	6	7	8	9	10	M
1. β	1.53	1.36	1.24	1.17	1.06	0.92	0.84	0.76	0.63	0.48	1.00
2. α	-0.02	-0.02	-0.01	0.00	-0.01	0.00	0.01	0.01	0.02	0.03	
3. $t(\alpha)$	-0.78	-2.12	-1.30	-0.54	-1.38	0.55	0.72	1.64	1.74	2.21	
4. $\rho(\tilde{R}, \tilde{R}_m)$	0.97	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.96	0.90	
5. $\rho(\tilde{e}_t, \tilde{e}_{t-1})$	0.05	-0.06	0.00	-0.13	-0.11	-0.07	0.10	0.06	0.11	0.15	
6. $\sigma(\tilde{e})$	0.12	0.06	0.06	0.05	0.04	0.05	0.05	0.05	0.06	0.07	
7. μ	0.26	0.22	0.21	0.21	0.18	0.17	0.16	0.15	0.13	0.12	0.18
8. σ	0.49	0.43	0.39	0.37	0.33	0.29	0.27	0.24	0.20	0.17	0.31

my sample for each year in six decades plus a year. Because CRSP has corrected the data since the BJS study, the numbers differ slightly from the corresponding numbers in BJS.

Exhibit 2, panel 2, and Exhibit 5, line 2, replicate the BJS results for the BJS period. The results are similar, but not identical. Most studies that followed BJS emphasize the ten portfolios in Exhibit 2. But the essence of the portfolio method lies in constructing a single portfolio (in this case, the beta factor) as in Exhibit 5.

In Exhibit 2, the first two lines show the slope and intercept of a regression of portfolio excess return on an equally weighted market excess return. We chose the equally weighted market portfolio rather than the value-weighted portfolio for convenience only. Line 3 shows a standard statistical measure of the "significance" of the intercept (compared with zero). But the data mining we did (along with the hundreds of other people looking at the same data) invalidates the significance test. I interpret the numbers in line 3 as roughly measuring the consistency of the positive intercept for low beta portfolios.

Line 4 shows the correlation between portfolio and market excess returns, while line 5 shows the estimated serial correlation of the residuals. Line 6 gives the estimated standard deviation of the residual. Lines 7 and 8 give the sample mean and standard deviation of portfolio excess return. Since means, correlations, and standard deviations are all changing, these are estimates of their averages through the period. Everything is expressed in annual terms, though BJS gave their

EXHIBIT 3
Monthly Regressions: 1931 through 1991

Item	1	2	3	4	5	6	7	8	9	10	M
					Portfolio Number						
1. β	1.52	1.34	1.22	1.14	1.05	0.93	0.85	0.76	0.64	0.49	1.00
2. α	-0.03	-0.02	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	
3. t (α)	-2.34	-2.25	-1.54	-0.62	-1.41	1.03	1.50	1.50	2.00	2.91	
4. $\rho\left(\tilde{R}, \tilde{R}_m\right)$	0.97	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.95	0.88	
5. $\rho\left(\tilde{e}_t, \tilde{e}_{t-1}\right)$	0.02	-0.04	0.00	-0.08	-0.06	-0.03	0.05	0.05	0.10	0.13	
6. $\sigma\left(\tilde{e}\right)$	0.11	0.06	0.05	0.04	0.04	0.04	0.05	0.05	0.06	0.07	
7. μ	0.17	0.17	0.16	0.14	0.14	0.13	0.11	0.11	0.10	0.09	0.14
8. σ	0.43	0.37	0.33	0.29	0.29	0.25	0.23	0.23	0.18	0.18	0.27

figures in monthly terms.

Exhibit 3 gives similar results for the entire period from 1926 through 1991. If anything, the pattern looks stronger than it did for the 1926-1965 period. (But keep in mind that if it looked weaker, I might not have written this article.) Low-beta stocks did better than the CAPM predicts, and high-beta stocks did worse.

In fact, as Exhibit 4 shows, the results since 1965 have been very strong. Over the entire twenty-six-year period, the market rose by normal amounts or more, but low-beta portfolios did about as well as high-beta portfolios. This is what Fama and French [1992] mean when they say the slope of the line relating average return to beta is flat (though they usually control for firm size).

Exhibit 5 shows the results for the beta factor calculated the way BJS did it. We took the excess returns from the ten portfolios in Exhibits 2-4, and weighted them by $1 - \beta_i$, where β_i is the i^{th} portfolio's beta. Thus we used positive weights on low-beta portfolios, and negative weights on high-beta portfolios. In effect, the beta factor is a portfolio that is long in low-beta stocks and short in high-beta stocks, with the largest long positions in the lowest-beta stocks, and the largest short positions in the highest-beta stocks.

Because low-beta stocks all tend to do well or badly at the same time, and because high-beta stocks

EXHIBIT 4
Monthly Regressions: 1966 through 1991

Item	1	2	3	4	5	6	7	8	9	10	M
					Portfolio Number						
1. β	1.50	1.30	1.17	1.09	1.03	0.95	0.87	0.78	0.67	0.51	1.00
2. α	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.03	
3. t (α)	-3.24	-0.93	-1.02	-0.24	-0.57	1.31	0.63	0.81	0.94	1.79	
4. $\rho\left(\tilde{R}, \tilde{R}_m\right)$	0.96	0.98	0.99	0.99	0.99	0.99	0.98	0.97	0.93	0.82	
5. $\rho\left(\tilde{e}_t, \tilde{e}_{t-1}\right)$	-0.02	-0.02	0.00	0.04	0.06	0.02	-0.03	-0.02	0.09	0.12	
6. $\sigma\left(\tilde{e}\right)$	0.08	0.05	0.04	0.03	0.03	0.03	0.03	0.04	0.05	0.08	
7. μ	0.06	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.06	0.08
8. σ	0.31	0.26	0.24	0.22	0.21	0.19	0.18	0.16	0.14	0.12	0.20

EXHIBIT 5
The Beta Factor

	Period	μ_z	σ_z	t(μ)
BJS	1/31-12/65	0.04	0.15	1.62
1.	1/31-12/65	0.05	0.15	1.93
2.	1/31-12/91	0.05	0.14	2.94
3.	1/66-12/91	0.06	0.13	2.44
	Period	μ_z	σ_z	t(μ)
1.	1/31-12/39	-0.07	0.22	-1.00
2.	1/40-12/49	0.06	0.15	1.17
3.	1/50-12/59	0.10	0.07	4.56
4.	1/60-12/69	0.06	0.11	1.67
5.	1/70-12/79	0.02	0.14	0.32
6.	1/80-12/91	0.14	0.12	3.90

all tend to do badly when low-beta stocks are doing well, this portfolio is not perfectly diversified. It has substantial variance. That's why we call it the "beta factor."

This portfolio captures the relative behavior of stocks with different betas. Since stocks that differ in beta also tend to differ in other ways, it combines the effects of all the characteristics correlated with beta. For example, high-beta stocks tend to be stocks with high return standard deviation, and issuers of high-beta stock tend to be high-leverage firms.

BJS did not, and I do not, try to isolate these characteristics. One reason is that it complicates the analysis. Another is that it invites data mining.

Exhibit 5 summarizes the results in Exhibits 2-4, and divides them into approximate decades. We see that the beta factor had a negative excess return only in the first decade. Low-beta stocks did better after the BJS study period than during it. They did best of all in the most recent decade.

BJS, however, did not use a strict portfolio method. They chose stocks for the ten portfolios using only information that would have been available at the time (about five prior years of monthly data to estimate beta). But the weights on the ten portfolios use information that was not available.

Black and Scholes [1974] refine the portfolio method to eliminate this possible source of bias. The principle is simple. We select stocks *and* weight them using only information that would have been available at the time. This eliminates any bias, and generally makes it easier to understand and interpret the results. Since we revise the portfolio over time, it lets us adapt to changes in the stock list and in the covariances.

The "multivariate" testing methods that such researchers as Kandel and Stambaugh [1989] and Shanken [1992] have explored do not have these features. In effect, they require use of information on covariances that would not have been available to an investor constructing a portfolio. And I find formal statistical tests harder to interpret than a "portfolio test."

Exhibit 6 shows the beta factor using a strict portfolio test. We weight the ten portfolios using five-year historical betas rather than the realized betas. This takes out any bias due to use of unavailable information in creating portfolio weights. Then we regress the portfolio excess return on the market excess return, and figure the residual. This takes out any effects of market moves because the portfolio beta is not exactly zero. The story in Exhibit 6 is about the same as the story in Exhibit 5.

Is this article, like so many others, just an exercise in data mining? Will low-beta stocks continue to do well in the future, or will recognition of the pricing of the beta factor cause so many investors to change their strategies that the effect is eliminated (or reversed)? Are the effects of borrowing restrictions, reluctance to borrow, and a mismeasured market portfolio strong enough to keep it alive? If the flat line relating past return to beta steepens in the future, how much will it steepen?

EXHIBIT 6
The Beta Factor Using Only Prior Information

	Period	μ_e	σ_e	t(μ)
BJS	1/31-12/65	0.04	0.15	1.62
1.	1/31-12/65	0.03	0.11	1.68
2.	1/31-12/91	0.04	0.10	2.69
3.	1/66-12/91	0.04	0.09	2.32
	Period	μ_e	σ_e	t(μ)
1.	1/31-12/39	-0.05	0.17	-0.94
2.	1/40-12/49	0.03	0.10	1.06
3.	1/50-12/59	0.08	0.06	4.25
4.	1/60-12/69	0.03	0.07	1.32
5.	1/70-12/79	0.01	0.10	0.18
6.	1/80-12/91	0.09	0.08	3.90

Send me your predictions! I'll record them, and in future decades we can see how many were right. My prediction is that the line will steepen, but that low-beta stocks will continue to do better than the CAPM says they should.

CORPORATE FINANCE

Suppose you believe that the line relating expected return to beta will continue to be flat, or flatter than the CAPM suggests. What does that imply for a firm's investment and financing policy?

On the surface, you might think that the line for corporate investments will be flat or flatter too. You might think a corporation should use a discount rate when it evaluates proposed investments that does not depend very much on the betas of its cash flows. In effect, it should shift its asset mix toward high-risk assets, because its investors face borrowing restrictions or because they prefer high-risk investments.

But this conclusion would be wrong, because corporations can borrow so easily. They face fewer borrowing restrictions than individuals. The beta of a corporation's stock depends on both its asset beta and its leverage.

If the line is flat for investors, a corporation will increase its stock price whenever it increases its leverage. Exchanging debt or preferred for stock increases leverage, even when the debt is below investment-grade. Now that the market for high-yield bonds is so active, there is almost no limit to the amount of leverage a corporation can have. Some securities even let a firm increase its leverage without significantly increasing the probability of bankruptcy.

If today's corporations do not face borrowing restrictions, and if a corporation makes its investment decisions to maximize its stock price, the market for corporate assets should be governed by the ordinary CAPM. A firm should use discount rates for its investments that depend on their betas in the usual way.

On the other hand, I think many corporations act as if they do face borrowing restrictions. They worry about an increase in leverage that may cause a downgrade from the rating agencies, and they carry over the investor psychology that makes individuals reluctant to borrow.

This may mean that corporate assets are priced like common stocks. Low-beta assets may be underpriced, while high-beta assets are overpriced. The line relating expected return to beta for corporate assets may be flatter than the CAPM predicts.

If so, then any corporation that is free to borrow and that wants to maximize its stock price should again use the ordinary CAPM to value its investments, and should use lots of leverage. Low-beta investments will look attractive because they have positive alphas. Thus the corporation will emphasize low-risk assets and high-risk liabilities.

Just like an investor who is free to borrow, a rational corporation will emphasize low-beta assets and use lots of leverage. Even if the line is flat for both investors and corporations, beta is an essential tool for making investment decisions. Indeed, beta is more useful if the line is flat than if it is as steep as the CAPM predicts.

No matter what the slope of the line, a rational corporation will evaluate an investment using the betas of that investment's cash flows. It will not use the betas of its other assets or the betas of its liabilities.

Announcements of the "death" of beta seem premature. The evidence that prompts such statements implies more uses for beta than ever. Rational investors who can borrow freely, whether individuals or firms, should continue to use the CAPM and beta to value investments and to choose portfolio strategy.

ENDNOTE

The author is grateful to Russell Abrams and Jonathan Kelly for help with the calculations; and to Clifford Asness, John Bu, Wayne Ferson, Josef Lakonishok, Richard Roll, Barr Rosenberg, Jay Shanken, and Myron Scholes for comments on prior drafts.

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