The Value Premium and the CAPM

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ABSTRACT

We examine (i) how value premiums vary with firm size, (ii) whether the CAPM explains value premiums, and (iii) whether, in general, average returns compensate β in the way predicted by the CAPM. Loughran's (1997) evidence for a weak value premium among large firms is special to 1963 to 1995, U.S. stocks, and the book-to-market value-growth indicator. Ang and Chen's (2005) evidence that the CAPM can explain U.S. value premiums is special to 1926 to 1963. The CAPM's more general problem is that variation in β unrelated to size and the value-growth characteristic goes unrewarded throughout 1926 to 2004.

Fama and French (1992), among others, identify a value premium in U.S. stock returns for the post-1963 period; that is, stocks with high ratios of the book value of equity to the market value of equity (value stocks) have higher average returns than stocks with low book-to-market ratios (growth stocks). Extending the tests back to 1926, Davis, Fama, and French (2000) document a value premium in the average returns of the earlier period.

Perhaps more important, Fama and French (1993) find that the post-1963 value premium is left unexplained by the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965). Ang and Chen (2005) show, however, that CAPM captures the value premium of the 1926 to 1963 period. They also argue that when the tests allow for time-varying market βs, even the post-1963 period produces no reliable evidence against a CAPM story for the value premium. Loughran (1997) argues that the value premium of 1963 to 1995 is in any case particular to small stocks.

This paper has three goals. The first is to provide a simple picture of how value premiums vary with firm size. The second is to examine if and when CAPM market βs explain observed value premiums. The third goal is to examine whether in general variation in β across stocks is related to average returns in the way predicted by the CAPM.

Our results on how the value premium varies with firm size are easily summarized. Loughran's (1997) evidence that there is no value premium among large stocks seems to be particular to (i) the post-1963 period, (ii) using the book-to-market ratio as the value-growth indicator, and (iii) restricting the tests to U.S. stocks. During the earlier 1926 to 1963 period the value premium is near identical for small and big U.S. stocks. When we use earnings-to-price ratios (*E/P*) rather than book-to-market ratios (*B/M*) to separate value and growth stocks, we find that the 1963 to 2004 period also produces little difference between value premiums for small and big U.S. stocks. As another out-of-sample test, we examine international value premiums for the 1975 to 2004 period from 14 major markets outside the U.S. When we sort international stocks on either *B/M* or *E/P*, we again find that value premiums are similar for small and big stocks.

The evidence on U.S. value premiums and the CAPM is a bit more complicated. The overall value premium in U.S. average returns is similar before and after 1963, but like Franzoni (2001), we find that market βs change dramatically. During the later period, value stocks have lower βs than growth stocks – the reverse of what the CAPM needs to explain the value premium. As a result, the CAPM fails the tests for 1963 to 2004, whether or not one allows for time-varying βs. During 1926 to 1963, however, value stocks have higher βs than growth stocks, and, like Ang and Chen (2005), we find that the CAPM captures the value premiums of the earlier period near perfectly.

Given its success with the value premiums of 1926 to 1963, it is tempting to infer that the CAPM provides a good description of average returns before 1963. It does not. The CAPM says that all variation in β across stocks is compensated in the same way in expected returns. Fama and French (1992) find that when portfolios are formed on size and β, variation in β related to size shows up in average returns, but variation in β unrelated to size seems to go unrewarded. This suggests that, contradicting the CAPM, it is size or a non-β risk related to size that counts, not β. The tests here extend this result. When we form portfolios on size, *B/M*, and β, we find that variation in β related to size and *B/M* is compensated in average returns for 1928 to 1963, but variation in β unrelated to size and *B/M* goes unrewarded during 1928 to 1963, and indeed throughout the sample period. As a result, we reject CAPM pricing for portfolios formed on size, *B/M*, and β, for 1928 to 1963 as well as for 1963 to 2004. We conclude that it is size and *B/M*, or risks related to them, and not β, that are rewarded in average returns.

Finally, our evidence that variation in β unrelated to size and *B/M* is unrewarded in average returns is as strong for big stocks as for small stocks. This should lay to rest the common claim that empirical violations of the CAPM are inconsequential because they are limited to small stocks and thus small fractions of invested wealth.

Our story proceeds as follows. Section I studies the relation between the value premium and firm size. Section II examines CAPM explanations of the value premium. Section III explores the general problem for the CAPM created by variation in β unrelated to the size and value-growth characteristics of firms. Section IV concludes.

I. Is There a Value Premium among Big Stocks?

Loughran (1997) contends that the value premium is limited to small stocks. For initial perspective on this issue, we examine variants of *VMG* (also known as *HML*), the monthly value-growth return of the three-factor model of Fama and French (1993). We construct *VMG* by forming six portfolios on size (market capitalization or market cap, which is price times shares outstanding) and book-to-market equity (*B/M*). Specifically, at the end of each June from 1926 to 2004, we sort NYSE, AMEX (after 1962), and (after 1972) Nasdaq firms with positive book equity into two size groups and three *B/M* groups. Firms below the NYSE median size are small (*S*) and those above are big (*B*). We assign firms to growth (*G*), neutral (*N*), and value (*V*) groups if their *B/M* is in the bottom 30%, middle 40%, or top 30% of NYSE *B/M*. The six portfolios, small and big growth (*SG* and *BG*), small and big neutral (*SN* and *BN*), and small and big value (*SV* and *BV*), are the intersections of these sorts. The data sources and calculation of book equity follow Davis, Fama, and French (2000), except that the NYSE sample, which extends back to 1926, now includes firms in any of the Moody's manuals, not just industrials.

The six value-weight size-*B/M* portfolios are the components of the monthly size and value-growth returns of the Fama-French three-factor model. The size factor, *SMB* (small minus big), is the average of the monthly returns on the three small stock portfolios minus the average of the returns on the three big stock portfolios,

$$SMB = (SG + SN + SV)/3 - (BG + BN + BV)/3. \quad (1)$$

The value-growth factor, *VMG* (value minus growth), is the average of the monthly returns on the two value portfolios minus the average of the returns on the two growth portfolios,

$$VMG = (SV + BV)/2 - (SG + BG)/2. \quad (2)$$

To test whether the value premium in average returns is special to small stocks, we split *VMG* into its small stock and big stock components,

$$VMGS = SV - SG \quad \text{and} \quad VMGB = BV - BG. \quad (3)$$

A. The Value Premium in Small and Big Stock Returns

Table I shows summary statistics for the monthly market excess return, *RM-RF* (the return on the value-weight portfolio of the NYSE, AMEX, and Nasdaq stocks in our sample minus the one-month Treasury bill rate), and the *SMB*, *VMG*, *VMGS*, and *VMGB* returns. Summary statistics for returns on the six size-*B/M* portfolios that we use to construct *SMB* and *VMG* are also shown. The sample period is July 1926 to December 2004 (henceforth, 1926 to 2004), but we also present results for July 1926 to June 1963 and July 1963 to December 2004 (henceforth, 1926 to 1963 and 1963 to 2004). Because July 1963 is the start date of the tests in Fama and French (1992, 1993), 1926 to 1963 is out of sample relative to early studies of the value premium.

Table I about here.

The size premium in average returns is similar for the two subperiods of 1926 to 2004. The average *SMB* return is 0.20% per month for 1926 to 1963 versus 0.24% for 1963 to 2004. It takes the power of the full 1926 to 2004 period to push the average premium (0.23%) just over the two standard error barrier ($t = 2.06$).

The overall value premium is also similar for the two subperiods of 1926 to 2004. The average *VMG* return is 0.35% per month for 1926 to 1963 and 0.44% for 1963 to 2004. The average *VMG* return for 1963 to 2004 is 3.34 standard errors from zero, but the average for 1926 to 1963 is only 1.78 standard errors from zero. A comparison of means test shows, however, that the premiums for the two subperiods differ by just 0.38 standard errors. Thus, there is no evidence of a change in the expected premium, and the full 1926 to 2004 period can be used to judge whether there is a value premium in expected returns. The premium for 1926 to 2004 is 0.40% per month, and it is a healthy 3.43 standard errors from zero.

Confirming Loughran (1997) and earlier evidence (Fama and French (1993), Kothari, Shanken, and Sloan (1995)), the value premium for 1963 to 2004 is larger for small stocks, 0.60% per month (t = 3.97), versus 0.26% (t = 1.87) for big stocks. But for 1926 to 1963, the value premium is near identical for small and big stocks (0.35% and 0.36% per month). Note that the difference between the small and big stock value premiums for 1963 to 2004 is mostly due to an increase in the premium for small stocks, from 0.35% to 0.60%; there is a smaller decline, from 0.36% to 0.26%, for big stocks. More important, a comparison of means test on the monthly *VMGB* returns shows that the big stock value premium for 1963 to 2004 is just -0.35 standard errors from the premium for 1926 to 1963, so there is little evidence of a change in the expected premium. The *VMGB* average return for the full 1926 to 2004 period, 0.31% per month (t = 2.23), is then solid evidence on the existence of a value premium in big stock expected returns. In short, there does seem to be a value premium in the expected returns on big stocks.

Nevertheless, the value premium in the average returns of 1926 to 2004 is 55% larger for small stocks (0.48% per month) than for big stocks (0.31%). And the average of the time series of differences between *VMGS* and *VMGB* returns is 1.60 standard errors from zero. Thus, the power of the full sample period says that there are value premiums in the expected returns on small and big stocks, but the expected premium may be larger for small stocks.

B. Finer Size Sorts

Table I classifies stocks above the NYSE median market cap as big. To facilitate comparison with Loughran (1997), we next examine value premiums for a finer size grid. We use the 25 portfolios of Fama and French (1993), formed as the intersection of independent sorts of stocks in June of each year into NYSE size and *B/M* quintiles. There is a problem, however. During 1926 to 1963 the portfolio for the largest size and highest *B/M* quintiles often has no stocks, and the portfolio for the smallest size and lowest *B/M* quintiles is also thin. To have at least ten stocks in each portfolio, the tests must be limited to 1963 to 2004.

Table II about here.

Table II summarizes characteristics of the 25 size-*B/M* portfolios of 1963 to 2004. Specifically, the table reports monthly averages of (i) number of firms, (ii) average firm size (market cap), and (iii) percent of total market cap. A striking result is the skewness of percents of market cap across both size and *B/M* quintiles. On average the smallest size quintile contains more than half the total number of NYSE, AMEX, and Nasdaq stocks. But these smallest stocks (micro-caps) are tiny and together they account for less than 3.0% of total market cap. In contrast, there are on average just 295 stocks in the largest size quintile, but these mega-caps account for about three-quarters of total market cap. The percent of total market cap falls sharply, from 73.6% to 13.2% for the second largest size quintile and to 6.5% for the third.

Percent of market cap also falls across *B/M* quintiles, but not as dramatically. On average, the lowest *B/M* quintile (extreme growth stocks) accounts for 40.3% of total market cap, versus 8.1% for the highest *B/M* quintile (extreme value stocks). The decline in percent of market cap across *B/M* quintiles is steepest in the largest size quintile. Among these mega-caps, the lowest *B/M* portfolio accounts for an impressive 32.8% of total market cap, versus 4.7% for the highest *B/M* portfolio. This sharp decline has two sources: (i) on average the extreme growth mega-cap portfolio has about four times as many stocks as the extreme value mega-cap portfolio, and (ii) though in the same size quintile, mega-cap extreme growth stocks are about twice as large as mega-cap extreme value stocks. In contrast, there is no clear relation between size and *B/M* in size quintiles below the largest. Except for the smallest size quintile, however, all size groups share the result that growth stocks are more numerous than value stocks. Thus, when growth and value are defined using NYSE stocks, there is a bias toward growth in the AMEX-Nasdaq population.

For perspective on the returns we examine next, an important result in Table II is the paucity of firms that are both large and in the extreme value group. On average, only 26 firms in the size quintile of the largest firms are in the highest *B/M* quintile, and only 35 firms in the next largest size quintile are in the highest *B/M* quintile. This is not surprising, however, since firms that are large in terms of market cap are likely to have high stock prices and so are unlikely to be extreme value (high *B/M*) firms.

Table III about here.

Table III shows average returns for 1963 to 2004 for the 25 size-*B/M* portfolios, along with value premiums within size quintiles, and size premiums within *B/M* quintiles. The value premium for a size quintile is the difference between the average return on the two highest *B/M* portfolios and the average return on the two lowest *B/M* portfolios of the size quintile. Similarly, the size premium for a *B/M* quintile is the difference between the average returns on the two smallest and the two biggest size portfolios of the *B/M* quintile. We use four portfolios (rather than the extremes of each group) to estimate premiums because, as noted above, some extreme portfolios are undiversified.

When value and growth are defined by sorts on *B/M*, the value premiums in average returns decline monotonically from smaller to bigger size quintiles. For the size quintile that contains the largest firms (mega-caps), the value premium for 1963 to 2004 is only 0.13% per month, and about one standard error from zero. But the value premiums of the remaining four size groups are economically and statistically substantial. They range from 0.36% to 0.59% per month and all are more than 2.6 standard errors from zero. Even in the quintile that contains the largest firms, average returns increase monotonically from lower (growth) to higher (value) *B/M* quintiles.

The evidence for a weak value premium in the largest size quintile depends on using *B/M* to identify value and growth stocks. Table III also shows value premiums within size quintiles for 25 portfolios formed on size and earnings-to-price ratios (*E/P*). These portfolios are formed in the same way as the 25 size-*B/M* portfolios, except we exclude firms with negative earnings rather than negative book equity and we use *E/P* rather than *B/M* as the value-growth indicator. The effect of this change is to tone down if not wipe out the decline in the value premium with firm size. The smallest size quintile still produces the largest value premium, but any decline in value premiums with size is far from monotonic. The largest size quintile produces the same value premium as the second smallest (0.26% per month), and the second largest size quintile produces a value premium (0.38% per month) close to that for the smallest size quintile (0.43%). Perhaps most important, when *E/P* is the value-growth indicator, the value premiums for all size groups are more than two standard errors from zero.

There are two interesting changes in average returns when we sort firms on *E/P* rather than *B/M*. First, and most striking, is the increase in average returns for extreme growth (low *E/P*) stocks in the two smallest size quintiles. This acts to reduce the value premiums for these size groups, and so brings the premiums closer to those of other size groups. In other words, the larger value premiums that we observe for small stocks when *B/M* is the value-growth indicator are due more to lower returns on small growth stocks than to higher returns on small value stocks. Second, using *E/P* as the value-growth indicator reduces average returns for the two extreme growth portfolios in the largest size quintile and increases average returns on the two extreme value portfolios. This leads to a higher value premium for the largest size quintile, and it is now more than two standard errors from zero.

Why do the return results change for the *E/P* sorts? Without showing the details, we can report that, at least for the smaller size quintiles, the answer traces to firms with negative earnings (excluded from the *E/P* sorts). Negative earnings are relatively rare for firms in the two largest size quintiles, and the average returns of large firms with negative earnings are similar to those of large firms with positive earnings. But many firms in the three smallest size quintiles are unprofitable, and their average returns are far lower than those of profitable small firms. In the two smallest size quintiles, the low returns of firms with negative earnings act mostly to lower the returns of firms in the lowest *B/M* quintile (extreme growth firms). This raises the estimates of value premiums for these size quintiles and creates an inverse relation between size and the value premium that is not observed when *E/P* is the value-growth indicator.

Finally, though not our central focus, it is interesting to note that the monotonic decline in the value premium from smaller to bigger size groups that we observe in the *B/M* sorts in Table III corresponds to a monotonic increase in size premiums from lower to higher *B/M* groups. But this pattern in size premiums for 1963 to 2004 is almost nonexistent when the value-growth indicator is *E/P*. Even the extreme growth (lowest positive) *E/P* quintile produces a hint of a size premium for 1963 to 2004, a hint that is absent in the *B/M* sorts.

C. International Results

International returns provide an out-of-sample test of whether there is a value premium among big stocks. Using Morgan Stanley Capital International (MSCI), we construct 25 size-*B/M* portfolios and 25 size-*E/P* portfolios using merged data for 14 markets outside the U.S.[1] For comparability with the U.S. results, the breakpoints for the five international size groups are the same NYSE market cap quintile breakpoints used for the U.S. Since international accounting methods differ from those of the U.S., the quintile breaks for *B/M* and *E/P* use the annual cross-sections of the ratios for international stocks. We can report, however, that using U.S. breaks for the ratios has no effect on our inferences.

An advantage of the MSCI data is that they are free of survivor bias; firms that die remain in the historical sample. Moreover, the annual accounting data shown at the end of any month are the most recently reported, so they are publicly available. A disadvantage of MSCI is that the sample covers only 1975 to 2004. In addition, though the sample firms account for more than 80% of the market cap of the 14 markets, the small end of the size spectrum is sparse, and there are few firms in the micro-cap quintile. Thus, in presenting the international results, we show only two size groups, the top size quintile (mega-caps), and all remaining firms. This is not a problem since our main interest is whether there is a value premium for the largest stocks and whether it is smaller than for other stocks.

The international sample resembles the U.S. sample in many ways. For example, on average there are about 350 mega-cap firms in the international sample versus almost three times as many smaller firms, but the mega-caps account for about three-quarters of the sample's total market cap (Table IV). Again, more of the sample's market cap comes from growth stocks, but in the international sample, this result is due entirely to mega-caps, where growth stocks outnumber value stocks by more than two to one.

Table IV about here.

More important, Table IV documents strong value premiums in international returns. (As in the U.S. results, we estimate international value premiums as the difference between the average returns for the two extreme value and the two extreme growth portfolios of a group.) When *B/M* is the value-growth indicator, the overall value-weight international value premium is 0.53% per month (t = 2.63); it is 0.65% per month (t = 2.78) for *E/P* groupings. (See also Fama and French (1998).)

The new evidence in Table IV centers on the value premium for very large stocks. When we sort on *B/M*, the value premium for mega-caps is six basis points per month larger than it is for all smaller stocks, but the difference is indistinguishable from zero (t = 0.41). Sorting on *E/P*, the premiums for the two size groups are virtually identical. In short, international returns show economically and statistically strong value premiums, and they are as large among the biggest stocks as among smaller stocks.

D. Bottom Line

In sum, when we use *B/M* to identify value and growth stocks in the U.S., value premiums for 1963 to 2004 are smaller for big firms. Although there are large and statistically reliable value premiums in the four smaller size quintiles, the premium for the largest size quintile, 0.13% per month, is just 1.01 standard errors from zero. When we sort on *E/P* rather than *B/M*, however, we find a strong value premium in the largest size quintile and little relation between the value premium and firm size. The evidence for 1926 to 1963 (Table I) is also relevant. Though we only have a 2x3 size-*B/M* grid for the earlier period, if the value premium is negatively related to size, small stocks should produce a bigger premium than big stocks. But the value premiums for small and big stocks for 1926 to 1963 (0.35% and 0.36% per month) are near identical. Finally, whether we sort on *B/M* or *E/P*, international average returns for 1975 to 2004 show strong value premiums that are at least as large for mega-caps as for smaller stocks. All this suggests that the weak relation between *B/M* and average returns observed for the largest U.S. size quintile for 1963 to 2004 may be a random aberration, due perhaps to the fact that there are relatively few mega-cap value stocks.

II. The Value Premium and the CAPM

Does the CAPM explain the value premium in average returns? In Fama and French (1993), we conclude that the answer is no for the post-1963 period. Ang and Chen (2005) find, however, that the CAPM explains the premium of 1926 to 1963. The plot of year-by-year betas for *VMG* in Figure 1 suggests an explanation. As in Franzoni (2001), the market β for *VMG* falls during the sample period. The β for 1926 to 1963 (Table V) is large and positive, 0.35 (t = 13.62), whereas the β for 1963 to 2004 is strongly negative, -0.28 (t = -10.31). Because the β for value stocks is lower than the β for growth stocks in the later period, the CAPM cannot explain the positive value premium for 1963 to 2004. In contrast, the β for *VMG* is positive for 1926 to 1963, so the positive value premium of this period may be consistent with the CAPM.

Figure 1 about here.

A. Time-Series Tests

The regressions of *VMG*, *VMGS*, and *VMGB* returns on the excess market return in Table V test whether the CAPM can explain value premiums. In a CAPM world, the true intercepts in these regressions are zero. Confirming Fama and French (1996), the CAPM regression to explain *VMG* returns for 1963 to 2004 produces an intercept, 0.57% per month (t = 4.74), that easily rejects the CAPM. Since the market β for *VMG* for 1963 to 2004 is negative, the intercept in the CAPM regression for *VMG* in Table V is larger than the (already large) average *VMG* return in Table I.

Table V about here.

The value premium for big stocks for 1963 to 2004, 0.26% per month, is economically large but slightly less than two standard errors from zero (t = 1.87, Table I). The negative market β for *VMGB*, however, leads to a CAPM regression intercept, 0.34%, that is larger and 2.53 standard errors from zero (Table V). Thus, even for big stocks (which for *VMGB* is all stocks above the NYSE median market cap) there is evidence that the CAPM cannot explain the value premium of 1963 to 2004. The value premium for small stocks does, however, produce a stronger CAPM rejection. The intercept in the CAPM regression for *VMGS* is 0.78% per month (t = 5.80).

To complete the picture, Table V shows CAPM regressions to explain excess returns on the six size-*B/M* portfolios in *SMB* and *VMG*. In the regressions for 1963 to 2004, the *F*-test of Gibbons, Ross, and Shanken (GRS, 1989) cleanly rejects the hypothesis that the CAPM can explain the average returns on these portfolios. The portfolios that seem to produce problems for the CAPM are the small value portfolio *SV* (CAPM intercept 0.61% per month, t = 4.47), the small neutral portfolio *SN* (intercept 0.41%, t = 3.40), and the big value portfolio *BV* (intercept 0.29%, t = 2.85). In contrast, the CAPM intercepts for the two growth portfolios, *SG* and *BG*, are only about one standard error below zero. Thus, the power to reject the CAPM for 1963 to 2004 seems to come more from the high returns on value portfolios than from the lower returns on growth portfolios.

Table V confirms the evidence of Ang and Chen (2005) on the success of the CAPM for the earlier 1926 to 1963 period. Average *VMG* returns are similar for 1926 to 1963 and 1963 to 2004, but a dramatic change in the market β for *VMG*, from negative -0.28 for 1963 to 2004 to positive 0.35 for 1926 to 1963, leads to an intercept for 1926 to 1963 (0.05% per month, $t = 0.31$) that is quite consistent with CAPM pricing. Splitting *VMG* into its small and big stock components, *VMGS* and *VMGB*, reinforces this conclusion. Table V shows that for 1926 to 1963, the CAPM also explains average returns on the six size-*B/M* portfolios. The CAPM intercepts for the six portfolios are all within 0.60 standard errors of zero, and the GRS test produces a *p*-value (0.77) that is quite consistent with CAPM pricing.

Though not our main interest, Table V also confirms earlier evidence (Chan and Chen (1988), Fama and French (1996)) that the size premium in average returns is consistent with CAPM pricing. The market β for *SMB* for 1926 to 1963, 0.19, is close to that for 1963 to 2004, 0.21. Since *SMB*'s market β does not seem to change from the earlier to the later period, we can use the power of the full sample to examine whether the CAPM explains the average *SMB* return. In the CAPM regression for *SMB* for 1926 to 2004, the intercept is 0.10% ($t = 0.92$). In short, Table I identifies a reliable average size premium for 1926 to 2004, but Table V suggests that about half of it is absorbed by *SMB*'s market β, leaving little evidence against CAPM pricing for the premium in the average returns on small stocks. Note, however, that the CAPM regressions for 1926 to 2004 for the two small stock portfolios, *SN* and *SV*, produce strong positive intercepts (0.25 and 0.36, $t = 2.50$ and $t = 2.66$)), so small stock average returns do pose some problems for the CAPM.

B. Time-Varying β

Ang and Chen (2005) argue that when β is allowed to vary over time, even the period after July 1963 produces no reliable evidence that the CAPM fails to explain value premiums. The market βs for *VMG*, *VMGS*, and *VMGB* in Figure 1, for annual periods beginning in July 1926, show that there is indeed substantial time variation in the βs of value premiums. The β estimates bounce around a lot, which is not surprising given that each uses just 12 monthly returns. But, confirming Franzoni (2001), the dominant pattern is down; the β estimates are near their highest values early in the sample period and near their lowest toward the end. The annual β estimates for the components of *VMG* in Figure 2 provide supporting details. The β estimates for the two value portfolios (again with lots of variation) largely just seem to fall, starting the period far above the estimates for the growth portfolios and ending far below.

Figure 2 about here.

Ang and Chen (2005) model variation in the market betas of value premiums as mean reverting first-order autoregressions in a highly parameterized latent variable model that also includes assumptions about how the expected value of the excess market return and its volatility vary over time. We are wary of imposing so much structure on the process assumed to generate β and the other central variables of the CAPM. Instead, we use a simple nonparametric approach that is less vulnerable to specification issues to accommodate variation in β. We estimate CAPM regressions for 1926 to 2004 that use slope dummies to allow for periodic changes in β. We examine four alternatives: (i) a constant β for the period, (ii) a single break in β in July 1963, (iii) changes in β every five years, and (iv) annual changes (as in Figures 1 and 2) at the June portfolio formation point. To judge which of these specifications is best, we examine regression R^2, adjusted for degrees of freedom. If shortening the period over which β is assumed constant increases R^2, we infer that picking up more variation in the true β more than compensates for the loss in degrees of freedom.

Table VI about here.

The message from the regressions in Panel A of Table IV is clear. For every portfolio, shortening the estimation interval for β increases R^2 or leaves it unchanged. We infer that allowing β to change each year when portfolios are rebalanced is best among the alternatives we examine. This is perhaps not surprising since portfolio compositions change when the portfolios are reformed at the end of each June.

Allowing β to change every year weakens the evidence against CAPM pricing of the value premium for the full sample period. Panel A of Table VI shows that with annual changes in β, the intercept in the CAPM regression for *VMG* for 1926 to 2004 is 0.20% per month (t = 2.05), versus 0.31% (t = 2.73) with no change in β, and 0.37% (t = 3.79) when β is allowed to change every five years.

Moreover, the rejection is mostly due to small stocks. With annual changes in β, the intercept in the full-period CAPM regression for *VMGB* is positive but just 0.08% per month (t = 0.68), versus 0.31% per month (t = 2.89) for *VMGS*. Allowing annual changes in β continues to produce a strong rejection of the CAPM in the GRS test for the six size-*B/M* components of *SMB* and *VMG* for 1926 to 2004 (Table VI).

C. The CAPM before and after July 1963

The full-period regressions in Panel A of Table VI reject CAPM pricing as an explanation for the average *VMG* return, but the split sample regressions in Table V open the possibility that the rejection is entirely due to the 1963 to 2004 subperiod. If so, full-period constant intercept regressions are misleading; by imposing one intercept for 1926 to 2004, they dilute both the success of the CAPM during 1926 to 1963 and its failure during 1963 to 2004. Since the CAPM is such an elegantly simple paradigm, it behooves us to examine in detail whether it had a golden age during 1926 to 1963.

Panel B of Table VI shows full-period CAPM regressions for the three value premiums that allow β to change every year and include a dummy variable for 1963 to 2004 in addition to the full-period intercept. The intercepts, *a26*, are the average returns for 1926 to 1963 left unexplained by the CAPM. The coefficients on the dummy variable for 1963 to 2004, *a63-a26*, measure differences between CAPM intercepts for 1963 to 2004 and 1926 to 1963. The dummy variable thus tells us whether the CAPM's ability to explain value premiums is different in the two periods. The answer is a clear yes. The coefficients on the 1963 to 2004 dummy in the regressions for *VMG*, *VMGS*, and *VMGB* are 2.97, 3.19, and 1.96 standard errors from zero. In contrast, the estimates of *a26* are within one standard error of zero. Thus, allowing β to change annually confirms the inference that the CAPM can explain the value premiums of 1926 to 1963, but 1963 to 2004 is a different matter.

If the CAPM's inability to explain value premiums is particular to 1963 to 2004, we get a clearer picture of the problem by estimating separate (rather than marginal) CAPM intercepts for 1926 to 1963 and 1963 to 2004. Panel C of Table VI shows full-period CAPM regressions for *VMG*, *VMGS*, and *VMGB* that allow β to change every year and include dummy variables for 1926 to 1963 and 1963 to 2004 but no full-period intercept.[2] These tests reject CAPM pricing for 1963 to 2004, cleanly for *VMG* and *VMGS* (intercepts for 1963 to 2004 of 0.46% and 0.62% per month, t = 3.52 and t = 4.29) and marginally for *VMGB* (an intercept for 1963 to 2004 of 0.28%, t = 1.83). The regressions for the six size-*B/M* portfolios are also bad news for CAPM pricing during 1963 to 2004. The 1963 to 2004 intercepts for *SV*, *SN*, and *BV* (0.59%, 0.45%, and 0.22% per month) in Panel C of Table VI are economically large and 3.52, 3.44, and 1.84 standard errors from zero. Lewellen and Nagel (2005) use a different approach to deal with time varying betas, but their inferences about the CAPM are consistent with ours.

In sum, allowing β to change annually leaves us with the conclusion that the CAPM can explain the value premiums in the average returns of 1926 to 1963, but it fails to capture the value premiums of 1963 to 2004.

III. β Sorts and the CAPM

Do the small CAPM intercepts for the value premiums of 1926 to 1963 imply that the CAPM explains expected stock returns during this period? Not necessarily. There is an alternative hypothesis that, unlike the CAPM, describes average returns for 1963 to 2004 as well as for 1926 to 1963. Specifically, expected returns vary with *B/M* (or a risk related to *B/M*), not with β. Value (high *B/M*) stocks have higher expected returns regardless of their βs. And β seems to be rewarded in average returns only when it is positively correlated with *B/M* (or size). The value premiums of 1963 to 2004 favor this story over the CAPM. The positive value premiums of this period line up with positive spreads in *B/M* and not with the negative spreads in β.

Distinguishing between the two stories in the returns for 1926 to 1963 is more challenging. Since both *B/M* and β are higher for value stocks than for growth stocks, the positive value premiums for 1926 to 1963 are consistent with both the CAPM and our alternative *B/M* explanation. One way to distinguish between the two is to create variation in β that is independent of the variation in *B/M* (Daniel and Titman (1997)). We do this by splitting each of the six size-*B/M* portfolios (used to construct *SMB* and *VMG*) into high and low β portfolios each year, using βs estimated with two to five years (as available) of past monthly returns. We then calculate the differences between the value weight returns on the six high β and the six low β portfolios. We also calculate an overall difference, *HBmLB*, which is the simple average of the six high minus low β return spreads. *HBmLB* is thus a diversified return that provides an overall summary of the β premium within portfolios formed on size and *B/M*. Since 1926 and 1927 are lost when we estimate the βs used to form the first spread portfolios in June of 1928, the sample period for these tests is 1928 to 2004 (July 1928 to December 2004).

Table VII about here.

Table VII shows that splitting the size-*B/M* portfolios on estimates of β produces small spreads in average returns. The overall *HBmLB* average return is only 0.04% per month (t = 0.40) for the full 1928 to 2004 period, 0.09% (t = 0.56) for 1928 to 1963, and -0.00% (t = -0.04) for 1963 to 2004. These tiny average return spreads are ominous for the CAPM.

The regressions in Table VII confirm that average returns on the β-spread portfolios violate the CAPM. The β splits of the size-*B/M* portfolios produce large spreads in post formation β. The estimates for 1928 to 2004 range from 0.33 (t = 15.47) to 0.52 (t = 23.49). The βs for the spread portfolios are also similar for 1928 to 1963 and 1963 to 2004, and the overall spread portfolio, *HBmLB*, has the same post formation β, 0.42, in both periods. Large positive market βs and tiny average return spreads combine to produce large negative intercepts in the CAPM regressions for the β-spread portfolios in Table VII. Twenty of 21 intercepts are negative and many are more than two standard errors below zero.

Because of its diversification, the overall *HBmLB* return has the lowest variance among the spread portfolio returns, and the CAPM regressions that explain the *HBmLB* return have the lowest residual variances. The *HBmLB* portfolio thus provides a powerful overall test of whether the CAPM can explain average returns on the β spread portfolios. The *HBmLB* intercept for 1928 to 2004, -0.22% per month (t = -3.31), strongly rejects the CAPM; the intercepts for 1928 to 1963 and 1963 to 2004 are similar (-0.24% and -0.20% per month) and more than 2.3 standard errors below zero. The GRS tests on the intercepts from the CAPM regressions for the six components of *HBmLB* also reject CAPM pricing.

In the end, we have four pieces of evidence on the CAPM. (i) Throughout 1926 to 2004, small firms have larger market βs than big firms, and the CAPM captures much of the size premium in average returns. (ii) During 1926 to 1963, there is a positive relation between β and *B/M*, and the value premiums of this period are also consistent with the CAPM. (iii) But the CAPM cannot explain the value premiums of 1963 to 2004, when high *B/M* (value) stocks have lower βs than low *B/M* (growth) stocks. (iv) Throughout 1926 to 2004, variation in β within portfolios formed on size and *B/M* is not compensated in the manner predicted by the CAPM – if at all. Taken together, these four findings suggest that there is little if any compensation for differences in beta unrelated to size and *B/M*. Apparently, it is not β, but size and *B/M* or risks related to them that count in expected returns.

Fans of the CAPM sometimes claim that violations of the model are unimportant because they are limited to small stocks that account for little total market cap. This conclusion stems from results like those in Tables V and VI, where the big growth and big neutral portfolios, *BG* and *BN*, which on average account for more than 80% of total market cap, do not suggest violations of the CAPM. But Table VII identifies substantial variation in β within *BG* and *BN* that does not show up in average returns. Although the β-spread portfolios for *BG* and *BN* produce large β estimates for 1928 to 2004, 0.39 (t = 26.28) and 0.42 (t = 24.85), their average returns are close to zero, 0.00% (t = 0.00) for *BG* and 0.07% (t = 0.60) for *BN*. It is thus not surprising that the β-spread portfolios for *BG* and *BN* produce negative CAPM regression intercepts that reject the model. The intercepts for 1928 to 2004 are -0.25% (*BG*) and -0.19% (*BN*) per month (t = -2.96 and t = -2.02), and they are outdone in size and significance only by the β-spread portfolio for *SG*. In short, the evidence that variation in β unrelated to size and *B/M* goes unrewarded in average returns is not restricted to small stocks or small fractions of total market cap.

IV. Conclusions

We examine (i) how value premiums vary with firm size, (ii) whether the CAPM explains value premiums, and (iii) whether in general average returns compensate differences in β in the way predicted by the CAPM.

Loughran's (1997) evidence that there is no value premium among the largest stocks seems to be particular to (i) the U.S., (ii) the post-1963 period, and (iii) using the book-to-market ratio as the value-growth indicator. During the earlier 1926 to 1963 period, the value premium is near identical for small and big U.S. stocks. When we use *E/P* rather than *B/M* to separate value and growth stocks, we find that 1963 to 2004 also produces strong value premiums for all size quintiles and little difference between value premiums for big and small U.S. stocks. Moreover, international value premiums for 1975 to 2004 from 14 major markets outside the U.S. are as large for mega-cap stocks as for smaller stocks. These results suggest that the weak relation between *B/M* and average returns observed for the largest U.S. size quintile during 1963 to 2004 may be a random aberration, due perhaps to the paucity of mega-cap value stocks.

The CAPM can explain the strong value premiums of 1926 to 1963, but not those of 1963 to 2004. During the later period, growth stocks tend to have larger market βs than value stocks, which is the reverse of what the CAPM requires to explain value premiums. We thus reject a CAPM explanation of the value premiums of 1963 to 2004, whether or not we allow for time-variation in market β. During the earlier 1926 to 1963 period, however, value stocks have larger βs than growth stocks, and like Ang and Chen (2005), we find that the CAPM captures the value premiums of this period near perfectly.

Unfortunately, the CAPM has a more general problem that overshadows its success with the value premiums of 1926 to 1963. The CAPM says all differences in β are compensated in the same way in expected returns. But when we form portfolios on size, *B/M*, and β, we find that variation in β related to size and *B/M* is compensated in average returns for 1928 to 1963, but variation in β unrelated to size and *B/M* goes unrewarded during 1928 to 1963 and throughout the sample period. As a result, we reject CAPM pricing for portfolios formed on size, *B/M*, and β, for 1928 to 1963 as well as for 1963 to 2004. This rejection of the CAPM is as strong for large stocks, which account for the lion's share of market wealth, as for small stocks.

The final scoreboard presents the following facts. During 1926 to 1963 the βs of portfolios formed on size and *B/M* line up with average returns in the manner predicted by the CAPM, and size and value premiums are captured by the CAPM. But variation in β unrelated to size and *B/M* seems to carry no premium. For 1963 to 2004, size and value premiums are similar to those of 1926 to 1963, but along the value-growth dimension β no longer lines up with average returns in the manner predicted by the CAPM. And again, variation in β unrelated to size and *B/M* carries little or no premium.

Based on these results, we conclude that the CAPM has fatal problems throughout the 1926 to 2004 period. Specifically, size and *B/M* or risks related to them are important in expected returns, whether or not they relate to β in a way that would support the CAPM, and β has little or no independent role. It seems safe to predict, however, that challenges are forthcoming.

Footnotes

* Graduate School of Business, University of Chicago (Fama), and Amos Tuck School of Business, Dartmouth College (French). We acknowledge helpful comments from Jonathan Lewellen, Eduardo Repetto, seminar participants at Emory University, and a referee.

[1] We thank Dimensional Fund Advisors for purchasing these data on our behalf.

[2] The annual βs from the regressions in Panels B and C of Table VI are in Figures 1 and 2. They are near identical to the annual βs from the regressions in Panel A of Table VII, which do not allow for changes in the intercepts during the sample period.

Figure Titles and Legends

Figure 1. One-year βs for value premiums. *VMG* is the average of the returns on the two value portfolios, *SV* (small value) and *BV* (big value), minus the average of the returns on the two growth portfolios, *SG* (small growth) and *BG* (big growth). *VMGS* is *SV* minus *SG* and *VMGB* is *BV* minus *BG*.

Figure 2a. One-year βs for small growth (*SG*) and small value (*SV*)

Figure 2b. One-year βs big growth (*BG*) and big value (*BV*)

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Table I
Summary Statistics for Monthly Returns on Size and Value Factors and the Size-*B/M* Portfolios Used to Construct Them

At the end of each June from 1926 to 2004, we form six value-weight portfolios, *SG*, *SN*, *SV*, *BG*, *BN*, and *BV*. The portfolios are the intersections of independent sorts of NYSE, AMEX (after 1962), and Nasdaq (after 1972) stocks into two size groups, *S* (small, firms with June market cap below the NYSE median) and *B* (big, market cap above the NYSE median), and three book-to-market equity (*B/M*) groups, *G* (growth, firms in the bottom 30% of NYSE *B/M*), *N* (neutral, middle 40% of NYSE *B/M*), and *V* (value, high 30% of NYSE *B/M*). Book equity is Compustat's total assets (data item 6), minus liabilities (181), plus balance sheet deferred taxes and investment tax credit (35) if available, minus (as available) liquidation (10), redemption (56), or carrying value (130) of preferred stock. In the *B/M* sorts in June of year *t*, book equity is for the fiscal year ending in the preceding calendar year, *t-1*, and market equity is market cap at the end of December of that calendar year. Only firms with positive book equity are used. The size premium, *SMB* (small minus big), is the simple average of the returns on the three small stock portfolios minus the average of the returns on the three big stock portfolios. The value premium, *VMG* (value minus growth), is the simple average of the returns on the two value portfolios minus the average of the returns on the two growth portfolios. *VMGS* is *SV* minus *SG*, *VMGB* is *BV* minus *BG*, and *VMGS-B* is *VMGS* minus *VMGB*. *RM-RF* is the difference between the value-weight market return and the one-month Treasury bill rate. The table shows means, standard deviations (Std Dev), and *t*-statistics for the mean (the ratio of the mean to its standard error).

	Factor Portfolios						Size-*B/M* Portfolios					
	RM-RF	*SMB*	*VMG*	*VMGS*	*VMGB*	*VMGS-B*	*SG*	*SN*	*SV*	*BG*	*BN*	*BV*
July 1926 to December 2004, 942 Months												
Mean	0.65	0.23	0.40	0.48	0.31	0.17	0.74	1.02	1.22	0.62	0.70	0.93
Std Dev	5.47	3.36	3.58	3.63	4.25	3.33	7.90	7.18	8.32	5.47	5.85	7.35
t-statistic	3.64	2.06	3.43	4.08	2.23	1.60	2.86	4.37	4.49	3.49	3.69	3.89
July 1926 to June 1963, 444 Months												
Mean	0.85	0.20	0.35	0.35	0.36	-0.01	1.03	1.16	1.37	0.83	0.89	1.20
Std Dev	6.43	3.48	4.17	3.89	5.23	3.86	8.75	8.80	10.70	6.16	7.23	9.62
t-statistic	2.79	1.23	1.78	1.89	1.46	-0.08	2.47	2.78	2.71	2.85	2.59	2.62
July 1963 to December 2004, 498 Months												
Mean	0.47	0.24	0.44	0.60	0.26	0.34	0.48	0.90	1.08	0.43	0.54	0.69
Std Dev	4.45	3.26	2.96	3.39	3.12	2.76	7.05	5.36	5.39	4.77	4.26	4.44
t-statistic	2.36	1.68	3.34	3.97	1.87	2.76	1.51	3.75	4.47	2.03	2.82	3.49

Table II
Characteristics of 25 Portfolios Formed on Size and *B/M*: July 1963 to December 2004, 498 Months

At the end of each June from 1963 to 2004, we form 25 portfolios as the intersections of independent sorts of NYSE, AMEX, and (after 1972) Nasdaq stocks into five size groups (using NYSE market cap quintile breakpoints for the end of June) and five book-to-market groups (again using NYSE quintile breakpoints for *B/M*). Book equity in *B/M* is for the fiscal year ending in the preceding calendar year and market equity is market cap at the end of December of that calendar year. Firms with negative book equity are excluded. For each portfolio, the table shows averages across the months of July 1963 to December 2004 of (i) number of firms, (ii) average market cap, and (iii) percent of total market cap, which is the product of (i) and (ii) divided by the sum of these products across portfolios. The table also shows the average across years of *B/M* for each portfolio, where book equity and market equity for a given year are the sums for the firms in a portfolio. In the blocks for Number of Firms and Percent of Total Market Cap, Sum is the sum across rows or columns of the items in the column or row.

	Number of Firms						Average Market Cap ($Millions)				
	Low	2	3	4	High	Sum	Low	2	3	4	High
Small	532	337	338	402	645	2255	39	42	40	36	27
2	163	117	114	103	79	576	186	188	191	189	185
3	121	88	81	67	48	405	444	452	453	456	464
4	100	75	64	53	35	327	1147	1142	1150	1160	1156
Big	108	66	52	43	26	295	10240	7658	6608	5454	5001
Sum	1025	682	649	669	832	3858					

	Percent of Total Market Cap						Annual Sum B/Sum M				
	Low	2	3	4	High	Sum	Low	2	3	4	High
Small	0.7	0.5	0.5	0.5	0.7	2.9	0.27	0.57	0.77	1.02	1.77
2	1.1	0.8	0.8	0.7	0.5	3.8	0.27	0.54	0.76	1.00	1.66
3	1.9	1.4	1.3	1.1	0.8	6.5	0.27	0.54	0.75	1.00	1.62
4	3.9	2.9	2.6	2.2	1.5	13.2	0.27	0.55	0.75	1.02	1.62
Big	32.8	15.5	11.6	9.0	4.7	73.6	0.26	0.53	0.75	0.99	1.49
Sum	40.3	21.1	16.8	13.6	8.1	100.0					

Table III
Average Monthly Returns for 25 Portfolios Formed on Size and *B/M* or *E/P*: July 1963 to December 2004, 498 Months

At the end of each June from 1963 to 2004, we form 25 portfolios as the intersections of independent sorts of NYSE, AMEX, and (after 1972) Nasdaq stocks into five size groups (using NYSE market cap quintile breakpoints for the end of June) and five book-to-market or earnings-price groups (again using NYSE quintile breakpoints for *B/M* and *E/P*). Book equity in *B/M* and earnings in *E/P* are for the fiscal year ending in the preceding calendar year; *M* = *P* is market cap at the end of December of that calendar year. The size-*B/M* portfolios include only firms with positive book equity, and the size-*E/P* portfolios include only firms with positive earnings. *H-L* is the value premium for a size group estimated from the time series of monthly differences between the average of the returns for the two highest *B/M* (or *E/P*) quintiles within a size quintile and the average of the returns for the two lowest *B/M* (or *E/P*) quintiles. Similarly *S-B* is the size premium for a *B/M* (or *E/P*) quintile estimated from the time series of monthly differences between the average return for the two smallest size quintiles within a *B/M* (or *E/P*) quintile and the average of the returns for the two biggest size quintiles. *t*(*H-L*) or *t*(*S-B*) is the average monthly difference divided by its standard error. The bottom right number in the *H-L* columns is the time-series average (or *t*-statistic for the time-series average) of the overall average of the five *H-L* returns.

	Low	2	3	4	High	*H-L*	*t*(*H-L*)
Size-*B/M* Portfolios							
Small	0.73	1.32	1.36	1.57	1.67	0.59	4.13
2	0.89	1.15	1.40	1.45	1.55	0.48	3.62
3	0.90	1.22	1.20	1.35	1.51	0.37	2.64
4	1.01	0.99	1.22	1.34	1.37	0.36	2.75
Big	0.90	0.97	0.98	1.05	1.06	0.13	1.01
S-B	-0.14	0.26	0.28	0.31	0.39	0.38	3.32
t(*S-B*)	-0.77	1.46	1.85	2.18	2.63		
Size-*E/P* Portfolios							
Small	1.08	1.30	1.43	1.52	1.71	0.43	4.20
2	1.07	1.31	1.34	1.36	1.53	0.26	2.00
3	0.96	1.17	1.28	1.28	1.51	0.33	2.50
4	0.94	1.04	1.15	1.34	1.42	0.38	3.03
Big	0.85	0.95	0.92	1.19	1.13	0.26	2.07
S-B	0.18	0.31	0.34	0.17	0.35	0.33	3.19
t(*S-B*)	1.05	2.04	2.36	1.33	2.54		

Table IV
Average Monthly Returns, Number of Firms, and Percent of Market Cap for International Portfolios Formed on Size and *B/M* or *E/P*: January 1975 to December 2004

All variables are in U.S. dollars. At the end of each December from 1974 to 2003, we form 10 value weight portfolios as the intersection of independent sorts of international stocks into two size groups (using the market cap breakpoint between the smallest 80% and largest 20% of NYSE firms at the end of December) and five book-to-market or earnings-price groups (using international breakpoints for *B/M* and *E/P* from the combined cross-section of international stocks). Book equity in *B/M* and earnings in *E/P* are for the latest reported year preceding December portfolio formation; *M* = *P* is market cap at portfolio formation. The size-*B/M* portfolios include only firms with positive book equity, and the size-*E/P* portfolios include only firms with positive earnings. Because the smallest size quintiles have few firms, the table shows results for the largest size quintile (Big) and combined results for the four remaining size quintiles (Not Big). *H-L* is the value premium for a size group estimated from the time series of monthly differences between the average of the returns for the two highest *B/M* (or *E/P*) quintiles within a size group and the average of the returns for the two lowest *B/M* (or *E/P*) quintiles. *t*(*H-L*) or *t*(Big-Not Big) is the average monthly difference divided by its standard error. Percent of Market Cap is the monthly average of the percent of total sample market cap in each portfolio. The 14 international markets in the tests are Australia, Belgium, Canada, France, Germany, Great Britain, Hong Kong, Italy, Japan, the Netherlands, Singapore, Spain, Sweden, and Switzerland.

	Average Monthly Returns							
	All	Low	2	3	4	High	*H-L*	*t*(*H-L*)
Size-*B/M* Sorts								
All	1.11	0.84	1.13	1.23	1.40	1.63	0.53	2.63
Big	1.07	0.81	1.14	1.21	1.41	1.56	0.51	2.24
Not Big	1.26	1.00	1.15	1.26	1.34	1.69	0.44	2.66
Big - Not Big	-0.19	-0.18	-0.01	-0.05	0.07	-0.13	0.06	0.41
t(Big-Not Big)	-1.49	-1.13	-0.10	-0.40	0.52	-0.75		
Size-*E/P* Sorts								
All	1.12	0.72	1.08	1.23	1.45	1.65	0.65	2.78
Big	1.08	0.68	1.09	1.17	1.44	1.57	0.62	2.50
Not Big	1.29	0.86	1.15	1.34	1.45	1.77	0.61	3.02
Big - Not Big	-0.21	-0.18	-0.06	-0.18	-0.01	-0.21	0.01	0.11
t(Big-Not Big)	-1.64	-1.09	-0.44	-1.38	-0.07	-1.42		

	Percent of Market Cap						Average Number of Firms					
	All	Low	2	3	4	High	All	Low	2	3	4	High
Size-*B/M* Sorts												
All	100.0	33.7	25.8	19.2	13.8	7.5	1421	289	289	287	282	274
Big	73.4	27.8	19.9	13.4	8.5	3.6	362	115	100	72	49	25
Not Big	26.6	5.9	5.8	5.8	5.2	3.9	1059	174	188	214	233	249
Size-*E/P* Sorts												
All	100.0	28.6	23.0	19.3	16.8	12.4	1248	257	256	252	250	233
Big	74.5	23.2	17.6	14.0	11.7	8.1	341	96	82	66	57	41
Not Big	25.5	5.4	5.5	5.3	5.1	4.3	906	163	175	186	192	192

Table V
CAPM Regressions to Explain Monthly Returns

The CAPM regression is

$$Prem_t = a + b[RM_t - RF_t] + e_t,$$

where $Prem_t$ is a size or value premium for month t, or the return on one of the six size-*B/M* portfolios in excess of the one-month Treasury bill rate, RF_t is the bill rate, and RM_t is the value-weight market (NYSE-AMEX-Nasdaq) return. The portfolios, formed on size and B/M at the end of June of each year, are *SG* (small growth), *SN* (small neutral), *SV* (small value), *BG* (big growth), *BN* (big neutral), and *BV* (big value). *SMB* (small minus big) is the simple average of the returns on the three small stock portfolios minus the average of the returns on the three big stock portfolios. *VMG* (value minus growth) is the simple average of the returns on the two value portfolios minus the average of the returns on the two growth portfolios. *VMGS* is *SV* minus *SG* and *VMGB* is *BV* minus *BG*. $t()$ is the ratio of a regression coefficient to its standard error, and R^2 is the coefficient of determination, adjusted for degrees of freedom. *GRS* is the *F*-statistic testing the hypothesis that the intercepts in the regressions for the six size-B/M portfolios are jointly equal to zero.

	SMB	*VMG*	*VMGS*	*VMGB*	*SG*	*SN*	*SV*	*BG*	*BN*	*BV*
July 1926 to December 2004, 942 Months										
a	0.10	0.31	0.46	0.16	-0.10	0.25	0.36	-0.01	0.04	0.15
b	0.20	0.13	0.04	0.23	1.28	1.19	1.32	0.98	1.02	1.21
$t(a)$	0.92	2.73	3.85	1.20	-0.84	2.50	2.66	-0.33	0.70	1.38
$t(b)$	10.52	6.29	1.71	9.52	59.77	65.05	53.74	140.94	96.86	62.70
R^2	0.10	0.04	0.00	0.09	0.79	0.82	0.75	0.95	0.91	0.81
						GRS = 5.39, *p*-value = 0.000				
July 1926 to June 1963, 444 Months										
a	0.04	0.05	0.13	-0.02	-0.03	0.08	0.10	0.03	-0.04	0.01
b	0.19	0.35	0.26	0.45	1.24	1.26	1.49	0.94	1.09	1.39
$t(a)$	0.26	0.31	0.78	-0.10	-0.15	0.52	0.46	0.59	-0.51	0.06
$t(b)$	7.95	13.62	9.82	13.94	45.57	50.93	42.50	118.30	86.03	53.56
R^2	0.12	0.29	0.18	0.30	0.82	0.85	0.80	0.97	0.94	0.87
						GRS = 0.55, *p*-value = 0.772				
July 1963 to December 2004, 498 Months										
a	0.14	0.57	0.78	0.34	-0.17	0.41	0.61	-0.05	0.12	0.29
b	0.21	-0.28	-0.37	-0.18	1.37	1.04	1.00	1.04	0.88	0.86
$t(a)$	1.02	4.74	5.80	2.53	-1.06	3.40	4.47	-1.03	1.65	2.85
$t(b)$	6.84	-10.31	-12.32	-5.87	38.67	38.94	33.09	86.82	53.14	37.85
R^2	0.08	0.17	0.23	0.06	0.75	0.75	0.69	0.94	0.85	0.74
						GRS = 9.18, *p*-value = 0.000				

Table VI
CAPM Regressions to Explain Monthly Returns for July 1926 to December 2004, Allowing for Time-Varying *β*s

The portfolios, formed on size and *B/M*, are *SG* (small growth), *SN* (small neutral), *SV* (small value), *BG* (big growth), *BN* (big neutral), and *BV* (big value). *VMG* is the average of the returns on the two value portfolios minus the average of the returns on the two growth portfolios. *VMGS* is *SV* minus *SG*, and *VMGB* is *BV* minus *BG*. *t*() is the ratio of a regression coefficient to its standard error, and R^2 is the coefficient of determination, adjusted for degrees of freedom. *GRS* is the *F*-statistic to test the hypothesis that the intercepts in the regressions for the six size-*B/M* portfolios are jointly equal to zero. The regressions in Panel A estimate one intercept for the sample period. In Panel B the regressions contain a full-period intercept, *a26*, and a marginal intercept, *a63-a26*, estimated by including a dummy variable for July 1963 to December 2004. In Panel C there are separate intercepts (dummy variables) for July 1926 to June 1963 and July 1963 to December 2004, and there is no full-period intercept. A slope dummy for July 1963 to December 2004 is used to allow for a single change in market *β* in 1963. Slope dummies for five-year or one-year periods are used to allow for changes in *β* every five years or every year.

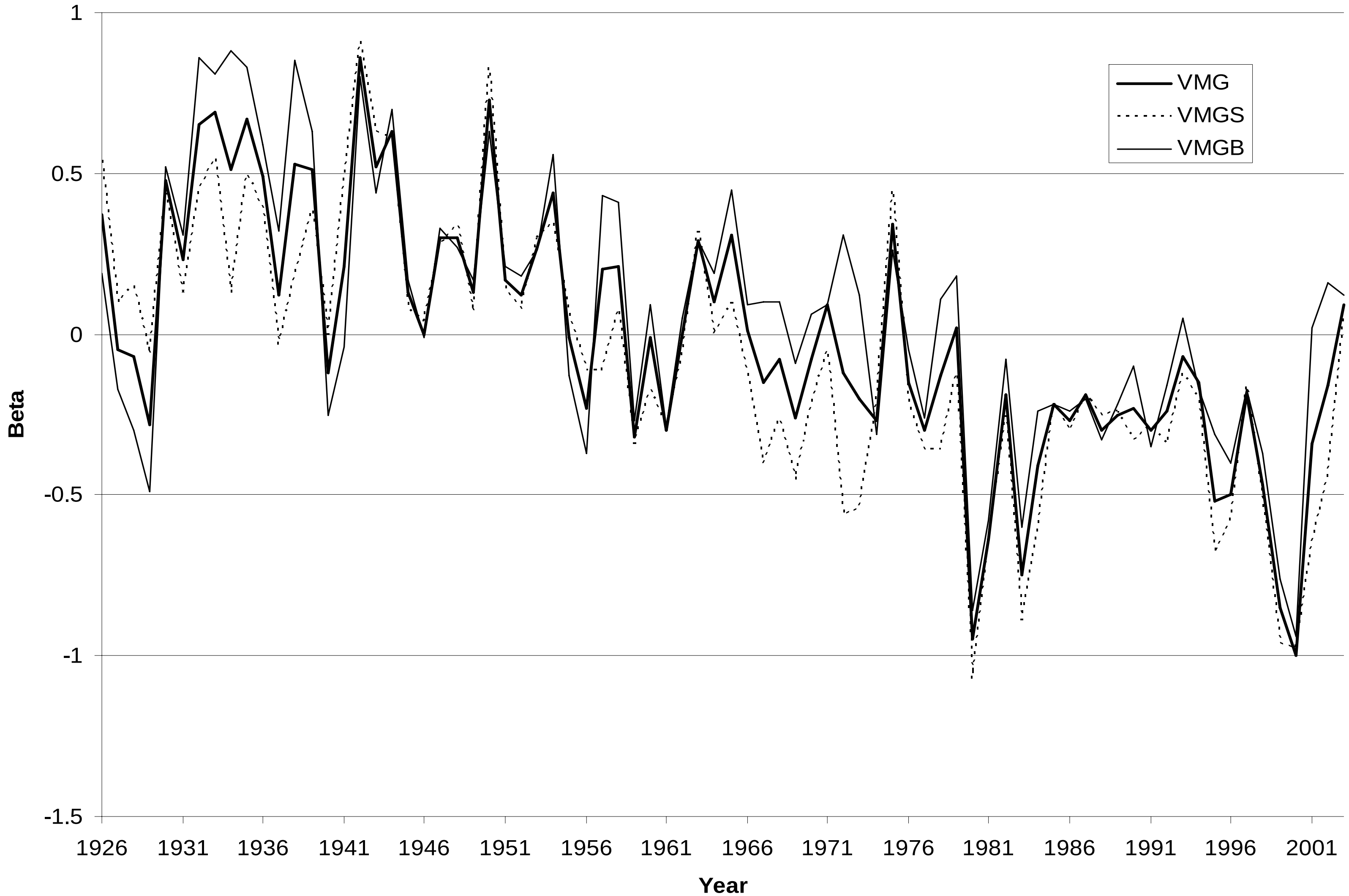
	VMG	*VMGS*	*VMGB*	*SG*	*SN*	*SV*	*BG*	*BN*	*BV*
Panel A: One Intercept									
No change in *β*									
a	0.31	0.46	0.16	-0.10	0.25	0.36	-0.01	0.04	0.15
t(*a*)	2.73	3.85	1.20	-0.84	2.50	2.66	-0.33	0.70	1.38
R^2	0.04	0.00	0.09	0.79	0.82	0.75	0.95	0.91	0.81
					GRS = 5.39, *p*-value = 0.000				
One Change in *β* in 7/63									
a	0.33	0.47	0.17	-0.10	0.26	0.37	-0.01	0.05	0.16
t(*a*)	3.22	4.42	1.42	-0.87	2.59	2.87	-0.40	0.82	1.65
R^2	0.25	0.20	0.23	0.79	0.82	0.78	0.96	0.92	0.84
					GRS = 6.28, *p*-value = 0.000				
β Changes Every Five Years									
a	0.37	0.48	0.24	-0.03	0.33	0.45	-0.03	0.08	0.21
t(*a*)	3.79	4.61	2.11	-0.26	3.50	3.63	-0.77	1.60	2.38
R^2	0.33	0.24	0.35	0.80	0.84	0.80	0.96	0.93	0.87
					GRS = 7.40, *p*-value = 0.000				
β Changes Every Year									
a	0.20	0.31	0.08	-0.03	0.24	0.27	0.00	0.03	0.08
t(*a*)	2.05	2.89	0.68	-0.29	2.49	2.20	-0.05	0.53	0.86
R^2	0.41	0.30	0.42	0.81	0.85	0.82	0.96	0.94	0.88
					GRS = 4.15, *p*-value = 0.000				
Panel B: Marginal Intercept for July 1963 to December 2004: *β* Changes Every Year									
a26	-0.11	-0.06	-0.16	-0.04	-0.01	-0.10	0.07	-0.02	-0.10
a63-a26	0.58	0.68	0.45	0.01	0.46	0.70	-0.13	0.09	0.32
t(*a26*)	-0.80	-0.39	-0.98	-0.24	-0.06	-0.57	1.23	-0.30	-0.74
t(*a63-a26*)	2.97	3.19	1.96	0.06	2.37	2.80	-1.72	0.90	1.79
Panel C: Separate Intercepts for July 1926 to June 1963 and July 1963 to December 2004: *β* Changes Every Year									
a26	-0.11	-0.06	-0.16	-0.04	-0.01	-0.10	0.07	-0.02	-0.10
a63	0.46	0.62	0.28	-0.03	0.45	0.59	-0.06	0.07	0.22
t(*a26*)	-0.80	-0.39	-0.98	-0.24	-0.06	-0.57	1.23	-0.30	-0.74
t(*a63*)	3.52	4.29	1.83	-0.17	3.44	3.52	-1.19	1.00	1.84

Table VII
Summary Statistics and CAPM Regressions for Monthly Returns on β Spread Portfolios

At the end of June of each year, the six portfolios, *SG* (small growth), *SN* (small neutral), *SV* (small value), *BG* (big growth), *BN* (big neutral), and *BV* (big value), formed on independent sorts on size and *B/M*, are each split into value-weight high and low market β portfolios, using two to five years of past returns (as available) to estimate β for individual stocks. The table summarizes the difference between the returns on the high and low β portfolios for each of the six size-*B/M* groups and the simple average of these six return spreads, *HBmLB*. Mean is the average return spread; *t*(Mean) is the average spread divided by its standard error; *a* and *b* are the intercept and slope from CAPM regressions of the spread portfolio returns on the market return in excess of the Treasury bill rate; *t*(*a*) and *t*(*b*) are the ratios the regression coefficients *a* and *b* to their standard errors; and R^2 is the coefficient of determination, adjusted for degrees of freedom. *GRS* is the *F*-statistic that tests the hypothesis that the intercepts in the regressions for the six size-*B/M* portfolios are jointly equal to zero.

	HBmLB	*SG*	*SN*	*SV*	*BG*	*BN*	*BV*
July 1928 to December 2004							
Mean	0.04	-0.16	0.14	0.04	0.00	0.07	0.15
t(Mean)	0.40	-1.08	1.18	0.37	0.00	0.60	1.14
a	-0.22	-0.49	-0.16	-0.19	-0.25	-0.19	-0.06
b	0.42	0.52	0.48	0.37	0.39	0.42	0.33
t(*a*)	-3.31	-3.99	-1.89	-1.96	-2.96	-2.02	-0.46
t(*b*)	34.90	23.49	31.97	21.47	26.28	24.85	15.47
R^2	0.57	0.38	0.53	0.33	0.43	0.40	0.21
				GRS = 3.47, *p*-value = 0.002			
July 1928 to June 1963							
Mean	0.09	-0.00	0.08	-0.01	0.06	0.13	0.32
t(Mean)	0.56	-0.02	0.38	-0.06	0.37	0.62	1.45
a	-0.24	-0.45	-0.32	-0.30	-0.24	-0.22	0.10
b	0.42	0.55	0.49	0.35	0.38	0.44	0.28
t(*a*)	-2.36	-2.07	-2.43	-1.76	-2.42	-1.48	0.48
t(*b*)	26.95	16.83	24.82	13.85	24.62	19.00	9.04
R^2	0.63	0.40	0.59	0.31	0.59	0.46	0.16
				GRS = 2.38, *p*-value = 0.028			
July 1963 to December 2004							
Mean	-0.00	-0.30	0.20	0.09	-0.05	0.02	0.01
t(Mean)	-0.04	-1.93	1.41	0.69	-0.33	0.18	0.07
a	-0.20	-0.51	-0.02	-0.10	-0.25	-0.15	-0.19
b	0.42	0.44	0.46	0.40	0.42	0.38	0.43
t(*a*)	-2.32	-3.95	-0.18	-0.95	-1.96	-1.34	-1.41
t(*b*)	21.59	15.40	19.23	17.26	14.95	14.86	14.13
R^2	0.48	0.32	0.43	0.37	0.31	0.31	0.20
				GRS = 4.11, *p*-value = 0.000			

Figure 1 - One-Year Betas for Value Premiums



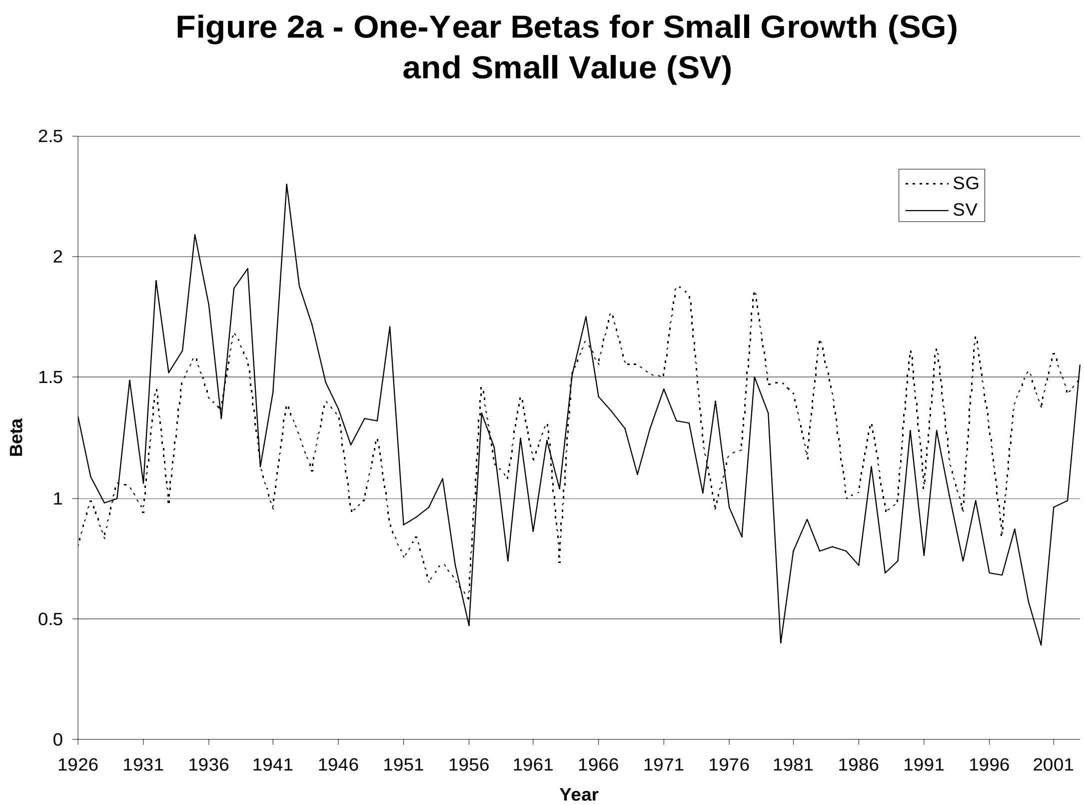


Figure 2a - One-Year Betas for Small Growth (SG)
and Small Value (SV)
2.5
2
1.5
1
0.5
0
Beta
SG
SV
1926 1931 1936 1941 1946 1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001
Year

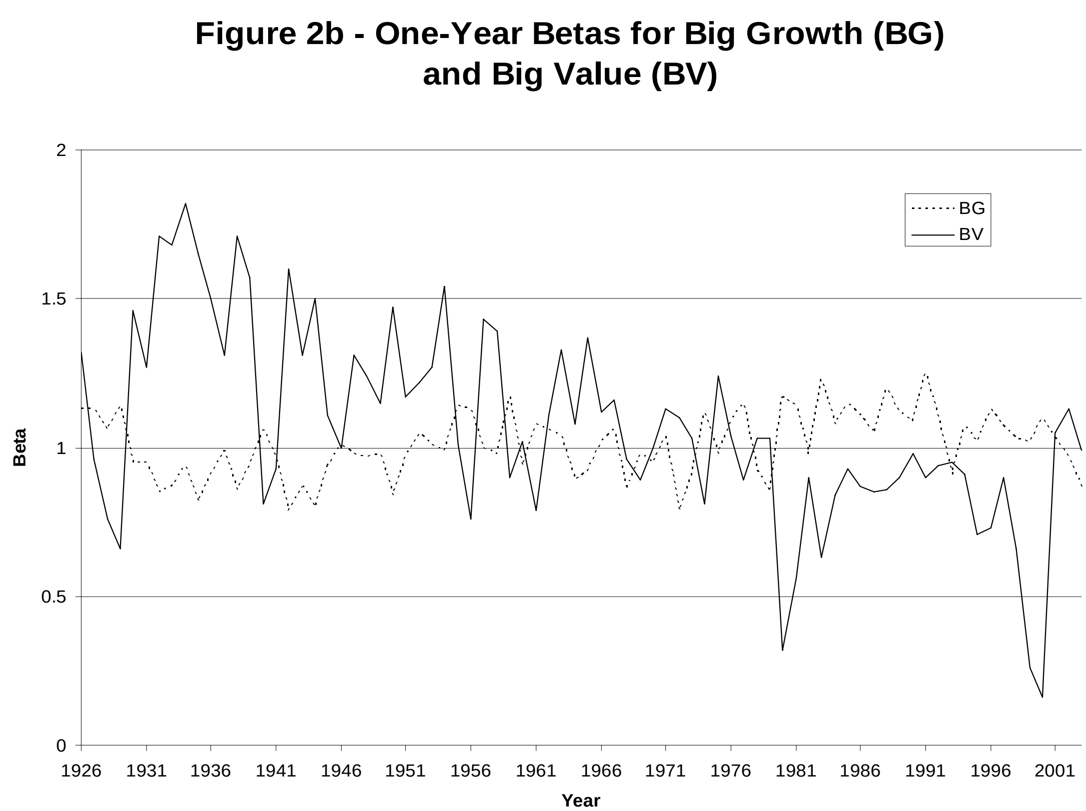


Figure 2b - One-Year Betas for Big Growth (BG)
and Big Value (BV)
2
1.5
1
0.5
0
Beta
BG
BV
1926 1931 1936 1941 1946 1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001
Year