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The Anatomy of Value and Growth Stock Returns

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Abstract

We break average returns on value and growth portfolios into dividends and three sources of capital gain, (i) reinvestment of earnings, (ii) convergence in price-to-book ratios (P/B) due to mean reversion in profitability and expected returns, and (iii) upward drift in P/B during 1926-2003. The capital gains of value stocks trace mostly to convergence: P/B rises as some value firms become more profitable and move to lower expected return groups. In contrast, reinvestment, which is trivial to negative for value portfolios, dominates the capital gains of growth stocks. For growth stocks, convergence is negative: P/B falls because growth stocks do not always remain highly profitable with low expected returns.

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Value stocks (stocks with low ratios of price to book value) have higher average returns than growth stocks (stocks with high price-to-book ratios). (See, for example, Rosenberg, Reid, and Lanstein 1985, Fama and French 1992, Lakonishok, Shleifer, and Vishny 1994.) Our goal is a better understanding of the sources of this value premium in average returns.

Returns are commonly broken into dividends (D_{t+1}/P_t) and capital gains (P_{t+1}/P_t).

$$(1) \quad 1 + R_{t+1} = D_{t+1}/P_t + P_{t+1}/P_t .$$

For a more complete understanding of the average returns of value and growth stocks, we examine the different sources of capital gain. In our initial tests we break the capital gain return (P_{t+1}/P_t) into two pieces. The first is the growth rate of book equity due to reinvestment of earnings. This source of capital gain follows from the dividend irrelevance theorem of Miller and Modigliani (1961). Specifically, an additional dollar of time $t+1$ earnings reinvested rather than paid out as dividends should result in an additional dollar of capital value for old shareholders at $t+1$. Breaking the growth rate of book equity (B_{t+1}/B_t) out of the capital gain return (P_{t+1}/P_t) leaves the growth rate of the price-to-book ratio ($P_{t+1}/B_{t+1} \div P_t/B_t$) as the remaining (multiplicative) piece of the capital gain return,

$$(2) \quad 1 + R_{t+1} = \frac{D_{t+1}}{P_t} + \left[\frac{B_{t+1}}{B_t} \right] \times \left[\frac{P_{t+1}/B_{t+1}}{P_t/B_t} \right] .$$

During 1963-2003, dividends contribute more to the returns on value stocks. But an interesting result is that the higher dividends of value stocks are special to 1963-2003. For 1926-1962 the contribution of dividends to average returns is not systematically different for value and growth stocks.

Differences in the way the capital gains of value and growth stocks split between growth in book equity and growth in the price-to-book ratio are more consistent over the sample period. In the year after firms are allocated to value portfolios, growth of book equity due to earnings retention is near zero. Thus, the large average capital gains of value stocks show up near entirely as growth in the price-to-book ratio (P/B). In contrast, firms invest heavily after they are allocated to growth portfolios, and on average the growth rate of book equity far exceeds the growth rate of the stock price. Thus, price-to-book ratios on

average decline after firms are identified as growth stocks, and the positive average rates of capital gain of growth portfolios are due to growth in book equity that more than offsets the decline in P/B.

Why do price-to-book ratios rise after firms are identified as value stocks and why do they fall for growth stocks? We suggest a simple story, driven by standard economic forces. At the time firms are allocated to value and growth portfolios, they tend to occupy opposite ends of the profitability spectrum. Growth firms tend to be highly profitable and fast-growing, while value firms are less profitable and grow less rapidly if at all (Lakonishok, Shleifer, and Vishny 1994, Fama and French 1995). High expected profitability and growth combine with low expected returns (discount rates) to produce high price-to-book ratios for growth stocks, while low profitability, slow growth, and high expected returns combine to produce low P/B for value stocks.

Competition from other firms, however, tends to erode the high profitability of growth stocks, and profitability also declines as they exercise their most profitable growth options. Thus, each year some growth stocks cease to be highly profitable fast-growing firms that are rewarded by the market with low discount rates (expected stock returns). As a result, the price-to-book ratios of growth portfolios tend to fall in the years after portfolio formation. Conversely, the price-to-book ratios of value portfolios tend to rise in the years after portfolio formation, as some value firms restructure, their profitability improves, and they are rewarded by the market with lower discount rates.

The tendency of price-to-book ratios to become less extreme after firms are allocated to value and growth portfolios is what we call convergence. If general market conditions did not change during the sample period, convergence would be the complete story for the average growth rates of P/B for value and growth portfolios, and growth rates of book equity and P/B would be a complete description of the sources of capital gains. There has, however, been upward drift in price-to-book ratios during 1926-2003 due to some combination of higher expected cashflows and lower expected returns (discount rates) at the end of the period than at the beginning. We label this the drift effect in P/B and average returns. In our second set of tests we break capital gain returns into (i) growth of book equity, (ii) convergence of P/B,

due to the mean reversion of the profitability, growth, and expected returns of value and growth stocks, and (iii) drift, due to the general upward trend of price-to-book ratios during the sample period.

The cumulative increase in price-to-book ratios during the sample period is substantial, but the contribution of this drift to average annual returns is small (relative to other sources of return) and similar (about one percent per year) for value and growth portfolios. The differences between average annual growth rates of P/B for value and growth portfolios are thus due mostly to convergence. Interestingly, however, though convergence is more important in average returns, drift is a bigger player in the volatility of annual returns. The standard deviation of the annual drift component of returns is typically three to four times the standard deviation of the annual convergence component.

Our story proceeds as follows. Section I motivates the simple breakdown of returns into dividends and capital gains due to growth in book equity and growth in P/B, and discusses estimation problems. Section II presents estimates of the simple breakdown for value and growth portfolios. Section III examines the more detailed breakdown of capital gain returns that splits growth in price-to-book ratios between convergence and drift. Section IV concludes.

I. Components of Returns: Preliminaries

Our tests center on six portfolios formed on size and price-to-book ratios. As in Fama and French (1993), at the end of each June from 1926 to 2003, we sort firms into two size groups, S (small, that is, NYSE, AMEX (after 1962), and (after 1972) Nasdaq firms with market capitalization below the NYSE median) and B (big, market cap above the NYSE median), and three price-to-book groups, G (growth firms, that is, NYSE, AMEX, and Nasdaq firms in the top 30% of NYSE P/B), N (neutral, middle 40% of NYSE P/B), and V (value, bottom 30% of NYSE P/B). The intersection of these independent sorts produces six portfolios, SG, SN, SV, BG, BN, and BV, refreshed at the end of June each year, where SG and BG are small and big growth portfolios, SN and BN are small and big neutral portfolios, and SV and BV are small and big value portfolios.

A. Concepts

Precise description of the concepts used in the dissection of returns requires a bit more notation.

The one-year (gross) return for July of year t through June of $t+1$ for one of the six portfolios is,

$$(3) \quad 1 + R_{t,t+1} = D_{t,t+1}/P_t + P_{t,t+1}/P_t,$$

where,

P_t = market value at time t of the securities allocated to the portfolio when it is formed at time t ,

$P_{t,t+1}$ = market value at time $t+1$ of the securities allocated to the portfolio at t ,

$D_{t,t+1}$ = dividends paid between t and $t+1$ on the securities allocated to the portfolio at t .

For simplicity, we omit the subscript that should appear on each variable to identify the portfolio.

The two time subscripts on most variables indicate (i) the time when the portfolio is formed, and (ii) the time when the variable is observed. For example, $R_{t,t+1}$ is the annual return observed at the end of June of year $t+1$ on a portfolio formed at the end of June of t . To simplify the notation, we drop a time subscript if the variable is observed when the portfolio is formed. For example, we use P_t , rather than $P_{t,t}$, as the market value of a portfolio when formed at time t .

Our first (simple) breakdown of the capital gain return isolates the growth in book equity and the growth in the price-to-book ratio,

$$(4) \quad \frac{P_{t,t+1}}{P_t} = \left[\frac{P_{t,t+1}/B_{t,t+1}}{P_t/B_t} \right] \times \left[\frac{B_{t,t+1}}{B_t} \right] = \left[\frac{PB_{t,t+1}}{PB_t} \right] \times \left[\frac{B_{t,t+1}}{B_t} \right],$$

where,

B_t = book value at time t of stocks allocated to the portfolio when it is formed at t ,

$B_{t,t+1}$ = book value at time $t+1$ of the stocks allocated to the portfolio at t ,

$PB_{t,t+1}$ = $P_{t,t+1}/B_{t,t+1}$, the aggregate price to book ratio (the sum of market values divided by the sum of book values) at $t+1$ of the stocks allocated to the portfolio at time t .

In words, the (gross) capital gain return on the portfolio from t to $t+1$ is the (gross) rate of growth of the price-to-book ratio for the stocks allocated to the portfolio at time t , times the (gross) rate of growth of book equity for these firms due to reinvestment of earnings. Note that $PB_{t,t+1}$ is the price-to-book ratio

at $t+1$ for the stocks allocated to the portfolio at t . This is not the price-to-book ratio of the refreshed version of the portfolio formed at $t+1$, PB_{t+1} , since some stocks allocated to the portfolio at t move to different portfolios at $t+1$ and other stocks are added to the refreshed portfolio at $t+1$.

B. Motivation

For perspective on (4), suppose the price-to-book ratio for the stocks allocated to a portfolio at t is not expected to change from t to $t+1$. Then (3) and (4) imply that the portfolio's expected (gross) return is just the expected dividend yield, $E_t(D_{t,t+1})/P_t$, plus the expected (gross) rate of growth of book equity, $E_t(B_{t,t+1})/B_t$, where $E_t(\cdot)$ is the expected value at time t .

Earlier research (e.g., Fama and French 1995), however, leads us to expect systematic changes in price-to-book ratios after firms are identified as value or growth stocks. The high price-to-book ratios of growth stocks, which are typically fast-growing highly profitable firms, tend to fall as the superior opportunities of these firms are eroded by competitors or natural decay. Conversely, firms tend to be relatively unprofitable when allocated to low P/B value portfolios. They are likely to respond by cutting back on unprofitable activities and taking other actions that improve profitability. As a result, we can expect that P/B rises after stocks are allocated to value portfolios.

The mean reversion in P/B due to mean reversion in profitability and growth is reinforced by the value premium – the negative relation between P/B and the expected returns (discount rates) that price expected cashflows. Thus, the expected decline in P/B for growth stocks associated with declining profitability tends to be reinforced by an increase in discount rates, and the expected increase in P/B for value stocks due to higher profitability is reinforced by lower discount rates.

The expected decline in the high price-to-book ratios of growth stocks and the expected increase in the low price-to-book ratios of value stocks is what we call convergence. It captures price effects (capital gains) due to convergence of growth, profitability, and expected returns.

We shall also see that for all our portfolios, P/B rises during 1926-2003 due to some combination of higher expected cashflows and lower discount rates (expected returns) at the end of the sample period. General changes in P/B during the sample period give rise to what we call the drift effect in capital gains.

The cumulative change in price-to-book ratios during 1926-2003 is substantial, but the contribution of this drift to average annual returns turns out to be relatively small – about one percent per year – and similar for value and growth portfolios. Thus, differences in average growth rates of P/B for value and growth portfolios are primarily due to convergence. This fact justifies focusing much of the paper on the simple breakdown of the capital gain return in (4).

Finally, equation (4) gets to the core of the forces that generate prices – whether pricing is rational or irrational. Rational prices for the stocks allocated to a portfolio at time t require rational assessments of (i) the expected payoff on the portfolio at $t+1$, $E_t(D_{t,t+1} + P_{t,t+1})$, (ii) the risk of the payoff, and (iii) the expected return implied by this risk. Assessing the risk of the payoff and its expected value requires predictions of how the profitability and growth of firms of the type (value or growth) allocated to the portfolio at t are likely to change and what the changes imply for future expected returns. This is what convergence is meant to capture – predictable changes in profitability and growth, and related changes in expected returns, that occur because growth stocks are not growth stocks forever and value stocks do not always remain value stocks. The growth in book equity for firms in the portfolio is in part the result of dividend policy, but it also depends on profitability and growth opportunities, and predictions of profitability and investment are central in pricing. In short, in a world of rational pricing the breakdown of the capital gain return in (4) captures the salient factors in the pricing of stocks.

The rational view of asset pricing outlined above has a well-known competitor. Behaviorists like Lakonishok, Shleifer, and Vishny (1994) argue that the higher average returns of value stocks relative to growth stocks are due to irrational pricing. Their story centers on convergence. Behaviorists argue that the irrational investors who dominate asset pricing consistently underestimate the deterioration in profitability and growth (negative convergence) that tends to occur after firms are allocated to growth portfolios and the improvement (positive convergence) after firms are allocated to value portfolios. The

result is unexpectedly low capital gains for growth stocks in the years after portfolio formation and high capital gains for value stocks.

For our purposes the important point is that along with the dividend yield in (3), the breakdown of the capital gain return in (4) captures the core sources of average return, irrespective of one's view about whether pricing is rational or irrational.

C. Estimation Details

We want to estimate how dividends and the two components of the capital gain return in (4) contribute to average returns on value and growth portfolios. The components of the simple capital gain return are, however, multiplicative, and the average of a product is not the product of the average components. If we switch to continuously compounded (CC) capital gain returns, (4) becomes,

$$(5) \quad \begin{aligned} \ln(P_{t,t+1}/P_t) &= [\ln(P_{t,t+1}/B_{t,t+1}) - \ln(P_t/B_t)] + \ln(B_{t,t+1}/B_t) \\ &= \ln(PB_{t,t+1}/PB_t) + \ln(B_{t,t+1}/B_t) . \end{aligned}$$

Thus, the components of the CC capital gain return are additive, and the average CC capital gain return is the sum of the average values of its components. CC returns also give direct perspective on the cumulative wealth generated by value and growth portfolios during our sample period.

A complication in estimating the terms of (5) is that the stocks allocated to a portfolio at the end of June of year t do not all survive to the next formation point at the end of June of $t+1$. Our solution to this problem follows the logic of the calculation of the annual capital gain returns we seek to explain.

We compute the annual capital gain return on a portfolio by compounding monthly value weight capital gain returns. This linking of returns implies that when stocks delist, their market value in the portfolio at delisting is invested in the stocks that remain. We can then separate the shares of the surviving firms held at the end of the year after portfolio formation (time $t+1$) into those purchased at t and those purchased as other firms delist between t and $t+1$. The total market equity of the portfolio at $t+1$, $P_{t,t+1}$, is the combined market value of the original and the additional shares. We define the total book equity at $t+1$, $B_{t,t+1}$, as the aggregate book equity "owned" by the original shares of the surviving

firms, scaled up by the ratio of the total market equity of the portfolio at $t+1$ divided by the $t+1$ market value of the original shares. Thus, we replace the missing book equity of the stocks that delist with the book equity acquired when the portfolio purchases additional shares of surviving firms.

Finally, our CC capital gain returns use CRSP (Center for Research in Securities Prices) returns without dividends. The CC total returns use CRSP returns with dividends. The contribution of dividends to the CC total return is taken to be the total return minus the return without dividends. Since monthly total returns are compounded to get annual returns, the dividend contribution includes dividends and the reinvestment return earned from the time a dividend is paid to the end of the annual return period.

II. The Simple Breakdown of Returns: Dividends, Reinvestment, and Growth in P/B

Table 1 shows average values of annual CC returns and their components. The time periods in Table 1 and later tables are for annual portfolio formation years. For example, 1926-2003 refers to portfolios formed each year at the end of June from 1926 through 2003, producing annual returns realized in June 1927 through June 2004. Three time periods are used throughout: (i) 1926-2003, (ii) the period after 1962 (1963-2003) examined by Fama and French (1992) and many other papers on value-growth returns, and (iii) the 1926-1962 “out-of-sample” period of Davis, Fama, and French (2000).

A. The Market Portfolio

To set the stage for the value and growth portfolios, it is interesting to examine the components of the average return on the value weight market portfolio of the stocks in our sample. The CC market return for 1926-2003 is 9.86% per year, of which less than half (3.97%) is due to dividends. Total market returns are similar for 1926-1962 and 1963-2003, 9.30% and 10.37% per year. There is a shift, however, from higher dividends in the first period to faster growth in book equity and higher capital gains in the second. The average annual dividend contribution falls from 4.87% for 1926-1962 to 3.15% for 1963-2003, but, fueled by the increase in the rate of growth of book equity (from 3.22% to 6.88% per year), the capital gain return rises from 4.44% to 7.21%. The higher capital gains from increased earnings

retention are a nice (if rough) confirmation of the arguments of Miller and Modigliani (1961) about the tradeoff of dividends for capital gains.

In the breakdown of the CC capital gain return of (5), the average growth rate of the price-to-book ratio for the market portfolio for 1926-2003 is only 0.75% per year, so the average capital gain return, 5.89% per year, is close to the average growth rate of book equity, 5.14% per year. (Similar results are observed in the two subperiods.)

The growth in P/B in (5) is for the un-refreshed market portfolio – the portfolio formed at the end of June of year t and held to the end of June of $t+1$. It is more common to examine the price-to-book ratio of the refreshed version of the market portfolio, which includes all stocks available in June of year t and then all stocks available in June of $t+1$. The average annual growth in P/B for the refreshed market for 1926-2003, 1.08% per year (Table 1), is higher than for the un-refreshed market, 0.75%. The two approaches use the same firms in June of t , so the difference is caused by new companies, which are in the refreshed market at $t+1$ and are typically growth firms with high P/B.

The interesting finding, however, is that growth in book equity due to reinvestment of earnings accounts for almost all the average capital gain return on the market portfolio, and growth in the price-to-book ratio is much less important. This is in sharp contrast to the results for value and growth portfolios, examined next, where growth in P/B is important in average capital gain returns, though it is opposite in sign for value (positive) and growth (negative) portfolios.

B. Dividends

In line with the results for the market portfolio, Table 1 shows that for the six size-P/B portfolios, the contribution of dividends to annual CC returns is typically higher for 1926-1962 than for 1963-2003. The one exception is the big value portfolio (BV) where the dividend component of average returns is near identical (4.75% and 4.76% per year) in the two periods.

More interesting, there are patterns in the contribution of dividends to average returns during 1963-2003 that are absent during 1926-1962. Table 1 shows that, controlling for price-to-book group, dividends contribute more to the 1963-2003 returns of large stocks. And given size, dividends contribute more to the returns of value stocks. Dividends add 4.76% to the average CC return on the big value portfolio for 1963-2003, versus 2.94% for the small value portfolio. Dividends add 2.32% to the 1963-2003 average return on the big growth portfolio, versus a tiny 1.19% for the small growth portfolio.

In contrast, there are no size or value-growth patterns in the contribution of dividends to average returns of the earlier 1926-1962 period. For example, small stocks have both the lowest and highest dividend contributions (3.60% per year for small value and 5.31% for the small neutral portfolio). During 1926-1962, the contribution of dividends to average returns is higher for the small growth portfolio (5.11% per year) than for the small value portfolio (3.60%), but dividends contribute near the same amount to the returns of the big growth and big value portfolios (4.67% and 4.75% per year).

Fama and French (2001) find that the propensity to pay dividends declines through time. But their results do not explain why the systematic patterns in dividends observed in later years (small firms and growth firms pay less) are absent in earlier years. This is an interesting topic for future research, particularly with respect to theories about why firms pay dividends.

C. Capital Gains: Growth in Book Equity and Growth in P/B

Table 1 also reports the average values of the components of the CC capital gain return identified in equation (5), that is, the growth rate of book equity and the growth rate of the price-to-book ratio. Here observed patterns are quite similar for 1926-1962 and 1963-2003.

Firms invest a lot in the year after they are allocated to growth portfolios. The CC growth rate of book equity for 1926-2003 averages 10.51% for the big growth portfolio (BG) and 13.80% for the small growth portfolio (SG). Average rates of capital gain for the two growth portfolios for 1926-2003 are much lower, 5.76% and 5.86%. Substantially higher growth rates for book equity than for price imply

declining price-to-book ratios. In the year after portfolio formation, P/B on average declines at a continuously compounded rate of 4.65% for BG and 8.04% for SG.

In contrast to the high reinvestment rates of growth stocks, during 1926-2003 book equity for the big value portfolio (BV) on average increases by only 0.83% in the year after portfolio formation, and book equity for small value (SV) shrinks by 3.54%. Thus, on average big firms retain few earnings and small firms disinvest in the year after they are identified as value stocks. Average CC rates of capital gain for 1926-2003 for the two value portfolios are, however, high, 6.86% for BV and 11.03% for SV. As a result, P/B increases strongly in the year after portfolio formation, at an average rate of 6.04% for BV and 14.57% for SV.

In short, the split of average capital gain returns between growth rates of book equity and growth rates of P/B produces near opposite results for growth and value portfolios. The capital gain returns of growth portfolios are due to high rates of reinvestment of earnings that more than offset declines in P/B. But for value portfolios, reinvestment of earnings is on average near zero or negative in the year after portfolio formation, and high average rates of capital gain show up as growth in P/B. And these general patterns in the rates of growth of book equity and P/B are much the same for 1926-1962 and 1963-2003.

Average growth rates of price-to-book ratios combine the effects of convergence and drift. We see next that drift is similar for value and growth portfolios, so differences in growth rates of P/B largely reflect convergence. The high P/B ratios of growth portfolios decline after portfolio formation because some growth stocks cease to be highly profitable, fast-growing firms with low expected stock returns. And the low P/B ratios of value portfolios rise because some value stocks are no longer low profitability firms with few investments and high expected stock returns.

III. Drift and Convergence

Equation (5) splits the capital gain return on a portfolio between growth in its book equity due to reinvestment of earnings and growth in its un-refreshed price-to-book ratio (the latter defined as the

growth from t to $t+1$ of P/B for the stocks allocated to the portfolio at t). We next split the average growth in un-refreshed price-to-book ratios between drift and convergence.

A. Definitions and Estimates

For a given portfolio (for example, small value) the drift component of average returns is meant to capture the effects of changes from the beginning to the end of the sample period in the price-to-book ratios of firms of that type. We estimate drift as the average value of $\ln(PB_{t+1}/PB_t)$, the CC growth rate of P/B for the refreshed version of the portfolio formed at t and then reformed at $t+1$. In economic terms, drift measures the contribution to average return of long-term changes in the expected growth, profitability, and discount rates used to price stocks of a given type.

In contrast, the convergence component of average returns focuses on changes in price-to-book ratios due to movement of firms across types in the year after they are allocated to a portfolio of a given type. The average growth rate of a portfolio's un-refreshed P/B (the average value of $\ln(PB_{t,t+1}/PB_t)$), is in part due to convergence, but it also includes drift. To split the two, we define convergence as the average difference between the CC growth rates of a portfolio's un-refreshed and refreshed P/B, that is, the average value of $\ln(PB_{t,t+1}/PB_t) - \ln(PB_{t+1}/PB_t)$. Since PB_t drops out of this expression, convergence is $\ln(PB_{t,t+1}/PB_{t+1})$, the percent difference between a portfolio's un-refreshed and refreshed price-to-book ratios at $t+1$. In economic terms, for a given portfolio formed at time t , convergence from t to $t+1$ is the percent difference between the portfolio's un-refreshed price-to-book ratio at $t+1$ and an estimate of the P/B it would have in the absence of migration of stocks across types from t to $t+1$. Thus, convergence measures the increase in P/B that occurs as some value stocks prosper and migrate towards growth, or the decline in P/B that occurs as some growth stocks falter and move toward value.

The estimates of drift for 1926-2003 (Table 1) are modest relative to other components of average returns, and average drift is similar for the six size-P/B portfolios. Average growth rates of refreshed P/B range from 0.91% per year for the big neutral portfolio to 1.66% for small value.

There is an interesting result in the drift estimates for 1926-1962 and 1963-2003. It is well-known that price-to-book ratios drift up in the later years of our sample period (for example, Fama and French 2002). But except for the big growth portfolio, average drift is in fact higher for 1926-1962 than for 1963-2003. For example, the estimates of drift for the market portfolio are 1.43% per year for 1926-1962, versus 0.77% for 1963-2003

Figure 1 plots the time series of refreshed price-to-book ratios that generate the estimates of drift for the three big stock (Figure 1a) and the three small stock (Figure 1b) portfolios. For purposes of comparison, each figure also shows the path of P/B for the market portfolio. The differences between the beginning (1926) and ending (2004) price-to-book ratios are testimony to the power of compounding. Modest average annual changes in P/B (and thus modest estimates of drift) cumulate to impressive 78-year CC growth in P/B, ranging from 70.8% for BN to 129.9% for SV. If the sample stopped in 1998, estimates of average drift would be larger. And it is perhaps surprising that five of the six portfolios have their peak P/B at that time – two years before the drop in the market in 2000. Only the big growth portfolio peaks in 2000, but BG is a large fraction of the value-weight market portfolio.

Relatively modest estimates of drift lead to the inference that average growth rates of un-refreshed P/B for value and growth portfolios are largely due to convergence. And the contributions of convergence to average returns are substantial. For 1926-2003, convergence in P/B (due to increases in expected profitability and growth and declines in expected returns) adds 12.91% and 4.98% per year to the average returns on the small and big value portfolios (Table 1). This compares to drift estimates for SV and BV of 1.66% and 1.05% per year. For the growth portfolios, the positive drift of refreshed price-to-book ratios (1.24% per year for SG and 0.93% for BG) means that estimates of convergence are more extreme than the declines in un-refreshed P/B. Convergence of P/B (due to increases in expected returns and reductions in expected profitability and growth in the year after portfolio formation) reduces average returns on the small and big growth portfolios by 9.28% and 5.58% per year. The capital losses from this source are, however, outweighed by the capital gains from growth in book equity due to reinvestment of earnings, which averages 13.80% and 10.51% per year for SG and BG.

B. Volatility

For value and growth portfolios, convergence of price-to-book ratios is more important in average returns than drift. But the tables turn when we examine return volatility, where drift is the biggest player.

Table 2 shows time-series standard deviations of annual CC returns and their components. The volatility of returns is much higher during 1926-1962, which includes the Great Depression, than during 1963-2003, but otherwise the patterns in volatility are quite similar in the two periods. Thus, to save space, Table 2 just shows results for the overall 1926-2003 period.

Given the persistence of dividend policies, it is not surprising that the volatility of the contribution of dividends to returns is tiny relative to the volatility of capital gain returns, which is always close to the volatility of total returns. More interesting, in the simple split of capital gain returns between growth in book equity and growth in un-refreshed price-to-book ratios, the volatility of growth in P/B is four to seven times the volatility of growth in book equity. And the standard deviation of the growth in un-refreshed P/B is close to that of total capital gain returns.

Most interesting, when we split growth in un-refreshed price-to-book ratios between drift and convergence, the volatility of the year-by-year drift component of returns dominates the volatility of convergence. For every portfolio, the volatility of the drift component of returns is close to the volatility of the growth of the un-refreshed price-to-book ratio, the capital gain return, and the total return. The standard deviations of the convergence component of returns are non-trivial (from 6.80% to 9.48% per year for the six size-P/B portfolios), but they are dwarfed by the standard deviations of the drift component, which are about three times as large.

As further evidence that drift of P/B is the dominant influence in the volatility of returns, Table 2 also shows the first-order autocorrelations of annual CC returns and their components. Although the standard errors of the autocorrelations are large (about 0.11 for 1926-2003), differences among the autocorrelations of the components are apparent. First, total returns inherit the negative autocorrelations of capital gain returns rather than the stronger positive autocorrelations of dividend contributions to

returns. Second, capital gain returns inherit the negative autocorrelations of growth rates of un-refreshed price-to-book ratios, rather than the stronger positive autocorrelations of growth rates of book equity. And finally, the growth rates of un-refreshed price-to-book ratios inherit the negative autocorrelations of year-by-year drift of P/B rather than the mostly positive autocorrelations of annual convergence.

One might argue that in splitting the capital gain return into growth in book equity and growth in un-refreshed P/B and then splitting the latter between drift and convergence, we are simply passing variation in the future stock price from the capital gain to the growth in un-refreshed P/B and then to drift (growth in refreshed P/B). It is thus not surprising that in the full breakdown of the capital gain return, the year-by-year estimates of drift dominate the variation of returns.

From an economic perspective, however, it is interesting that dividends, growth in book equity due to reinvestment of earnings, and convergence in P/B make large contributions to average returns but relatively small contributions to return volatility. It is also interesting that drift in P/B (due to annual repricing of stocks of a given type in response to variation in expectations about profitability, growth, and expected returns for stocks of that type) dominates return volatility but is a bit player in average returns, whereas convergence in P/B (due to convergence in profitability, growth, and expected returns across types) is a big player in average returns but is much less important in year-by-year return variation.

V. The Bottom Line

We break average returns on value and growth portfolios into dividends and three sources of capital gain, (i) reinvestment of earnings, (ii) convergence in price-to-book ratios due to mean reversion in profitability, growth, and expected returns, and (iii) upward drift in P/B during 1926-2003.

During 1963-2003, dividends contribute more to the average returns on value stocks and big stocks. But surprisingly, these patterns in dividends are special to 1963-2003. For 1926-1962, the contribution of dividends to average returns is not systematically different for big and small stocks or for value and growth stocks.

The total increases in price-to-book ratios during 1926-2004 are substantial, but the contributions of this drift to average annual capital gain returns is small (relative to other sources of return) and similar (about one percent per year) for value and growth portfolios. Throughout the sample period the capital gains of value stocks trace mostly to convergence: P/B rises as some value firms become more profitable and move to lower expected return groups. In contrast, reinvestment, which is trivial to negative for value portfolios, dominates the capital gains of growth stocks. For growth stocks, convergence is negative: P/B falls because growth stocks do not always remain highly profitable with low expected returns.

How much of the convergence of price-to-book ratios for value and growth portfolios is expected and unexpected – and by whom? The answer depends on whether one leans toward a rational or a behavioral view of asset pricing. Rationalists like Fama and French (1995) would argue that convergence in the profitability, growth, and expected returns of value and growth stocks is somewhat predictable and so built into the forward-looking prices of stocks. In this view, average convergence in P/B is to a large extent the result of rational pricing that aligns expected returns and risk. And value stocks have higher expected returns because they are more risky.

In contrast, behaviorists like Lakonishok, Shleifer, and Vishny (1994) argue that the investors who determine stock prices never come to understand convergence in profitability and growth. Investors are thus surprised by the deterioration in profitability and growth that tends to occur after firms are identified as growth stocks and the improvement after firms are identified as value stocks. The result is lower average returns (and negative average convergence) for growth stocks and higher returns (positive convergence) for value stocks. In this view, convergence is largely unexpected, at least by the consistently irrational (and learning impaired) investors that dominate asset pricing.

The important point, however, is that our breakdown of average returns into the contributions of dividends and capital gains due to reinvestment, drift, and convergence captures the core factors in asset pricing irrespective of one's views about whether pricing is rational or irrational.

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Table 1 – Components of average continuously compounded annual returns, in percent

We form six value-weight portfolios, SG, SN, SV, BG, BN, and BV, at the end of each June from 1926 to 2003 as the intersections of two size groups, small (S, firms with June market cap below the NYSE median) and big (B, above the median), and three price-to-book (P/B) groups, growth (G, firms in the top 30% of NYSE P/B), neutral (N, middle 40%), and value (V, bottom 30%). The portfolios for year t include NYSE, AMEX (after 1962), and Nasdaq (after 1972) stocks with positive book equity in t-1. Book equity is Compustat's total assets (data item 6), minus liabilities (181), plus deferred taxes and investment tax credit (35) if available, minus (as available) liquidating (10), redemption (56), or carrying value (130) of preferred stock. In the P/B sorts, book equity is for the fiscal year ending in t-1, and market equity is for the end of December of t-1. Market is the value-weight portfolio of the six portfolios. Total Return and Capital Gain are the average continuously compounded annual with and without dividend returns. Dividend Contribution is the difference between with and without dividend average returns. Growth in B is the average CC annual change in an un-refreshed portfolio's book equity from June of t to June of t+1. A firm's book equity in June of t is its book equity for calendar year t-1, adjusted for shares issued or repurchased from December of t-1 to June of t. The book equity in June of t+1 is the book equity for calendar year t adjusted for share changes from June to December of t. Similarly, a firm's market equity P at the end of June of t+1 is market equity at the end of June of t accreted by the next twelve months' capital gains. Growth in un-refreshed P/B is the average CC annual change in P/B from portfolio formation in June of t to June of t+1. Drift is the average CC annual change in P/B for the refreshed portfolio from t to t+1. Convergence is the difference between the un-refreshed and refreshed P/B.

| | Total Return | Capital Gain | Dividend Yield | Growth in B | Growth in Un-Refreshed P/B | Drift | Convergence |
|-----------|-----------------|-----------------|-------------------|----------------|----------------------------------|-------|-------------|
| 1926-2003 | | | | | | | |
| Market | 9.86 | 5.89 | 3.97 | 5.14 | 0.75 | 1.08 | -0.33 |
| SG | 8.81 | 5.76 | 3.05 | 13.80 | -8.04 | 1.24 | -9.28 |
| SN | 12.87 | 8.93 | 3.94 | 4.78 | 4.15 | 1.08 | 3.07 |
| SV | 14.28 | 11.03 | 3.25 | -3.54 | 14.57 | 1.66 | 12.91 |
| BG | 9.29 | 5.86 | 3.44 | 10.51 | -4.65 | 0.93 | -5.58 |
| BN | 10.02 | 5.46 | 4.55 | 4.78 | 0.69 | 0.91 | -0.23 |
| BV | 11.62 | 6.86 | 4.76 | 0.83 | 6.04 | 1.05 | 4.98 |
| 1926-1962 | | | | | | | |
| Market | 9.30 | 4.44 | 4.87 | 3.22 | 1.22 | 1.43 | -0.21 |
| SG | 9.36 | 4.25 | 5.11 | 10.83 | -6.57 | 1.68 | -8.26 |
| SN | 10.93 | 5.62 | 5.31 | 2.77 | 2.85 | 1.19 | 1.66 |
| SV | 11.61 | 8.00 | 3.60 | -4.11 | 12.12 | 2.03 | 10.09 |
| BG | 9.03 | 4.36 | 4.67 | 7.83 | -3.48 | 0.80 | -4.27 |
| BN | 8.99 | 3.87 | 5.12 | 2.82 | 1.05 | 1.06 | -0.01 |
| BV | 10.46 | 5.70 | 4.75 | 0.23 | 5.47 | 1.32 | 4.15 |
| 1963-2003 | | | | | | | |
| Mkt | 10.37 | 7.21 | 3.15 | 6.88 | 0.33 | 0.77 | -0.44 |
| SG | 8.31 | 7.12 | 1.19 | 16.48 | -9.36 | 0.84 | -10.20 |
| SN | 14.62 | 11.92 | 2.71 | 6.60 | 5.32 | 0.97 | 4.35 |
| SV | 16.69 | 13.76 | 2.94 | -3.03 | 16.78 | 1.33 | 15.45 |
| BG | 9.53 | 7.21 | 2.32 | 12.92 | -5.71 | 1.05 | -6.75 |
| BN | 10.94 | 6.91 | 4.03 | 6.55 | 0.36 | 0.78 | -0.42 |
| BV | 12.67 | 7.91 | 4.76 | 1.36 | 6.54 | 0.81 | 5.73 |

Table 2 – Standard deviations and autocorrelations of the components of continuously compounded returns: 1926-2003

We form six value weight portfolios, SG, SN, SV, BG, BN, and BV, at the end of each June from 1926 to 2003 as the intersections of two size groups, small (S, firms with June market cap below the NYSE median) and big (B, above the median), and three price-to-book (P/B) groups, growth (G, firms in the top 30% of NYSE P/B), neutral (N, middle 40%), and value (V, bottom 30%). The portfolios for year t include NYSE, AMEX (after 1962), and Nasdaq (after 1972) stocks with positive book equity in t-1. Book equity is Compustat's total assets (data item 6), minus liabilities (181), plus deferred taxes and investment tax credit (35) if available, minus (as available) liquidating (10), redemption (56), or carrying value (130) of preferred stock. In the P/B sorts, book equity is for the fiscal year ending in t-1, and market equity is for the end of December of t-1. Market is the value weight portfolio of the six portfolios. Total Return and Capital Gain are the average continuously compounded annual with and without dividend returns, and Dividend Yield is the difference between the average returns. Growth in B is the average CC annual change in an un-refreshed portfolio's book equity from June of t to June of t+1. A firm's book equity in June of t is its book equity for calendar year t-1, adjusted for shares issued or repurchased from December of t-1 to June of t. The book equity in June of t+1 is the book equity for calendar year t adjusted for share changes from June to December of t. Similarly, a firm's market equity P at the end of June of t+1 is market equity at the end of June of t accreted by the next twelve months' capital gains. Growth in un-refreshed P/B is the average CC annual change in P/B from portfolio formation in June of t to June of t+1. Drift is the average CC annual change in P/B for the refreshed portfolio from t to t+1. Convergence is the difference between the un-refreshed and refreshed P/B.

| | Total Return | Capital Gain | Dividend Yield | Growth in B | Growth in Un-Refreshed P/B | Drift | Convergence |
|----------------------------------|-----------------|-----------------|-------------------|----------------|----------------------------------|-------|-------------|
| Standard Deviations (in percent) | | | | | | | |
| Market | 24.10 | 24.36 | 1.45 | 4.11 | 24.57 | 24.51 | 1.38 |
| SG | 33.30 | 33.86 | 2.50 | 6.57 | 34.46 | 32.20 | 9.72 |
| SN | 29.64 | 30.10 | 1.95 | 7.32 | 30.87 | 30.79 | 6.80 |
| SV | 33.57 | 33.71 | 1.61 | 8.03 | 33.36 | 34.29 | 9.31 |
| BG | 23.48 | 23.72 | 1.59 | 5.24 | 24.67 | 26.28 | 9.43 |
| BN | 27.69 | 28.02 | 1.45 | 3.97 | 28.11 | 28.48 | 8.49 |
| BV | 31.73 | 31.69 | 1.96 | 5.95 | 31.98 | 34.86 | 9.48 |
| Autocorrelations | | | | | | | |
| Market | -0.18 | -0.17 | 0.89 | 0.56 | -0.22 | -0.22 | 0.16 |
| SG | -0.19 | -0.19 | 0.84 | 0.49 | -0.16 | -0.26 | 0.09 |
| SN | -0.21 | -0.20 | 0.87 | 0.62 | -0.20 | -0.23 | 0.42 |
| SV | -0.19 | -0.20 | 0.88 | 0.57 | -0.22 | -0.22 | 0.31 |
| BG | -0.12 | -0.11 | 0.89 | 0.43 | -0.13 | -0.06 | 0.03 |
| BN | -0.22 | -0.22 | 0.81 | 0.64 | -0.26 | -0.15 | 0.09 |
| BV | -0.26 | -0.28 | 0.93 | 0.39 | -0.35 | -0.24 | 0.06 |

Table 3 – Migration: Average transition vectors and returns, 1926-2003

We form six value weight portfolios, SG, SN, SV, BG, BN, and BV, at the end of each June from 1926 to 2003 as the intersections of two size groups, small (S, firms with June market cap below the NYSE median) and big (B, above the median), and three price-to-book (P/B) groups, growth (G, firms in the top 30% of NYSE P/B), neutral (N, middle 40%), and value (V, bottom 30%). Firms allocated to one of the six portfolios in June of year t can (i) remain in that portfolio in June of t+1, (ii) move to one of the other five portfolios, or (iii) move to one of four other groups. Good Delists stop trading between June of t and June of t+1 because they are acquired by another firm (CRSP delist codes 200 to 399). Bad Delists stop trading because they no longer meet listing requirements (CRSP delist codes below 200 and above 299). Neg is firms with negative book equity for the fiscal year ending in calendar year t, and NA are those missing book equity for year t or market equity for June of t+1. The year t transition vector for a portfolio is the fraction of the aggregate market cap of the portfolio when formed at the end of June of year t that falls into each of the ten groups at the end of June of t+1. The table reports averages of the annual transition vectors. The Average Returns are the average of the annual value-weight simple (not continuously compounded) returns from July of t to June of t+1 on the firms that migrate to the indicated group by June of t+1. To compute the annual return for a delisted firm, we augment the firm's return up to delisting with the monthly returns on the firm's initial (time t) portfolio from delisting until June of t+1.

| Total Portfolio | SG | SN | SV | BG | BN | BV | Bad Delist | Good Delist | Neg | NA | |
|-------------------------------------|-------|--------|--------|--------|--------|-------|------------|-------------|-------|--------|-------|
| Average Transition Vectors | | | | | | | | | | | |
| SG | 58.6 | 22.8 | 1.7 | 10.6 | 1.3 | 0.0 | 0.7 | 2.7 | 0.8 | 0.7 | |
| SN | 9.1 | 60.1 | 16.1 | 2.5 | 7.1 | 0.6 | 0.5 | 3.1 | 0.2 | 0.8 | |
| SV | 1.2 | 15.5 | 69.6 | 0.3 | 3.0 | 5.4 | 0.9 | 3.0 | 0.2 | 0.9 | |
| BG | 0.6 | 0.3 | 0.0 | 86.9 | 10.4 | 0.2 | 0.1 | 0.8 | 0.1 | 0.5 | |
| BN | 0.1 | 0.8 | 0.3 | 14.0 | 74.4 | 8.6 | 0.1 | 1.3 | 0.0 | 0.3 | |
| BV | 0.0 | 0.3 | 2.0 | 0.7 | 21.2 | 74.0 | 0.1 | 1.3 | 0.0 | 0.5 | |
| Average Annual Returns (in percent) | | | | | | | | | | | |
| SG | 15.71 | 10.42 | -4.65 | -25.96 | 80.57 | 47.35 | 129.71 | -31.05 | 31.71 | -1.67 | -2.24 |
| SN | 18.95 | 33.21 | 13.68 | -1.70 | 88.30 | 54.15 | 67.51 | -4.79 | 40.58 | -9.34 | 6.29 |
| SV | 22.35 | 64.08 | 31.68 | 12.69 | 180.22 | 70.91 | 65.89 | -0.68 | 43.84 | -10.54 | 9.98 |
| BG | 12.60 | -23.44 | -26.26 | -43.94 | 14.39 | 1.09 | -3.83 | 1.40 | 28.97 | 10.27 | 10.88 |
| BN | 14.50 | -13.58 | -16.07 | -23.45 | 30.13 | 13.72 | 1.56 | 2.66 | 32.50 | 19.11 | 11.60 |
| BV | 18.07 | -19.91 | -9.42 | -17.81 | 45.85 | 29.44 | 16.49 | -43.73 | 35.69 | 24.65 | -0.64 |

Table 4 – Migration: Average returns, contributions to average returns, and average transition vectors for a coarser grid, 1926-2003

For each of the six size-P/B portfolios, we group the ten outcomes in Table 3 into three categories. Same includes firms allocated to the same size-P/B portfolio when it is formed in June of year t and when it is reformed in t+1. It also includes NA, firms missing book equity for year t or market equity for June of t+1. Minus includes stocks that (i) move to a lower P/B portfolio in the same size group, (ii) move from a big portfolio to a small portfolio, (iii) are delisted for cause (Bad Delist), or (iv) have negative book equity in t+1. Plus includes stocks that (i) move to a higher P/B portfolio in the same size group, (ii) move from a small portfolio to any of the big portfolios, or (iii) are acquired by another firm (Good Delist) in t+1. Average Return is the average of the annual value-weight simple (not continuously compounded) returns from July of t to June of t+1 for all firms in a size-P/B portfolio (Portfolio) or for the Minus, Same, or Plus groups of the portfolio. The year t transition vector for a portfolio is the fraction of the aggregate market cap of the portfolio when formed at the end of June of year t that is in the Minus, Same, or Plus group at the end of June of t+1. The Average Transition Vector is the average of the annual vectors. The Minus, Same, or Plus group's contribution to the overall portfolio's average return for year t is the fraction of the year t market cap that migrates to the group in t+1 times the value weight average excess return for the group from t to t+1. The Average Contribution to the Average Excess Return is the average of the annual contributions.

| | Average Return | | | Average Contribution to Average Return | | | Average Transition Vector | | | |
|----|----------------|--------|-------|--|-------|-------|---------------------------|-------|------|------|
| | Portfolio | Minus | Same | Plus | Minus | Same | Plus | Minus | Same | Plus |
| SG | 15.71 | -6.21 | 10.40 | 66.25 | -2.06 | 6.63 | 11.14 | 26.0 | 59.3 | 14.7 |
| SN | 18.95 | -2.03 | 13.77 | 48.62 | -0.64 | 9.04 | 10.56 | 16.8 | 60.9 | 22.3 |
| SV | 22.35 | -1.31 | 12.71 | 46.84 | -0.01 | 8.51 | 13.85 | 1.1 | 70.5 | 28.4 |
| BG | 12.60 | -2.01 | 14.35 | 28.97 | -0.29 | 12.64 | 0.25 | 11.8 | 87.5 | 0.8 |
| BN | 14.50 | -1.33 | 13.73 | 29.92 | 0.08 | 10.20 | 4.23 | 9.9 | 74.8 | 15.3 |
| BV | 18.07 | -16.82 | 16.45 | 30.29 | -0.56 | 12.63 | 6.00 | 2.4 | 74.5 | 23.1 |

Figure 1a - Refreshed P/B for Market, Small Growth (SG), Small Neutral (SN), and Small Value (SV)

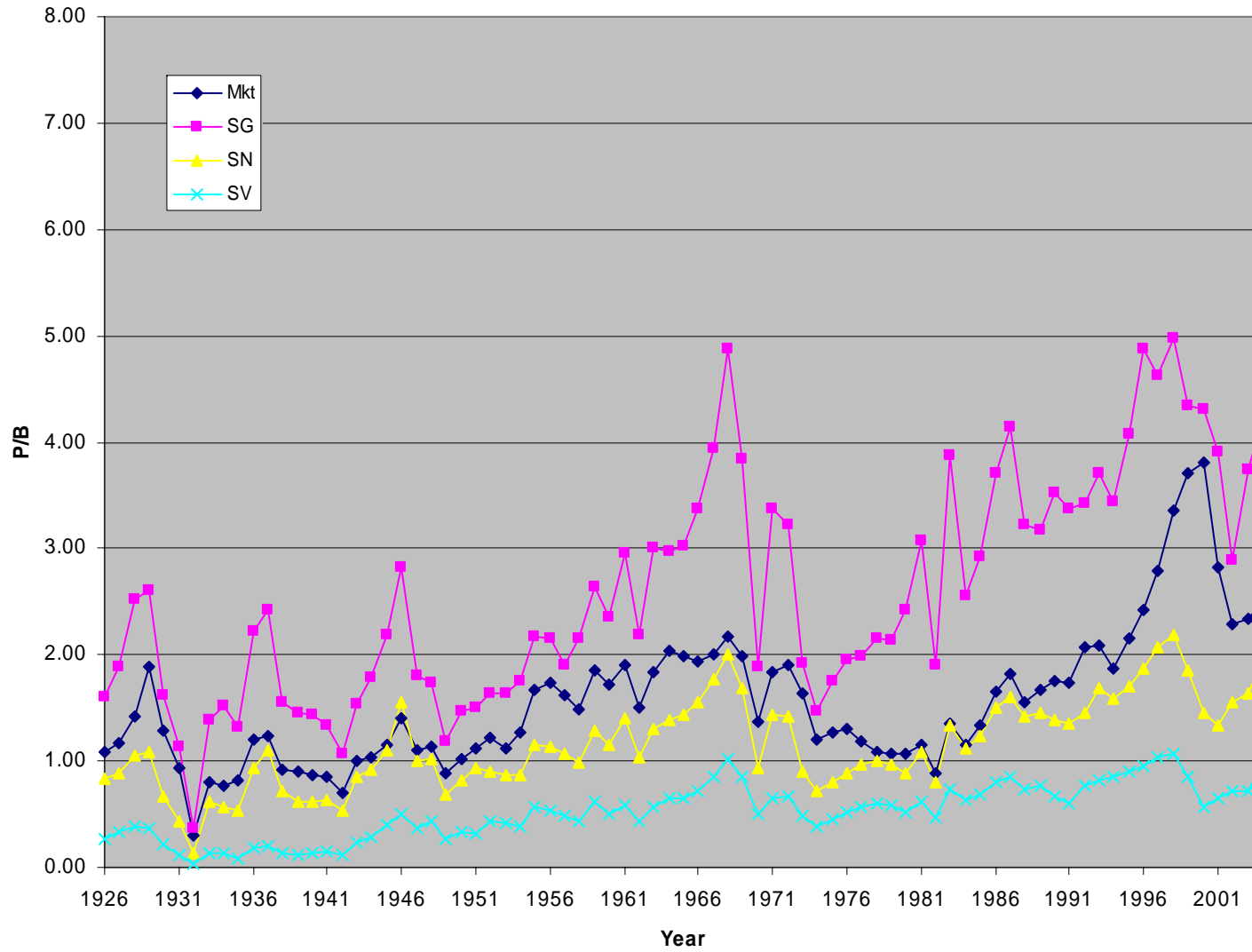


Figure 1b - Refreshed P/B for Market, Big Growth (BG), Big Neutral (BN), and Big value (BV)

