Using the Supply-Side Approach to Understand and Estimate Equity Returns

Advantages of a disciplined framework.

Charles P. Jones and Jack W. Wilson

Investors always want good estimates of future returns on major financial assets such as stocks and bonds. An element in this issue is the equity risk premium puzzle, first identified by Mehra and Prescott [1985], which has generated voluminous discussion. Even assuming that the historical risk premium has been higher than warranted, the question always remains—what is the likely return on equities, and thus the risk premium, for the future?

Many investors traditionally have simply extrapolated historical average returns on major asset classes. Clearly, the 20th century was very favorable to stocks and not so favorable to bonds—and the last two decades of the century were particularly favorable for stocks. The important question for investors is whether such a relations will continue to hold and how investors are affected as they form expectations about the future.

As Dimson, Marsh, and Staunton [2002, p. 4] note about levels reached in the market by 2000:

> The most fundamental question of all is: Do investors realize that returns are likely to revert to more normal levels, or do current valuations embody exaggerated expectations based on imperfect understanding of history?

A good argument can be made that equity valuation conditions have fundamentally changed. Dividend yields on stocks reached record-low levels in 2000, while price-earnings ratios have reached very high levels in recent years. Meanwhile, long-term interest rates did not rise in 2004-2005 as many observers expected.

We analyze a disciplined approach to understanding historical stock returns and to making intelligent assessments of future stock returns using that information and its

Charles P. Jones
is the Edwin Gill professor of finance in the College of Management at North Carolina State University in Raleigh, NC.
charles_jones@ncsu.edu

Jack W. Wilson
is emeritus professor of finance in the College of Management at North Carolina State University.
jack_wilson@ncsu.edu

modifications. Our analysis relies on a model presented by Ibbotson and Chen [2003], who use a supply-side approach to dissect average historical returns into their building blocks and provide a framework for estimating long-term sustainable equity returns.[1]

We show how investors can use this framework when they estimate the expected equity return for intermediate periods as well as for the long run. Model users are forced to justify, or at least be clearly aware of, any changes made to the model's benchmark long-run values used to estimate sustainable returns, which ought to lead to better estimates of returns for more intermediate periods.

BACKGROUND

Although average historical asset performance is often used to predict expected equity returns, similar conditions may not prevail in the future. The United States has enjoyed an unmatched level of economic success by avoiding major negative events experienced by other countries, such as hyperinflation, major destruction of infrastructure from war, or revolution. If conditions have changed on more than a short-term basis, it stands to reason that average historical rates of return may not provide reliable estimates of future returns for intermediate periods. And true structural changes in the economy could result in revisions in long-term estimates of stock returns, such as the almost universally recognized approximate 10% per year return on S&P 500 stocks.

One can also argue that the long-term expected equity return will average out to something approximating the average historical return, which for the entire 20th century was 10.35% for the S&P 500 index on a geometric mean basis. If the equity risk premium is indeed a constant, unusual equity/bond return relationships are transitory, and will revert to more normal levels.

The essence of the supply-side approach is that in the very long run stock returns must reflect what companies can provide in terms of equity return building blocks, which in turn must reflect underlying economic conditions.

SUPPLY-SIDE MODEL

Ibbotson and Chen [2003] made an important contribution in analysis of supply-side models of equity returns. They use this model both to explain average compound equity returns for 1926-2000 and to estimate the long-term sustainable equity return based on the historical averages for the determining factors. They start by noting that historical equity returns consist of three building blocks: inflation, the real risk-free rate, and the equity risk premium. Alternatively, equity returns can be broken into inflation, real capital gains, and the income component from stocks.

Equation (1) expresses return as a combination of these variables:[2]

$$R_t = [(1 + CPI_t)(1 + Rcg_t) - 1] + Inc_t + Rinv_t \quad (1)$$

where

R_t is the return on equities;
CPI is the inflation rate as measured by the Consumer Price Index;
Rcg_t is the real capital gain;
Inc_t is the income component of stocks as measured by the dividend yield; and
$Rinv_t$ is the reinvestment return resulting from compounding and interaction effects.[3]

Converting Equation (1) to geometric means, we have:[4]

$$\overline{R} = [(1 + \overline{CPI})(1 \_ \overline{Rcg}) - 1] + \overline{Inc} + \overline{Rinv} \quad (2)$$

Our results for 1926-2004 using an updated S&P 500 data set in Wilson and Jones [2002] are:[5]

$$10.10\% = [(1 + 3.04\%)(1 + 2.64\%) - 1] + 4.11\% + 0.23\%$$

Note that 10.10% is the actual geometric mean of the 79 annual total returns for the S&P 500 index for 1926-2004. All values on the right-hand side are geometric means.

This calculated historical average geometric rate of return on equities is important because it, and similar numbers, serves as a benchmark for talking about average annual returns on a portfolio of large common stocks. Such averages constitute a useful benchmark in making forecasts of future equity returns.[6]

It is obvious from Equation (2) that the income component, at 4.11%, has played a major role in the past in determining the average annual compound rate of return on stocks. In effect, dividends constituted about 40% of the total return on the S&P 500 index. The average nominal capital gain, on a geometric mean basis, was 5.76%; therefore, the real capital gain was [1.0576/1.0304] − 1.0 = 0.0264, or 2.64%. Inflation compounded at an annual rate of 3.04%, as measured by the official BLS estimate of the CPI.

Ibbotson and Chen show that the components of the historical average return can be stated alternatively using

an earnings model by breaking the real capital gain portion of return into its two components, growth in real EPS and growth in P/E. They also present a dividend version of the supply-side model and then explain why they disagree with the dividend model and prefer to use the earnings model.[7]

The earnings model decomposes the total equity return into four components rather than three (not counting the reinvestment term) because the real capital gain can be broken into two components. These four components, inflation, growth in real EPS, growth in P/E, and the income component, along with the reinvestment term, result in the equation:

$$R_t = [(1+CPI_t)(1+g_{REPS,t})(1+g_{P/E,t})-1] + Inc_t + RinV_t \quad (3)$$

where: $(1+g_{REPS,t})(1+g_{P/E,t})=(1+Rcg_t)$

Applying this analysis to 1926-2004, we calculate that the growth in real EPS added 1.72 percentage points to the geometric mean total return of 10.10%, and the change (rise) in the P/E ratio added 0.90 percentage points.[8]

Plugging in the values for this time period results in:

$$10.10\% = [(1+3.04\%)(1+1.72\%)(1+0.90\%)-1] + 4.11\% + 0.23\% \quad (4)$$

We will use Equation (3) to develop estimates of the expected equity return under certain conditions.

ESTIMATING LONG-TERM SUSTAINABLE EQUITY RETURNS

Ibbotson and Chen [2003, p. 94] note that "investors' expectations for *long-term* equity performance should be based on the supply of equity returns produced by corporations." Used in this context, historical performance is relevant because long-term averages reasonably reflect what the corporate sector is able to do, on average, over a long period of time (the emphasis is on *long*). They argue that only three of the four factors (ignoring reinvestment) in (3) are historically supplied by companies—the income return, the growth in real EPS, and inflation. P/E ratios, however, reflect investor expectations about future earnings and are exogenous to the model.

Therefore, in estimating a forward-looking long-term equity return, Ibbotson and Chen omit the P/E component, resulting in a valuation-neutral equation:

$$R_t = [(1+CPI_t)(1+g_{REPS,t})-1]+Inc_t+Rinv_t \quad (5)$$

We use Equation (5) and historical average data based on our Wilson-Jones revised S&P series to estimate the long-term, sustainable equity return for the S&P 500:

$$\overline{R} = [(1+\overline{CPI})(1+\overline{g_{REPS}})-1]+\overline{Inc}+\overline{Rinv} \quad (6)$$
$$9.15\% = [(1+3.04\%)(1+1.72\%)-1]+4.11\%+0.23\%$$

Given historical geometric means for the relevant variables for 1926-2004, 9.15% can be considered a reasonable supply-side forecast of the expected *long-term sustainable* geometric mean return on equities. It is important to understand that this is a long-term sustainable estimate based on what companies should be able to deliver, on average, over many years (and given no P/E effect).

The justification for this approach is simple—this is what companies have "supplied" over the period starting in 1926; therefore, it provides a solid basis for estimating what companies are likely to be able to supply in the future on a long-run and sustainable basis. Obviously, permanent structural changes in the economy could make such an estimate unreliable, but just as clearly the past 79 years (1926-2004) have encompassed several dramatic events, including the Great Depression, record inflation, and extraordinary consecutive yearly returns in the stock market.

In making their long-run estimate, Ibbotson and Chen assume a constant equity risk premium. This is an important issue that relates to current research involving the question of constant versus time-varying expected returns.[9]

We also assume a constant equity risk premium to obtain our long-run estimate of 9.15%. Many finance professionals argue that time-varying risk premiums are appropriate. We believe the supply-side model could be adapted to such risk premiums, but we do not directly deal with this issue here.

The assumption of a constant equity risk premium turns out to be important in this analysis. As seen in Equation (6), achieving a long-term and sustainable estimate of the average equity return of 9.15% will require, other things equal, that the income component return to a level closer to its long-run historical average than is the case today. This could imply a substantial drop in the market's P/E ratio, but Equation (6) does not allow for a long-term P/E effect, assuming as it does neutral valuation over the long run.

In fact, the P/E ratio on the S&P 500 as of late 2005 was much lower (estimated at slightly less than 16 by S&P) than it had been in the recent past. A P/E much closer to its long-run average may be less likely to undergo a significant decline. Of course, real earnings growth could

increase, but the increase necessary to offset the entire gap is highly unlikely. Alternatively, the payout rate could adjust so as to resolve the issue.

We obviously cannot eliminate the possibility of lower expected returns over the long-run future. While the difficulties just described suggest it may be difficult for companies actually to supply the long-term averages for the equity return as stated, given the current low dividend yield, we do not believe that some combination of higher real earnings growth, changes in the payout rate, and somewhat higher yields without a corresponding sharp adjustment in the P/E ratio can be absolutely ruled out.

We would simply note that 9.15% is an estimate of the long-term sustainable equity return; that recent and current conditions are a deviation from this average; and that some combination of subsequent events may very well return the average to this path.

USING THE SUPPLY-SIDE MODEL TO ESTIMATE RETURNS FOR INTERMEDIATE PERIODS

The supply-side approach to estimating returns is based on a very long-run perspective (and specific assumptions as discussed). Can it be used to make a more intermediate estimate of the equity return, taking into account both relatively recent changes that have occurred as well as changes that might reasonably be expected in the future?

We believe the supply-side model can be a valuable aid to investors in assessing the general tenor of average stock market returns over a shorter or more intermediate period primarily by providing an organized and systematic framework for investors. The model imposes a discipline on the user because 1) the factors that determine future equity returns are identified; 2) a long-run sustainable estimate of equity returns can be made and serves as a benchmark; and 3) current and expected conditions can be taken into account in a systematic, transparent manner.

When we make intermediate estimates of equity returns, there is no ambiguity about the factors that affect estimated stock returns because the supply-side model identifies these factors. Furthermore, when an investor uses this model to make an estimate, it is very clear which factors are being changed, and by how much, relative to their historical average. This discipline should help investors think carefully about and justify their assumptions, and therefore make improved estimates of average market returns.

Is the supply-side model a cure-all when it comes to making short or intermediate forecasts of the expected market return rather than estimating the long-run, sustainable return? The answer, of course, is no, for several reasons.

First, the model becomes ambiguous as to the time element. It certainly does not directly apply to making one-year ahead forecasts, formulated as it is in terms of annual geometric means. There are no guidelines as to how many years should be included in the forecast period. Given that we are not making a one-year-ahead forecast, are we estimating an average return for the next two or three years, five years, or whatever?

Second, and very obviously, there is always an inherent danger in using current values for the relevant variables instead of their long-term averages. How long will such values continue? On the other hand, many market observers would agree that dramatic changes in some current values will not occur very quickly. The dividend yield is the most obvious example. Its current value has been radically different from its long-term average for several years, and there is essentially no reasonable chance that the record-low dividend yield reached in recent years could return to anything like its former level over a short period of time (barring a truly dramatic drop in stock prices).

Third, assume that model users decide they want to estimate an average equity return for the market for some short or intermediate period. The currently expected rate of inflation can be obtained from ongoing survey data, and reasonable estimates of the income component can be made, even allowing for some change and some adjustment for share repurchases if this is thought to be appropriate. Real earnings growth is more difficult to estimate for shorter periods, and relatively small differences in the rate chosen can have relatively large impacts on the estimates of equity returns.

Finally, unlike the long-term forecast, the effect of the P/E ratio may need to be included in the intermediate forecast—and the P/E ratio is notoriously volatile and difficult to predict.

Given these caveats, the supply-side model can nevertheless be extremely useful in helping investors think logically and systematically about the expected equity return for the market for the short- and intermediate-term future. The reason again is that the components of the model are identified, and the user has only to decide what values to assign the components, and why such decisions are being made.

The implications of any assumptions made by the investor become clearer very quickly. This imposes a discipline on the investor in the form of an organized framework for estimating equity returns.

ESTIMATING INTERMEDIATE AVERAGE EQUITY RETURNS FOR THE MARKET

In our examples, we make no explicit assumption about the exact period of time involved. It is whatever short to intermediate period an investor thinks is appropriate. What is more important is that model users understand, implicitly or explicitly, the assumptions they make when they estimate expected returns. We prefer to think of this analysis as a disciplined framework for estimates of expected average equity returns over a period rather than a method that provides a yearly or precisely specified estimate (which is always dangerous to assume).

What then about constant versus time-varying returns? We assume, like Ibbotson and Chen, constant expected returns, on average, over long periods of time. The calculated values for the model's components in Equation (5) represent what corporations can reasonably expect to supply in the way of equity return components over the long run.

Therefore, if the dividend yield is currently considerably below its long-term average and has been for some time, as is the case now, we would consider this a deviation that will eventually be more in line with its expected long-run average. Thus, we are not changing the assumptions used to make a long-run sustainable estimate of equity returns. Instead, we are explicitly recognizing current and anticipated conditions over the shorter-run future.

The most obvious difference in today's world is the lower dividend yield of recent years. Today's dividend yield reflects current dividend payout rates, recently at historical lows, a story that by now is well known. The yield on the S&P 500 in mid-2005 was 1.80%, which was up from the historic low recorded in 2000, but clearly a significantly different number from the historical average of 4.11%.

Although companies are currently paying less in dividends, they also buy back shares. In the 1990s companies returned more cash in the form of share repurchases than they did in dividends. It is difficult to estimate the amount of share repurchases accurately while also accounting for stock buy-backs (such as for employee stock options).[10] Liang and Sharpe [1999] suggest adding 0.5 percentage points to the dividend yield to account for this impact.

In truth, no one knows with confidence what the exact adjustment factor should be, if any, and we freely admit that any adjustment for repurchases we make is an assumption. The important point is that if investors believe an adjustment should be made for repurchases, they can easily incorporate that into this model.

We also have to choose a rate of inflation. Previous survey data covering long-range inflation forecasts have indicated a lower expected rate of inflation, on the order of 2.3% to 2.7%, for several years. Nevertheless, conditions change over time. As our approach is that the supply-side model for these types of forecasts should reflect current conditions, we use 3.1% as the rate of inflation, consistent with the University of Michigan's survey of long-run inflation expectations at the moment.

Using Equation (6) to make a generalized estimate of intermediate equity returns, it is obvious that taking into account current lower dividend yields (even allowing for any reasonable adjustment for stock repurchases) and survey data about inflation expectations significantly reduces the estimate of expected equity returns for at least the next few years. Say we use 3.1% for inflation, and add 0.5 percentage points to the current dividend yield to produce an income return of about 2.30 percentage points.

As Equation (7) shows, this lowers the estimate of the equity return to 7.40%, other things equal (and assuming no P/E effect):

$$7.40\% = \left[(1+3.1\%)(1+1.72\%)-1.0\right] + 2.30\% + 0.23\% \quad (7)$$

Perhaps an investor could also make a case for using a higher real earnings growth rate than the historical average because real growth rates have been higher in recent years. Even this becomes problematical at some point as the investor tries to decide which time period is most appropriate to imitate. Furthermore, the real earnings growth rate for the most recent 25-year period was 1.87%, not very different from the historical average. Therefore, we use 1.72%.

It seems only rational to take into account the current dramatically lower income component as we estimate equity returns for the next several years. Given a 1%-2% yield in recent years, it is simply unreasonable in estimating expected returns for the immediate future to not incorporate this into the estimates. An estimate of 7.40%, as calculated in (7), is a reasonable figure for the expected equity return for some short or intermediate time period, taking into account as it does the current lower income component, if (and only if):

- No change is expected in the P/E ratio over the next few years.
- The growth in real earnings will approximate the historical average.
- No dramatic drop in stock prices is anticipated, which would raise the yield component.
- Inflation does not change dramatically from survey-based estimates of recent years.

Estimates in the 7%-8% range are in line with a number of lower-than-historical average expected returns discussed by several researchers, such as Jones, Wilson, and Lundstrum [2002] and Ilmanen [2003, p. 23].

The value of this type of analysis for making more intermediate-term estimates of equity returns can be significant. It forces the model user to think about, and justify, assumptions as to future conditions.

For example, those who argue for future equity returns in excess of the long-term sustainable estimate over the intermediate future must make a case for higher income yields, higher inflation, an increase in the P/E ratio, or higher growth in real earnings than the values used in (6), or some combination of these variables. Conversely, those forecasting lower equity returns in the current environment can easily defend their forecasts by showing how today's lower dividend yield suggests lower equity returns, barring a dramatic increase in real earnings growth or a significant rise in the P/E ratio.

Given the likelihood of only modest changes in the income component over the next few years (as opposed to a long-run average), and the strong likelihood that the average rate of inflation is likely to move in a narrow range, this leaves only two possibilities for affecting expected equity returns: growth in real earnings, or a change in the P/E ratio. Therefore, those investors interested in short- to intermediate-term estimates of expected equity returns should focus most of their attention on these two variables.

Growth in Real Earnings

The growth in real earnings is clearly a key variable in this analysis. Using the current dividend yield adjusted to 2.30%, and continuing the other components of the equity return as described, we learn from the model that an estimated equity return that approximately matches the historical geometric mean equity return would require real earnings growth of around 5%, holding the P/E ratio constant:

$$10.79\% = \left[(1+3.1\%)(1+5.0\%)-1.0\right] + 2.30\% + 0.23\% \quad (8)$$

And, in fact, some market analysts and forecasters in 2004-2005 were using an estimated growth in real earnings of 4.5% to 5.0% (based on an estimated growth in nominal profits of 7%, with 2.0% to 2.5% inflation).

We calculate the long-term average growth in real earnings for 1926-2004 to be 1.72%. This is in line with other estimates of the historical average growth in real earnings. For example, for the period 1900-2001 real earnings growth has been estimated at 1.5% compared to an estimated growth rate for real gross domestic product of 3.3%.[11] In the long run, real EPS growth cannot exceed real GDP growth, and has averaged only about half that rate.[12]

Exhibit 1 shows geometric mean growth rates for S&P 500 real earnings for various time periods within the 1926-2004 period. Note that for all four longer periods starting 1950, 1960, 1970, and 1980, and ending in 2004, the average growth rate never exceeded 2.29%. Going back to 1940, the average growth rate of real earnings through 2004 averaged 2.61%, but at each successive ten-year point (1950, 1960, and so on), the real growth rate in earnings declined until 1990.

Optimistic forecasts of 4.5% to 5.0% real growth in earnings do not match well what we know about the

EXHIBIT 1
Historical Growth Rates of Real Earnings per Share for the S&P 500 Index

Time Period	Geometric Mean Growth Rate in Real Earnings
Modern Period	
1926-2004	1.72%
Various Time Periods Through 2004, Starting with 1930	
1930-2004	1.54%
1940-2004	2.61
1950-2004	2.29
1960-2004	2.20
1970-2004	2.01
1980-2004	1.87
Recent Rapid Growth Periods	
1983-2004	3.40%
1990-2004	3.58
1990-1999	4.65

long-term average performance of this variable. As Brinson [2005, p. 26] notes:

> If one wishes to contend that 4.5-5.0 percent real EPS growth will be the obtained trend in the future, then one should be ready with a rigorous argument delineating what variables are changing and why they would cause the historical trend to leap from 1.80 % to a much higher level. Such rigor is conspicuously absent.

That said, it is also the case that real earnings growth has exceeded the long-term average for certain periods of time. For example, Exhibit 1 shows that for the 20-year period ending in 2004, real earnings growth approximated 3.40% per year, and for 1990-2004 it averaged 3.58% on a geometric mean basis. Therefore, an investor seeking an estimate of equity returns over the next few years might expect continued growth in real earnings in line with the recent past.

Using a rounded 3.5% for real earnings growth and 2.3% for the adjusted income component, the model would produce an estimate of:

$$9.24\% = [(1+3.1\%)(1+3.50\%)-1.0] + 2.30\% + 0.23\% \quad (9)$$

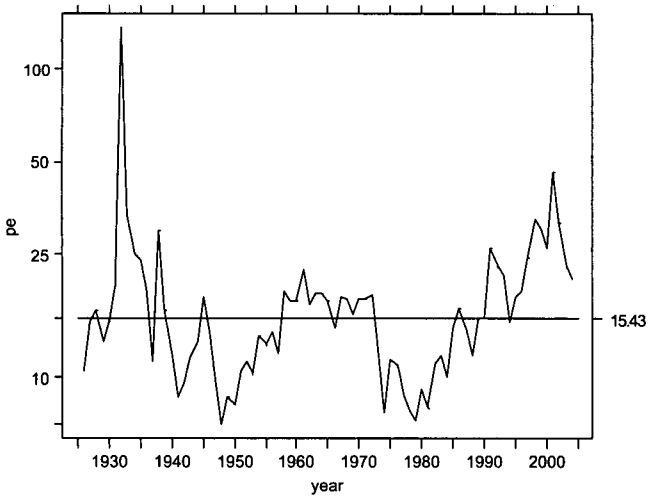
Once again we see the value of the supply-side approach as a disciplined framework for making estimates of the expected return on equities for shorter periods of time. In order to achieve an average equity return of 9.24%, given the current lower income component and lower-than-long-run inflation average, and assuming no change in the P/E ratio, the investor must convince himself or herself that real earnings growth will be twice the historical average, a heroic assumption.

Also note, however, that for shorter periods of time the real growth rate can be quite high. For the extraordinary decade of the 1990s, real growth averaged 4.65% annually. The relevant question for investors, obviously, is can such a rate be reasonably expected in the future?

Assuming no P/E effect, higher expected stock returns depend heavily upon higher expected real growth rates in earnings, unless one assumes a dramatic increase in the income component.

EXHIBIT 2

Annual Year-End P/E Ratios 1926-2004



Note: Vertical axis on logarithmic scale. The horizontal line is drawn at 15.43, which is the median PE ratio for the period.

P/E Ratio Effect

Everyone recognizes the volatility in the P/E ratio. Note that while the ending P/E reported by Ibbotson and Chen for the year 2000 was 25.96, it had declined by 2004 to 20.70. As of mid-2005, the P/E ratio for the S&P 500 using forecasted 2005 earnings was around 16.30. This is clearly lower than recent P/E ratios, which were in the 20s, and modestly above the long-term average for this variable.

Exhibit 2 shows the P/E ratios for 1926-2004. One fact that clearly stands out is that, from a long-run perspective, P/E ratios above 20 are relatively rare except for the period since 1991 (1930s data are distorted because of extremely low earnings).[13] On an overall basis, this supports the case for a valuation-neutral model for estimating stock returns unless the P/E ratio declines to unusual lows, as was the case in the mid-1970s.

In order to better understand the effect of the P/E ratio on stock returns, consider a period when market valuations were flat on a beginning and ending basis. The P/E ratio was 18.39 in 1972 and 18.14 in 1995, essentially no-change. Dividend yields were also very similar at 3.09% and 3.00%, respectively. The actual geometric mean stock return for this period was 12.13%. Looking at the components, geometric means were: for price appreciation 7.78%; for dividend yield 4.16%; for earnings growth 1.97%; and for the CPI 5.64%. The components go together to produce:

$$12.11\% = [(1+5.64\%)(1+1.97\%)-1] + 4.16\% + 0.23\% \quad (10)$$

EXHIBIT 3

Estimates of the Expected Return on the S&P 500 Index Over Intermediate Periods Under Varying Assumptions

	CPI	Real EPS Growth Rate	Annual Growth in P/E	Income	Reinv.	Estimated Equity Return
Historical Return: 1926-2004	3.04%	1.72%	0.90%	4.11%	0.23%	10.10%
Estimates:						
Adjusted Conditions:						
A. Changes in Real Earnings Growth, No Changes in P/E						
1. Inflation of 3.1% and Income of 2.30%*	3.10%	1.72%	0	2.30%	0.23%	7.40%
2. (1) + real EPS growth of 3.50%	3.10	3.5	0	2.30	0.23	9.24
3. (1) + real EPS growth of 5.00%	3.10	5.0	0	2.30	0.23	10.79
B. Changes in P/E Ratio, No Changes in Real Earnings Growth						
4. (1) + P/E growth of 2.50%/yr	3.10	1.72	2.50	2.30	0.23	10.03
5. (1) + P/E growth of 3.75%/yr	3.10	1.72	3.75	2.30	0.23	11.34
6. (1) + P/E growth of 5.00%/yr	3.10	1.72	5.00	2.30	0.23	12.65

** Assumes repurchase of shares adjustment of 0.5; CPI number based on recent survey data of multiyear expectations.*

As we can see, there is no P/E effect here. Average stock returns were determined by a combination of inflation, real earnings growth, dividend yield, and reinvestment return. The impact of inflation is particularly notable in these years.

Now consider the opposite extreme, when the P/E approximately doubled, from 1990 to the end of 1999, from 15.47 to 30.50. In this case, the actual geometric mean stock return for the period was 18.19%. Looking at the components, geometric means were: for price appreciation 15.31%; for dividend yield 2.63%; for earnings growth 4.65%; and for the CPI 2.93%. During this period the P/E growth rate was 7.05% per year on a compound basis, an extraordinary rate of change. The components go together to produce:

$$18.15\% = [(1+2.93\%)(1+4.65\%)(1+7.05\%)-1] + 2.63\% + 0.21\% \quad (11)$$

It is obvious from (11) that growth in the P/E ratio and growth in real earnings were the driving factors for average stock returns during the 1990s. Inflation was slightly below its long-term average, and the income component was significantly below its long-term average.

As one can see from these two examples, the P/E effect on stock returns can be strong or non-existent. On a very long-run basis, it is in all probability going to be modest, as was the case for 1926-2004. One can justify leaving the P/E out of a long-term analysis of supply factors affecting equity returns, but on an intermediate-term forecast basis it may well need to be included.

Reasonable logic would suggest that the higher the P/E ratio is currently, the less likely it is to be even higher some time in the future. For example, as we saw above, the P/E doubled from the beginning of 1990 to the end of 1999, but there is incredibly little likelihood of it doubling from there.

In another example that might apply for someone making an intermediate-term forecast of the equity return, assume an increase is expected for the P/E ratio over a five-year period from 17 to 21. Also assume inflation and real growth in earnings at 3.10% and 1.87% (the 1980-2004 growth rate), and the income component at its current adjusted level of 2.30% (that is, it includes the repurchase adjustment). Given these assumptions, the expected equity return would be 12.10%. This is a higher expected return than that produced by tripling the historical growth in real earnings to 5.25% but assuming no change in the P/E ratio:

$$12.10\% = [(1+3.1\%)(1+1.87\%)(1+4.32\%)-1.0] + 2.30\% + 0.23\% \quad (12)$$

Exhibit 3 illustrates these calculations by showing some combinations of real earnings growth and growth in the P/E ratio, leading to a contribution by the P/E factor. It is clear that assuming some rise in the P/E ratio over some intermediate period that may be entirely appropriate in the view of the model user will have a substantial impact on any estimate of intermediate sustainable equity returns.

CAVEATS, DISCLAIMERS, AND CAUTIONS

If we look at some of the examples of estimating equity returns, we might think estimation is relatively simple. Consider, however, some salient points.

First, the supply-side model was developed on the basis of very long-term returns, both ex post and ex ante. It is not clear how adaptable the model is to intermediate-term estimates.

Second, Arnott and Asness [2003] discuss three assumptions made by Ibbotson and Chen including: market efficiency; that Miller and Modigliani propositions hold intertemporally; and that expected market returns do not vary through time. They note that Ibbotson and Chen's reasoning and set of assumptions are clearly rejected by their own empirical work.

Third, hindsight always makes forecasts easier. It seems obvious now that dividend yields are significantly lower than the long-term average, but was it that obvious at the beginning of the 1990s? For the two prior decades, the 1980s and the 1970s, the yields had been 4.6% and 4.2%, respectively. Furthermore, how likely is it that most users would have correctly forecast that real earnings growth would increase by 4.5 percentage points over the decade of the 1990s?

Fourth, how long will a change in the model's long-term values last? The rate of inflation is a good example. A lower rate of inflation has been a hallmark of the last years of the 20th century and the early years of the 21st century. The annual (geometric) rate of inflation between 1999 and 2004 was approximately 2.5%. All survey-based long-run inflation forecasts since 1997 have consistently ranged around an average rate of about 2.5%. Therefore, a model user making an intermediate estimate of equity returns for the S&P 500 index during this period could justify such a rate in the model. By August of 2005, however, we had seen a higher rate of inflation; for the 12 months July 2004 to July 2005, the rate of increase in the CPI Index was 3.17%. Needless to say, survey data vary depending on the survey and time period considered, and vary from the most recently recorded annual rate of inflation.

Despite such caveats, we believe the supply-side approach is extremely valuable for both understanding historical stock returns and making estimates of long-term sustainable equity returns. Moreover, we believe it provides a valuable framework for making disciplined estimates of expected equity returns. It helps the user identify the relevant factors that affect the equity return and allows the user to make specified changes in the long-run values after analyzing and justifying why such changes are warranted. While users must still be cautious in making estimates using this model, this is always the case in estimating equity returns.

CONCLUSIONS

The supply-side model of equity returns developed by Ibbotson and Chen offers a valuable methodology for both understanding long-term average equity returns and estimating a long-run and sustainable equity return. Properly understood and used, it also offers a framework for making intelligent assessments of the expected equity return for intermediate periods.

The supply-side model is based on the fundamental building blocks of average equity returns. By restating the basic model in terms of an earnings model, we make the P/E ratio and the real growth rate in earnings part of the model. Most investors would agree that these are critical variables in understanding and estimating average equity returns.

We illustrate application of the supply-side model using updated data through 2004. We show that the model can be used as a disciplined framework for organizing and making more intermediate-term estimates of the expected equity return. While there is likely less precision agreement in intermediate estimates as opposed to the long-term sustainable estimate that Ibbotson and Chen produce, it is reasonable to use the supply-side approach as a framework for making estimates of the expected equity return for some period. The value of this approach is in the discipline it imposes on users to think carefully about changes in the parameters of the model when they make their estimates. Users can concentrate on the assumptions rather than the model itself.

While such an approach can be extremely valuable in estimating the expected equity return, in no way is it a simple solution to estimation. Consider interval estimates of the boundaries of returns over various investment horizons. Although the limits narrow as the investment horizon lengthens, there is great variability in the series. Even with our assumption of a constant expected return, the confidence intervals are quite wide. And assuming time-varying expected returns, the variability increases even more.

Issues remain with the supply-side approach just as in any other approach. The difference is that here the

critical issues are clear, and the assumptions the model user makes are transparent.

ENDNOTES

The authors thank a reviewer for several excellent suggestions that significantly improved this article.

[1]Ibbotson and Chen [2003] made an important contribution to our understanding of stock returns.

[2]This equation is taken from Ibbotson and Chen [2003].

[3]Our estimate of reinvestment and interaction effects is consistent with the estimates of Ibbotson and Chen.

[4]Following Ibbotson and Chen, these equations are stated on an additive basis. Multiplication is appropriate when combining geometric means, after adding 1.0. Including the reinvestment term in these equations makes it possible for the equations to produce accurate results on an additive basis.

[5]Ibbotson and Chen use the same data set, updated through 2000. All calculations in the article begin in 1926 to correspond with the beginning point of the Ibbotson Associates data.

[6]Ibbotson and Chen calculate that the annual geometric mean rate of return on the S&P 500 index for 1926-2000 was 10.7%.

[7]S&P earnings for the S&P 500 begin as of February 1957 when that composite index was formed. Earnings estimates for 1926 through 1941 are based on estimates by Alfred Cowles, who followed the methods of the Standard Statistics Co. (which merged with Poor's). In all cases, the earnings are for year-end for the corresponding year-end price. Ibbotson and Chen use exactly the same earnings series.

[8]Ibbotson and Chen calculated real earnings growth of 1.75% and growth in P/E of 1.25% for 1926-2000.

[9]We are much indebted to the reviewer for raising this point. As a result, we were able to revise our exposition and take account of this important issue in ways we had not originally. The reviewer's contributions in this regard significantly improved our work; any oversight with regard to this issue represents our shortcomings.

[10]The argument here is that stock buy-backs primarily involve shares issued to executives through stock option programs.

[11]See Ilmanen [2003, p. 17].

[12]Bernstein and Arnott [2003] argue that earnings must grow more slowly than GDP because GDP growth depends in part on the growth of new companies, which does not enhance the earnings growth of established companies.

[13]In 18 years there is a P/E ratio of over 20; the upper quartile of the distribution includes all the years from 1996 through 2004. We know that the P/E for 1933 was severely distorted because of the low earnings.

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