

Asset Allocation/ Equity Selection

September 2001

Explanation of the Comparative Values Models

Asset Allocation

The first investment decision is the allocation of resources among financial assets—stocks, bonds and cash-equivalents/the money market. This is done even before one chooses specific instruments within each asset. How do you select among assets?

In fact, you do not decide in any *absolute* sense if stocks are cheap, or bonds are cheap, or cash. What you do is compare the relative attraction of one asset with the others. If in fact all are cheap, you buy the cheapest, and if none are cheap, you select the least costly. What you compare is the *expected* rate of return from each asset.

In the models, first the market's expected return for each asset is calculated. For the fixed-income markets, where the price is known and future payments (the coupon) are known, the expected rate of return is the yield to maturity at a given price. The expected return from stocks is calculated from expectations of dividends, earnings and growth rates. Based upon the expectations and the price of the market (S&P 500), the *implicit* expected rate of return for the stock market is calculated.

Risk and Return

In Chart 1, the thick line plots the expected return from stocks. The thin line plots the yield on 13-week Treasury bills. Now we can compare the expected return of the stock market to the expected return—the yield—from T-bills.

What we want to know is: If there is more, how much *more* return is received for taking the risk of investing in stocks as compared with the safety of investing in U.S. Government issue Treasury bills? How much premium, or extra return, are we getting for taking the risk of investing in stocks—or, what is the “equity risk premium?”

Chart 2 subtracts the yield at each point on 13-week T-bills from the corresponding expected return on the S&P 500 and plots the equity risk premium versus T-bills at each point in time. The solid line labeled “average” is the average risk premium over the past 20 years. So, by definition, whenever the actual risk premium plotted is above the average risk premium, an investor receives an above-average return, or premium, to be in stocks relative to T-bills, and, therefore, stocks are relatively attractive. When the risk premium is below average, an investor receives a below-average risk premium to be in stocks, and, therefore, stocks are unattractive relative to T-bills.

In Chart 3, we have translated this risk premium series into a probability series of stocks outperforming T-bills. The average risk premium corresponds to a 50%, or neutral, probability. As the risk premium goes above average and the attraction of stocks increases correspondingly, the probability of stocks outperforming T-bills increases; as the risk premium goes below average, the probability decreases.

In addition to the risk premium relationship analyzed between stocks and T-bills, we analyze the relationships between stocks and bonds (Charts 4-6) and between bonds and T-bills. By combining these asset allocation probabilities, an asset weighting strategy is developed based upon the probability that any given asset is the top performing asset (see Chart 7).

These “theoretical” asset weightings are for an unconstrained/flexible portfolio, i.e., where each asset—stocks, bonds and cash—can range from 0% to a 100% weighting. The suggested weightings for a “typical” account (i.e., an account with narrower permissible ranges) are also calculated.

Chart 1: Expected Rate of Return—S&P versus 13 week U.S. Treasury Bills

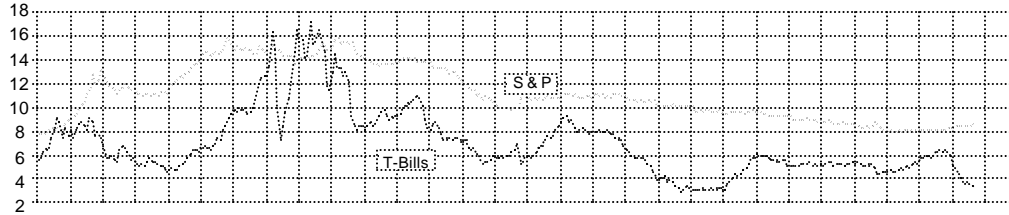


Chart 2: Risk Premium—Stocks versus Cash

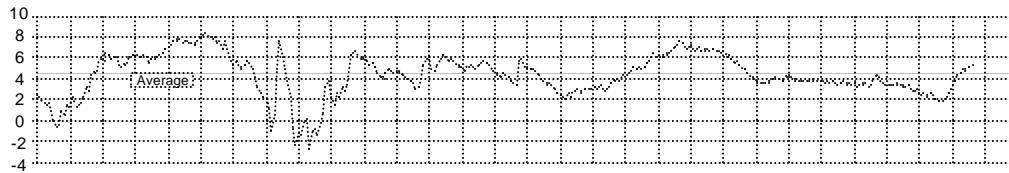


Chart 3: Probability of Stocks Outperforming Cash

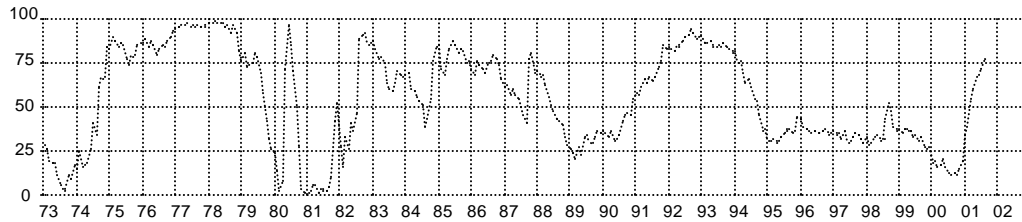


Chart 4: Expected Rate of Return—S&P versus 10-Year U.S. Government Bonds

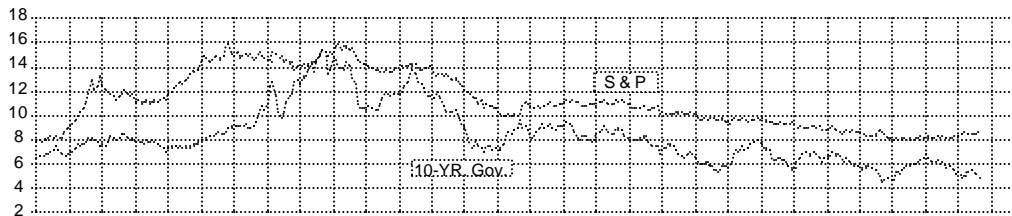


Chart 5: Risk Premium—Stocks versus Bonds

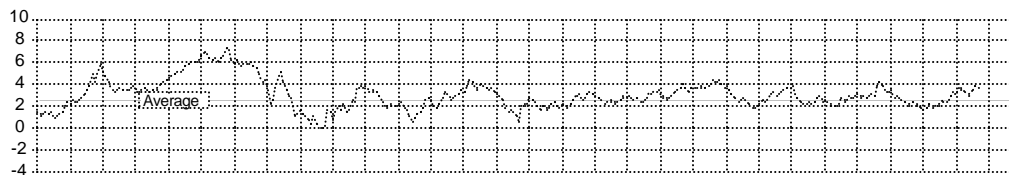


Chart 6: Probability of Stocks Outperforming Bonds

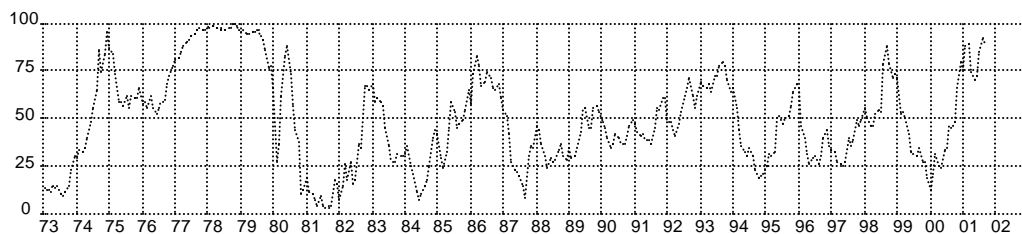


Chart 7a: Suggested Balanced Account Weight

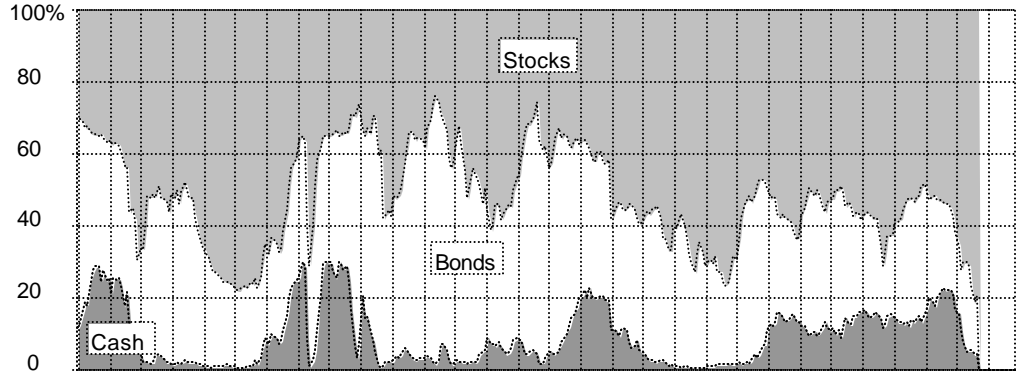


Chart 7b: Suggested Equity Account Weight

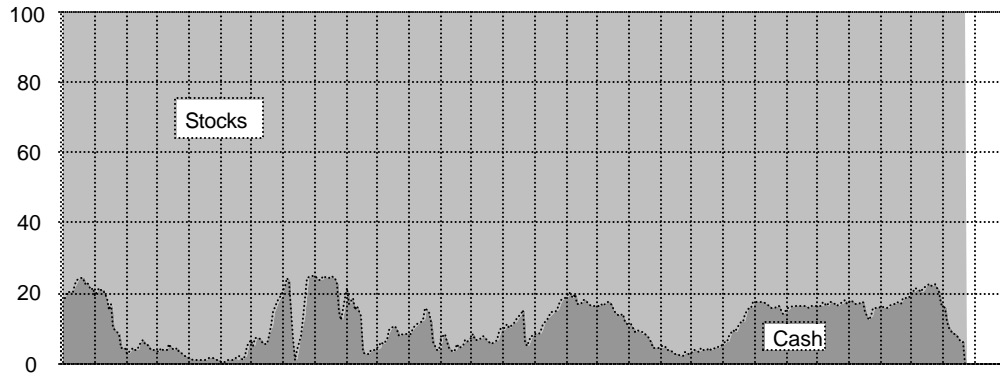
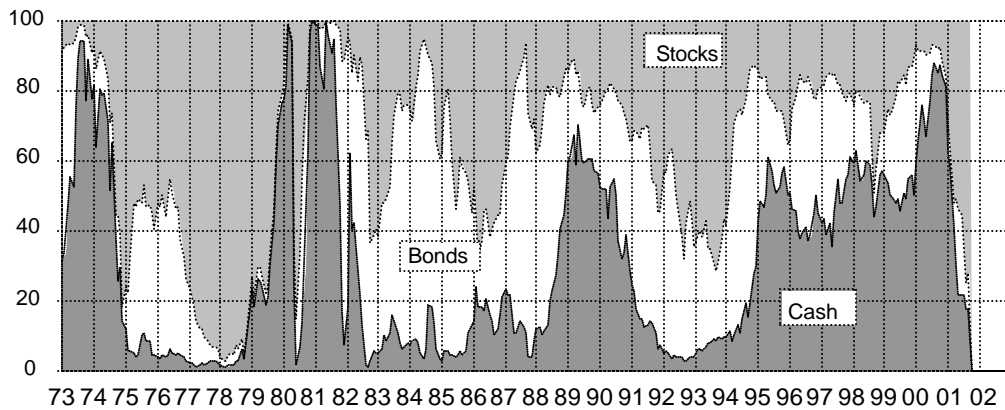


Chart 7c: Probability of Top Performance*



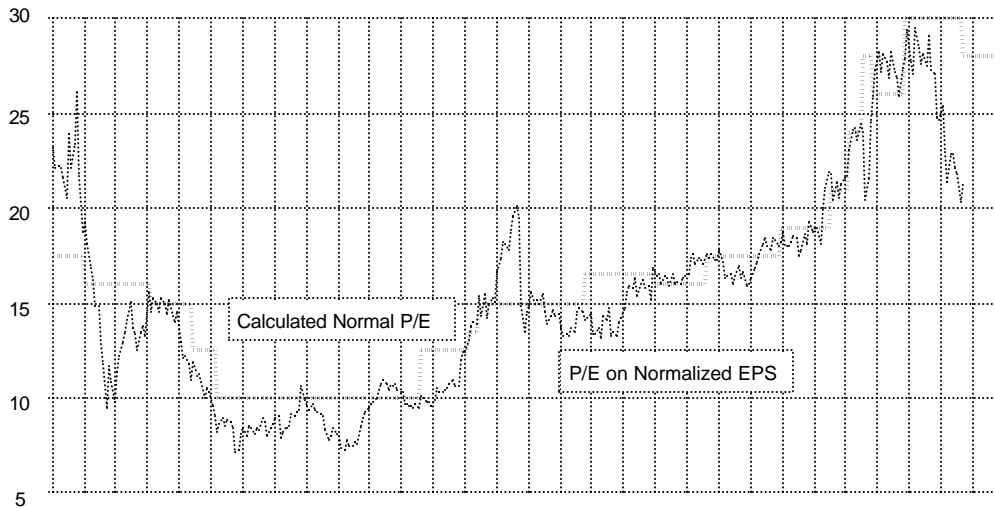
*Flexible/Asset Allocation account weights.

Suggested balanced account weightings today are based upon a portfolio where maximum stock weightings are 100%, minimum 40%, bond weightings are 75% maximum and 10% minimum, and maximum cash weightings are 25%, minimum 0%. Suggested equity account weightings are based upon a portfolio where maximum stock weightings are 100%, minimum 75%, and maximum cash weightings are 25%, minimum 0%.

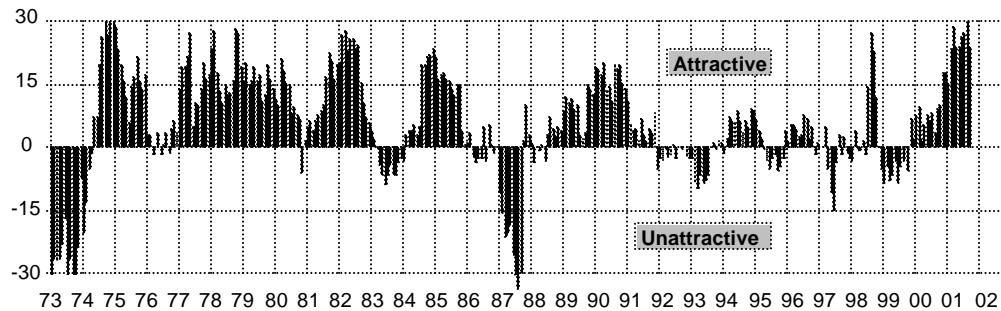
The S&P P/E Valuation Model

Using a rearrangement of the classic dividend discount model (see Appendix B), the normal P/E for the market (S&P 500) is calculated based upon expectations of inflation, growth rate and dividend payout ratio. The current P/E on normal EPS for the S&P 500 is then compared to that calculated normal P/E. The greater the percent appreciation potential to normal value, the more *attractive* are stocks. The greater the percent *depreciation* potential to normal value, the more *unattractive* are stocks.

S&P 500



P/E on Normalized EPS—Percent deviation from Normal Value



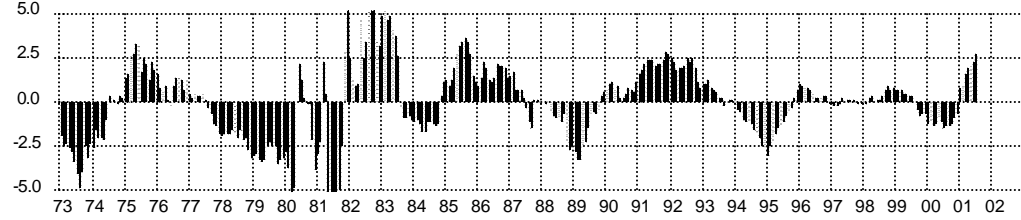
Liquidity and Earnings Power

Liquidity: 13 week T-bill; year-over-year basis point change (inverted).

Earnings Power: Operating S&P 500 EPS percent deviation from normal EPS.

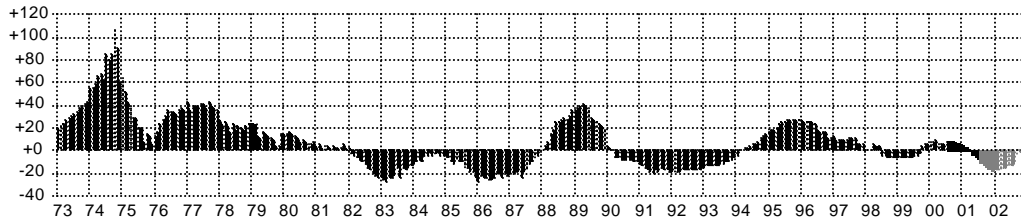
Liquidity

13-week T-bill; year-over-year basis point change (inverted)
100 bps



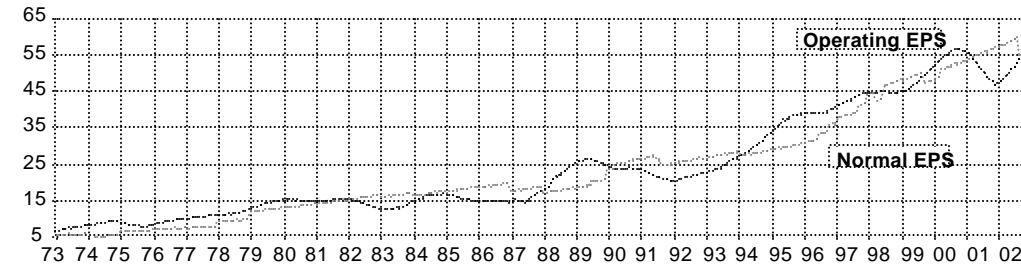
Earnings Power

Operating S&P 500 EPS percent deviation from normal EPS



S&P Earnings

Actual operating EPS (2001, 2002 estimates) and normal EPS



Equity Valuation

Comparative or relative valuation is the methodology we use in all our valuation work. First, in looking at the aggregate market, we want to determine a value—or expected return—for the market that is fair value relative to the stock market’s competition. For the stock market, the competition is the alternative investments—bonds and cash equivalents.

Now, given an asset allocation decision—stocks, bonds or the money market—the next question is one of equity selection. Which stocks within the stock market should an investor buy? The approach taken here is “value.”

Up to this point, in looking at the overall market, we have used “expected return” as a measure of value. A more traditional gauge of equity value is the price/earnings ratio. In fact, P/E and expected return are related, and one is easily calculable given the other (see Appendix C).

Assuming that we have determined that the stock market as a whole does offer a fair return relative to the alternative investments, and that we have also calculated the “fair” or “normal” average stock market P/E suggested by that fair or normal expected return, we now want to determine what P/E to pay for specific stocks.

Basically, the faster a stock’s earnings per share grow in the future, the higher the price—the P/E ratio—you would pay for those earnings. For stocks with growth higher than the average (or market) growth rate, you would pay higher than the average (or market) P/E; for those with growth below the market, you would pay a lower P/E. The mathematical approach we use to calculate this fair P/E is called an “earnings payback” model. (The formulas, explanation and academic references are in Appendices B and C.)

One way to state that fair P/E value for a given level of growth is as a percent of the average or market P/E—the relative price to earnings ratio. For example, paying a 56 P/E for a stock versus a 28 P/E for the average (or market) stock would mean paying 200% relative P/E, the 56 times P/E being 200% of—or twice—the market’s P/E.

Given the methodology for calculating a P/E for a given growth rate, that growth forecast still needs to be made. And given the growth forecast and the fair P/E that the growth rate suggests, one still needs a forecast of normal, or mid-cycle, earnings power to multiply the P/E by to calculate a fair value.

$$\text{Calculated Normal P/E Ratio} \quad \times \quad \text{Normal Earnings Power} \quad = \quad \text{Calculated Value}$$

By calculating the “fair value” of a stock and determining the potential gain if the stock should move from its current price to its “fair value” (and adding the dividend yield), we calculate the potential return from a given stock. By examining a stock’s potential return relative to the average (or market) potential return, we have what has been an effective index of relative attraction. Included in the Comparative Values report is an array of stocks in an excess return distribution of relative attraction.

Price Trend

The above approach to fundamental value has been an effective predictor of future price direction in stocks. The weakness in the approach, however, has been timing. Over the efficient horizon of the value model—six to twelve months—those stocks identified as undervalued/high potential will tend to outperform the average (or market) stock, and those identified as overvalued/low potential will tend to underperform. However, during that efficient time horizon cheap stocks can get cheaper and expensive stocks can get more so.

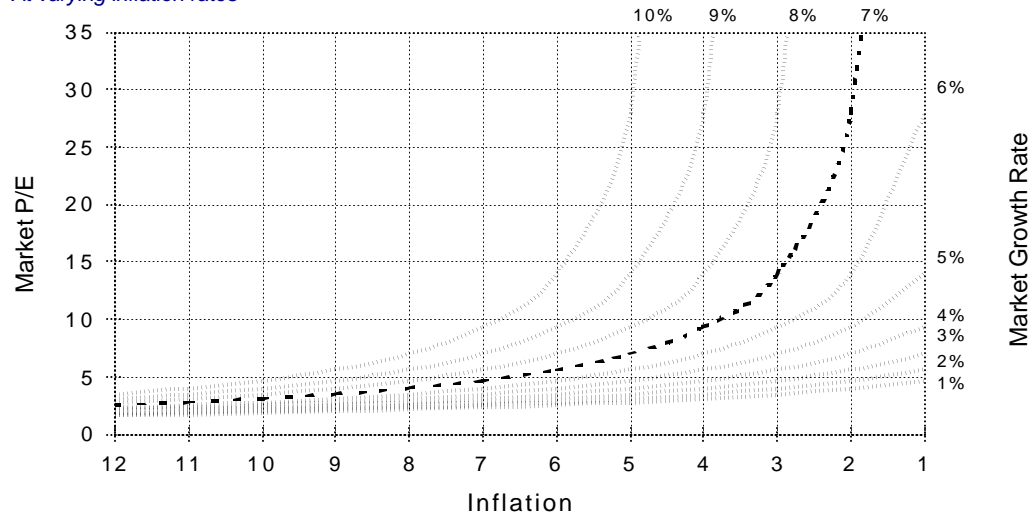
A moving average technique called exponential smoothing (see Appendix E) measures the price trend. This measure of trend over the recent past is in fact a predictor of trend over the near-term future—two to four months.

Investment Strategy Pyramid

This price momentum predictor is then overlaid on the longer-term fundamental value indicator (see Chart E-1 in Appendix E for a layout of the display) in the Investment Strategy Pyramid.

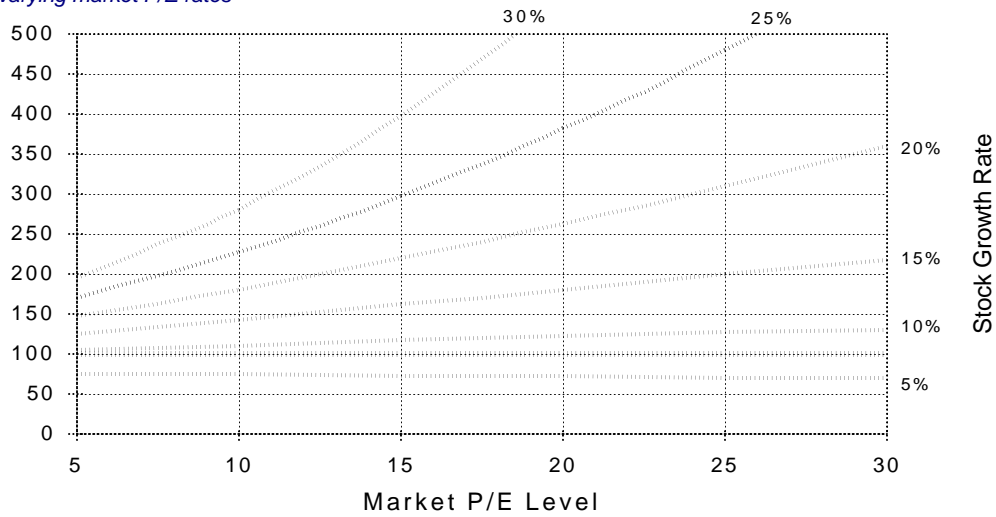
Market P/E Levels

At varying inflation rates



Relative P/E

At varying market P/E rates



Appendix A

Asset Allocation

Explanation of the Model

Asset Allocation Model

The Asset Allocation Model identifies the relative attraction of three asset classes—cash equivalents/money-market, fixed income and equity—by examining the expected rate of return of representative instruments.

Expected Rate of Return for Cash Equivalents (T-bills)—Source: Board of Governors of the Federal Reserve System. Data represent coupon equivalent yield of discount rates on new three-month bills issued.

Expected Rate of Return for Fixed Income (Government Bonds)—Source: Board of Governors of the Federal Reserve System. Data represent yield on Treasury securities at a constant maturity.

Expected Rate of Return for Equity (S&P 500)—Based upon forecasts of expected normalized earnings, dividend and earnings growth rate, the expected rate of return is calculated as follows:

Expected Rate of Return is R, given that P = current price, D = current normalized dividend, and g = secular long-term growth rate.

$$P = \sum \frac{D(1+g)^t}{(1+R)^t}$$

By examining these respective measures of investor expected return rates, the premium expected return (risk premium) from one instrument versus another is determined. Comparing current relationships with normal average levels and the range about an average, the relative attraction of a given instrument versus another is determined.

The probability that any deviation from average is meaningful can then be established by examining the distribution of risk premiums historically. The greater the actual deviation from average (relative to historical standard deviation), the greater the probability.

The Asset Weighting model combines the underlying three asset classes and assigns percent weightings of stocks, bonds and cash-equivalents. It is assumed that:

1. The percent weighting allocated to any asset class can range from 0% to 100%.
2. In equilibrium, the weightings for each class would be 33%.

The goal of the asset weighting model is both to maximize total return and minimize potential loss. Obviously, a goal that would maximize total return with no risk aversion would 100% weight the most attractive (highest probability) asset, i.e., a probability of 51% would suggest the same 100% weighting that a 100% probability would. The approach taken here minimizes the variability of return that would result from an “all or none” approach, while taking advantage of relative opportunities between asset classes to provide a higher return over the longer term than any single asset would.

Note: assumptions 1) and 2) can be modified to any given portfolio guidelines and suggested weightings generated accordingly.

The Asset Weighting Formula

Given three asset classes X, Y, Z

Defining

$P(X. v. Y)$ = the probability of asset X outperforming asset Y

$P(X. v. Z)$ = the probability of asset X outperforming asset Z

$P(Y. v. Z)$ = the probability of asset Y outperforming asset Z

$W(X)$ is the weighting of asset X

$$W(x) = \frac{P(X.v.Y) \times P(X.v.Z) + P(X.v.Z) \times P(X.v.Y) + 1 - P(Y.v.Z) \times P(Y.v.X) - P(Z.v.Y) \times P(Z.v.X)}{3}$$

where

$$P(A.v.B) = \mathbf{CND}[\text{rp}(AB), \overline{\text{rp}}(AB), \text{sd}(AB)]$$

CND is the Cumulative Normal Distribution Function

$\text{rp}(AB)$ is the current risk premium of asset A versus asset B

$$= r(A) - r(B)$$

$r(A)$ is the expected return of asset A

$r(B)$ is the expected return of asset B

$\overline{\text{rp}}(AB)$ is the mean risk premium of asset A versus asset B

$\text{sd}(AB)$ is the standard deviation of the risk premium of asset A versus asset B

Appendix B

Equity Valuation

Explanation of the Model

The Comparative Values equity valuation model is based upon an earnings payback methodology. The model analyzes the relative attraction of individual stocks, industry groups and economic sectors.

The Valuation Model

The Market P/E Model

The S&P 500 index is used as a representative market index. A long-term secular normal P/E for the aggregate market is assigned:

$$\text{Market P/E} = \frac{\text{Dividend Payout Ratio}}{\text{Equity Discount Rate} - \text{Earnings Growth Rate}}$$

The current dividend payout ratio is 28%, the expected return—the equity discount rate—is 8% (reflecting the sum of a 6% real return and a 2% secular inflation expectation) and the earnings growth rate is 7.0% (reflecting a 9.7% return on equity and a 72% retention rate).

$$\text{Market P/E} = \frac{0.28}{0.08 - 0.07} = 28.0$$

The Stock P/E Model

While a dividend discount/rate of return model is used to assign a normal P/E level to the aggregate market, an earnings payback model is used to assign P/Es for individual stocks because of the difficulty in establishing reliable long-term inputs for individual companies (particularly dividend levels for high-growth companies).

Earnings payback requires the determination of the time period to payback or the recouping of the initial investment through the stream of earnings. Given a growth rate of 7.0%, the expected earnings stream from the market is 1.07, 1.145, 1.225, etc. That stream will sum to \$28.00 in 15.4 years. Since the derived assigned P/E for the market was 28.0, the original cost is paid back in 15.4 years. By definition, 15.4 years is the market's payback period.

If an individual stock, for example, were to grow at 20%, the expected earnings stream is 1.200, 1.440, 1.728, etc. That stream will sum to \$93.16 in 15.4 years, the market's payback period. Therefore, if the average (or market) stock growing at 7.0% is worth a P/E of 28.0, then a stock growing at 20% is worth a 93.2 P/E, so that it will return the initial investment in the market's payback period.

By requiring payback through earnings in the derived market's payback period (15.4 years), the rate of return for the market average is obtained.*

For any given growth rate, a P/E can be assigned so that the stock will return the initial investment in the market's payback period. Table B-1 shows assigned P/Es for growth rates from 0% to 20%.

Given the assigned P/E for a given growth rate, two adjustments are made:

1. A premium for above-average dividend payout ratio and a discount for below-average dividend payout ratio at a given growth rate.
2. A premium for below-average earnings volatility and a discount for above-average earnings volatility.

Adjustments for Dividend Payout

A premium or discount for a dividend payout ratio above or below normal is calculated in order to equalize invested capital at the end of the market payback period.

The market (S&P 500), given a growth rate of 7.0% and dividend payout ratio of 28%, would have a normal yield (given the 28.0 P/E derived previously) of 1.0%, since the yield is equal to the payout ratio divided by the price/earnings ratio ($0.28/28.0 = 0.01$).

For a payout ratio differing from market average, a different yield is found. For example, at 7.0% growth, given the 28.0 P/E, a 65% payout ratio would imply a 2.3% yield. At this 65% payout, there is a yield premium of plus 1.3% ($1.023/1.01 = 1.013$).

Compounding the dividend premium for the 15.4 year payback period, the terminal premium amount of invested capital is 22.1% ($=1.013083^{15.4}$). To equalize terminal invested capital, a 22.1% higher P/E would be paid initially for a 65% payout ratio, given a 7.0% growth rate in both cases. Table B-2 shows premiums and discounts for dividend payout ratios.

Adjustments for Earnings Volatility

Earnings volatility greater than the market's implies greater risk than the market's. Given historical normal earnings volatility for the market of 25% (deviation around a trendline), a stock with 35% earnings volatility implies 10% greater downside risk. If the initial P/E paid is reduced by 10%, risk would be equalized. Similarly, a premium is assigned for earnings volatility less than the market to reflect a reduction in earnings risk. Table B-3 displays premiums and discounts for earnings volatility.

*For a discussion of this relationship see "The Savings Investment and Valuation of a Corporation," *Review of Economics and Statistics*, Vol. XLIV (February 1962), and "The Payoff Period and the Rate of Profit," *University of Chicago Journal of Business*, Vol. XXVIII, No. 4.

Normal Earnings

Having developed a normal P/E for any given growth rate and made adjustments for dividend payout and earnings volatility, a unique normal P/E is assigned for a given stock. In order to calculate normal value, the normal assigned P/E is multiplied by normal earnings. Normal earnings are defined as earnings in mid-cycle, eliminating fluctuations due to seasonal or cyclical factors.

Example

XYZ Corp. has the following inputs:

12% Projected normal earnings growth rate
 25% Projected dividend payout ratio
 15% Projected earnings volatility
 \$3.50 Normal earnings for the year ending 12/31/02

- From Table B-1, a P/E of 44.0 is assigned for 12% growth rate.
- From Table B-2, a 1.3% premium is assigned for a 25% payout at 12% growth.
- From Table B-3, a 10% premium is assigned for earnings volatility of 15%.

Given:
 Premium for dividend payout +1.3%
 Premium for earnings volatility +10.0
 Net Premium +11.3%

Given:
 P/E for 12% growth 44.0
 Adjustment for premium x1.113
 Assigned normal P/E for XYZ 49.0

Given:
 Normal earnings 12/31/02 \$3.50
 Assigned normal P/E x49.0
 Calculated normal value \$171.50

If, for example, on 12/31/01 XYZ is selling at \$50, the potential percent gain to normal value is 243.0%.

Normal value \$171.50
 Current price -50.00
 Potential gain \$121.50

Potential percent gain = $\$121.50 / \$50.00 = 243.0\%$

If XYZ had a current dividend yield of 3.6%, it would have a potential total return of 246.6% (243.0% potential gain plus 3.6% yield).

If, for example, the S&P 500 on 12/31/01 had a calculated potential total return of 15.0% (calculated the same way as for XYZ, given inputs for the S&P 500), the excess potential return would be 231.6%.

XYZ potential total return	246.6%
S&P 500 potential total return	<u>-15.0%</u>
XYZ excess potential return	231.6%

Ranking Stocks by Value

Ranking stocks by excess potential return produces a list of stocks in order of relative attraction. The most attractive stocks have the highest excess potential return, and the least attractive the lowest excess potential return. Ranking stocks by excess potential return has been, based upon actual experience, an effective predictor of future relative price performance for stocks.

Table 1: Normal P/E Multiples

Given normal market P/E = 28.00

Normal market growth rate = 7.0

Payback period = 15.4

Growth rate	Normal P/E	Growth rate	Normal P/E	Growth rate	Normal P/E
0.0%	15.4x	7.0%	28.0x	14.0%	53.0x
0.5	16.0	7.5	29.3	14.5	55.5
1.0	16.7	8.0	30.6	15.0	58.2
1.5	17.4	8.5	32.0	15.5	60.9
2.0	18.2	9.0	33.5	16.0	63.9
2.5	18.9	9.5	35.0	16.5	66.9
3.0	19.8	10.0	36.7	17.0	70.2
3.5	20.6	10.5	38.4	17.5	73.5
4.0	21.5	11.0	40.2	18.0	77.1
4.5	22.5	11.5	42.1	18.5	80.8
5.0	23.5	12.0	44.0	19.0	84.7
5.5	24.5	12.5	46.1	19.5	88.8
6.0	25.6	13.0	48.3	20.0	93.2
6.5	26.8	13.5	50.6		

Table 2: Premiums and Discounts for Dividend Payout Ratio

Given normal market payout rate = 28.00

Normal market growth rate = 7.0

Growth Rate	Dividend payout ratio											
	0%	5%	15%	25%	35%	45%	55%	65%	75%	85%	95%	100%
0.0%	-62.0	-60.1	-55.9	-51.4	-46.4	-40.9	-34.8	-28.3	-21.1	-13.2	-4.6	0.0
1.0	-55.3	-53.2	-48.7	-43.8	-38.5	-32.7	-26.4	-19.5	-12.1	-4.0	4.7	9.4
2.0	-48.2	-46.0	-41.3	-36.1	-30.6	-24.6	-18.1	-11.1	-3.5	4.6	13.4	18.1
3.0	-41.1	-38.7	-33.8	-28.5	-22.8	-16.7	-10.1	-3.1	4.5	12.6	21.3	25.9
4.0	-34.0	-31.6	-26.5	-21.1	-15.4	-9.2	-2.6	4.4	11.8	19.8	28.3	32.8
5.0	-27.0	-24.6	-19.5	-14.1	-8.4	-2.3	4.2	11.1	18.4	26.1	34.3	38.6
6.0	-20.4	-18.0	-12.9	-7.6	-1.9	4.0	10.4	17.0	24.1	31.5	39.3	43.4
7.0	-14.2	-11.8	-6.8	-1.6	3.9	9.7	15.7	22.1	28.9	35.9	43.4	47.2
8.0	-12.5	-10.3	-5.7	-0.8	4.2	9.5	15.1	20.9	27.0	33.4	40.0	43.5
9.0	-10.9	-8.9	-4.6	-0.2	4.5	9.4	14.4	19.7	25.2	31.0	36.9	40.0
10.0	-9.6	-7.6	-3.7	0.4	4.7	9.1	13.7	18.5	23.5	28.7	34.1	36.8
11.0	-8.3	-6.5	-2.9	0.9	4.8	8.9	13.0	17.4	21.9	26.6	31.4	33.9
12.0	-7.2	-5.5	-2.2	1.3	4.9	8.6	12.4	16.3	20.4	24.6	28.9	31.1
13.0	-6.2	-4.7	-1.6	1.6	4.9	8.2	11.7	15.3	18.9	22.7	26.6	28.6
14.0	-5.3	-3.9	-1.1	1.8	4.8	7.9	11.0	14.3	17.6	21.0	24.5	26.3
15.0	-4.5	-3.2	-0.6	2.0	4.8	7.6	10.4	13.3	16.3	19.4	22.6	24.2
16.0	-3.8	-2.6	-0.2	2.2	4.7	7.2	9.8	12.4	15.2	17.9	20.8	22.2
17.0	-3.2	-2.1	0.1	2.3	4.5	6.8	9.2	11.6	14.0	16.5	19.1	20.4
18.0	-2.6	-1.6	0.3	2.3	4.4	6.5	8.6	10.8	13.0	15.3	17.6	18.7
19.0	-2.2	-1.3	0.5	2.4	4.3	6.2	8.1	10.1	12.1	14.1	16.2	17.2
20.0	-1.7	-0.9	0.7	2.4	4.1	5.8	7.6	9.3	11.2	13.0	14.9	15.8

Table 3: Premiums and discounts for earnings volatility

Given normal market volatility = 25

Volatility*	Market volatility									
	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	
Premium/discount	+20.0	+15.0	+10.0	+5.0	0.0	-5.0	-10.0	-15.0	-20.0	

*Deviation of earnings about least squares trendline.

Appendix C

Equity Valuation Formulas

Calculated Normal P/E

Given:

- T_M = Market Payback Period
- G_M = Market Growth Rate
- PE_M = Market Normal P/E
- G = Growth Rate for a given stock
- PE_G = Normal P/E for a given growth Rate, G

Given T_M such that

$$\sum_{t=1}^{T_M} \frac{1}{(1 + G_M)^t} = PE_M$$

Then

$$PE_G = \sum_{t=1}^{T_M} \frac{1}{(1 + G)^t}$$

Premiums and Discounts for Dividend Payout

Given:

- POM = Market Dividend Payout Ratio
- PON_G = Normal Dividend Payout Ratio at Growth rate G
- PO = Dividend Payout Ratio for a given stock
- $DPD_{G,PO}$ = Premium or Discount for Dividend Payout at Growth Rate, G , and Payout Ratio, PO
- $Y_{G,PO}$ = Yield for a Given Growth Rate, G , and Payout Ratio, PO
- $Y_{G,PON}$ = Yield for a Given Growth Rate, G , and Normal Payout Ratio, PON

Then Given

$$PON_G = 100 - \frac{100 - POM}{1 - \frac{G}{G_M}} \cdot \frac{100 - POM}{1 - \frac{G}{G_M}}$$

for $G \leq G_M$

$$PON_G = POM - \frac{POM - G}{G - G_M} \cdot POM$$

for $G > G_M$

Then where

$$\begin{aligned} Y_{G,PON} &= PON_G/PE_G \\ Y_{G,PO} &= PO/PE_G \end{aligned}$$

Then

$$DPD_{G,PO} = \frac{\dot{\epsilon} (1 + Y_{G,PO}) \dot{u} T_M}{\ddot{\epsilon} (1 + Y_{G,PON}) \ddot{u}}$$

Premiums and Discounts for Earnings Volatility

Given:

$$\begin{aligned} V_M &= \text{Market Earnings Volatility} \\ V &= \text{Volatility for a Given Stock} \\ VPD_V &= \text{Premium or Discount for a Given Volatility, } V \end{aligned}$$

Then

$$VPD_V = V_M - V$$

Calculated Value

Given:

$$\begin{aligned} NEPS_t &= \text{Normal EPS for a given stock at time } t \\ VAL_t &= \text{Calculated Value for a given stock at time } t \end{aligned}$$

Then:

$$VAL_t = PE_G \times [PD_{G,PO} + VPD_V] \times NEPS_t$$

Appendix D

Price Momentum: Explanation of the Model

Price Momentum

Newton's Law of Inertia states that a body in motion tends to stay in motion—a body at rest tends to stay at rest. A similar rule has been suggested for stocks: a stock that is going up will continue to go up; a stock that is going down will continue to go down. This “persistence of trend” argument has been suggested under various names (relative strength, relative momentum, price momentum, etc.) with as many differing measures of trend (moving average, smoothed average, speed of change, etc.) as names.

Essentially any valid measure of trend in stock price will do. The key is to identify a pure trend and eliminate false trends. In the most exact form, change in price from tick to tick would establish a new trend at each tick. Yet this would be exceptionally volatile and never establish a pure or true trend. A measure of the change in a very long-term average of price—e.g., 200 days—would establish a long-term trend but might not adequately react to a break in trend in time to provide any valid investment information.

In order to measure a true trend, one needs two or more points that establish the basis for the trend; then by fitting a line to those points, a trend is determined by the slope of that line. The identification of valid points and the determination of the valid number of points is the key to measuring a true trend. The Price Momentum Model uses an exponential smoothing technique to estimate the true slope or trend of a stock's price. Exponential smoothing is a weighted moving average calculation used to estimate the current value of a time series. Calculating the slope of a stock's prices by this methodology and ranking by the slope as a measure of the stock's rate of change is an effective indicator of future near-term price direction.

The mathematics of the Price Momentum Model are detailed below. Assuming that the current price (X) is expressed as some previous price (A) plus the amount of gain (B) per period of time (t), then $X = A + B \cdot t$. Given B is the amount of change in price per period t, then B/A is the percent rate of change, or slope, in price.

Using an exponential smoothing technique, A and B are calculated where $S1_t$ is the first exponentially smoothed average at time t and $S2_t$ is the second exponentially smoothed average, each using a smoothing factor Z.

$$S1_t = Z \cdot X_t + (1-Z) \cdot S1_{(t-1)}$$

$$S2_t = Z \cdot S1_t + (1-Z) \cdot S2_{(t-1)}$$

and

$$A = 2 \cdot S1_t - S2_t$$

$$B = (Z/(1 - Z)) \cdot (S1_t - S2_t)$$

The choice of the smoothing factor, Z (usually between 0.01 and 0.33), is proprietary and determines the length of time in the trend measurement.

(See R.G. Brown, *Smoothing, forecasting and Prediction of Discrete Time Series*, Prentice Hall, 1963 for the proof of these mathematical relationships.)

Appendix E

Investment Strategy Pyramid: Explanation of the Model

While the Equity Valuation Model has proven a reliable indicator of future stock price direction over 6-18 months, for some investors this might be too long a period to be of optimum usefulness. Conversely, while the Price Momentum Model is useful over a shorter horizon, the limited life of the information and the attendant heavy turnover might make such an approach impractical as a stand-alone approach. While combining the two models will not produce an investment strategy panacea, it is useful for the “fundamental investor” to be aware of the price trend of stocks and for the “trend investor” to be aware of the fundamental value considerations.

The specific weighting/importance of each of the two factors will vary by user and by which factor currently is predominant in the market. In the Investment Strategy Pyramid display, all investors would prefer stocks on the top of the page versus the bottom. Investors more concerned with value in selecting stocks would lean toward the left hand of the page, while those concerned with momentum would lean toward the right hand of the page (for the unattractive stocks at the bottom of the page, worst value is toward the right, worst momentum toward the left).

Combining Value and Price Trend

Note that in the Investment Strategy Pyramid display (Chart E-1) the five boxes (#1, 2, 4, 7 and 11) along the upper left-hand diagonal are all headed with the title “best value,” then sliding down to the second left-hand diagonal, the title of those five boxes is “good value,” followed by “neutral value,” “poor value,” and last, “worst value”—a one through five ranking system by value.

Along the upper right-hand diagonal those five boxes (#1, 3, 6, 10 and 15) are headed, on the second line, “best momentum” (best price momentum), following down along the right-hand diagonal to “good momentum,” “neutral momentum,” “poor momentum,” and last, “worst momentum.”

What we have at the top of the page are stocks with better value and better momentum, and at the very bottom of the page those with lesser value and lesser momentum.

The box in the very middle at the far left (box 11) headed “best value” and “worst momentum” is at times the bane of valuation models. These stocks, because they are “best value,” are expected to outperform the market over the next 6-18 months, but noting that they are also “worst momentum” suggests that you might have to be very patient with these stocks. And if you have an investment horizon of less than 6-8 months, you might at times do better to choose “best value” with “neutral momentum” or “best value” with “good momentum,” where in the near term, these stocks would not be expected to underperform the market by virtue of their current momentum measure, and in the long term, would be expected to outperform the

market by virtue of their value. While “best value” and “best momentum” would appear to be a perfect choice, it is indeed rare that you can build a portfolio from this group (box 1). In fact, by the time a stock has built up “best momentum,” it usually is up enough that it is no longer “best value.” (And if in fact one particular stock is “best value”/“best momentum,” that is not a guarantee on that particular stock.)

Conversely, the box in the middle of the page at the far right (box 15) headed “worst value” and “best momentum” contains relatively overvalued, unattractive stocks. And while over the long term they would be expected to underperform, as indicated by their “worst value,” in the near term they might continue to outperform as indicated by their “best momentum.” This is never a group to buy, except for the most short-term oriented trader, but if already held, selling it might be premature. These stocks are to be watched closely for signs of deteriorating momentum. As the momentum slows and they move to “worst value” and “good momentum,” some selling is probably in order although they still have above average (better than neutral) momentum. But when they reach “worst value” and “neutral momentum” and then “worst value” and “poor momentum,” they are clearly to be avoided.

Viewing this display as a clock, with box 1 at 12:00, *buying* would be indicated between 9:00 and 12:00, *holding* between 12:00 and 3:00, *selling* between 3:00 and 6:00 and *avoiding* between 6:00 and 9:00. While clearly this is not an absolute decision rule, what this display is intended to provide for the fundamental value investor is an overlay of price momentum to fine-tune timing—and for the short-term trading/trend investor, a warning on fundamentals, so that when the trend changes, the investor does not stay too long.

The plus (+) and/or the minus (-) signs before a stock name signify a change in position since the previous week. The sign farthest from the name indicates a change in value since the previous week; the sign closest to the name indicates a change in momentum. Example:

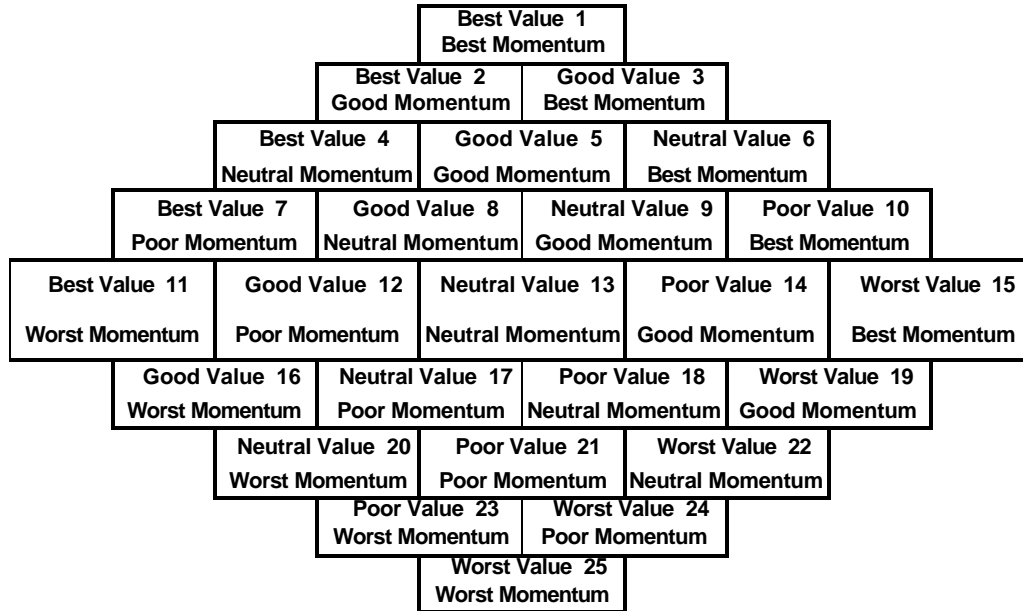
(+ - Gen Motors) indicates an increase in value, decreases in momentum.

(- Gen Motors) indicates a decrease in value, no change in momentum.

(+ Gen Motors) indicates no change in value, an increase in momentum.

(Gen Motors) indicates no change in value or momentum.

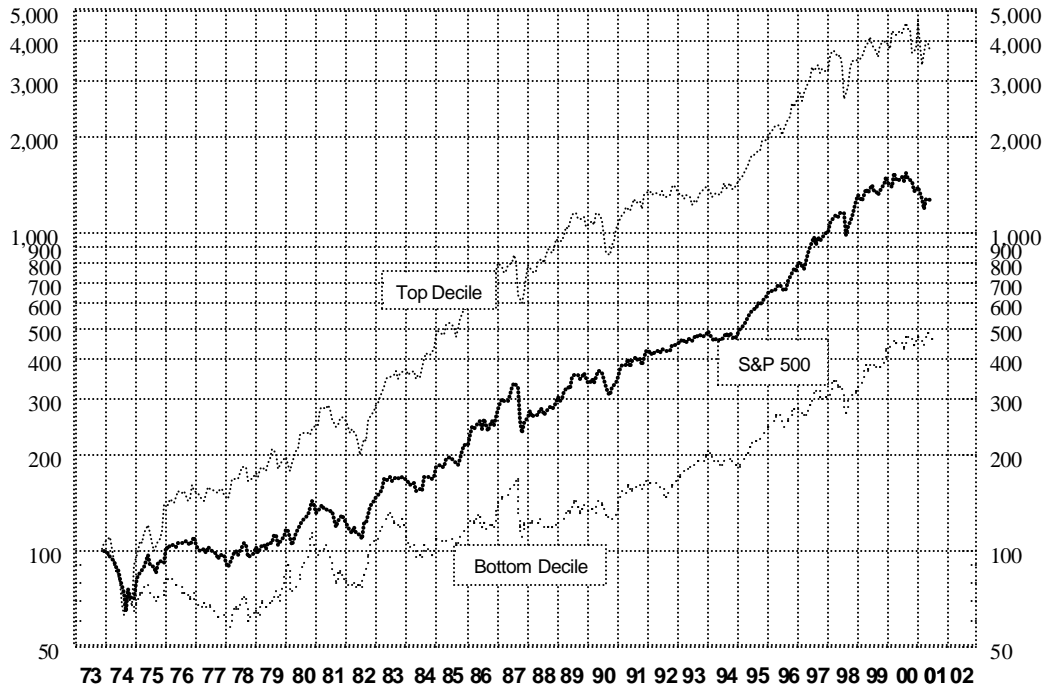
Chart E-1



Appendix F

Equity Valuation Model: Performance

Performance of the Comparative Values Equity Valuation Model



Percent change in price

	MAT¹	LAT²	S&P 500³
Compound Annual Rate	+14.0%	+5.7%	+9.6%

¹Performance of the most attractive decile of stocks with monthly reselection as of 6/30/01.

²Performance of the least attractive decile of stocks with monthly reselection as of 6/30/01.

³Performance of the S&P 500 index with monthly reselection as of 6/30/01.

Appendix G

Asset Allocation Model: Performance

	<i>Asset Allocation Model</i>					
	Balanced	Equity	Flexible	Stocks	Bonds	Cash
Total Returns						
1 Year	-4.87%	-10.93%	2.35%	-14.82%	10.39%	5.40%
3 Years	18.76	15.36	22.41	12.19	17.77	16.17
5 Years	75.81	87.21	55.20	95.95	46.10	28.55
10 Years	221.14	266.11	151.55	306.68	124.30	58.89
15 Years	428.16	537.56	303.18	613.49	216.71	122.06
20 Years	1306.51	1470.06	1049.31	1629.97	706.70	253.65
Since Inception (12/72)	2540.64	2809.33	2744.75	2731.95	949.15	583.44
Compound Annual Returns						
1 Year	-4.87%	-10.93%	2.35%	-14.82%	10.39%	5.40%
3 Years	5.90	4.88	6.97	3.91	5.60	5.12
5 Years	11.95	13.36	9.19	14.40	7.88	5.15
10 Years	12.37	13.86	9.66	15.06	8.41	4.74
15 Years	11.73	13.14	9.74	14.00	7.99	5.46
20 Years	14.13	14.76	12.99	15.32	11.00	6.52
Since Inception (12/72)	12.17	12.55	12.47	12.45	8.60	6.98
Standard Deviations of Annual Total Returns						
1 Year	11.06%	15.30%	5.60%	18.59%	5.93%	0.28%
3 Years	11.16	15.68	5.24	18.95	6.71	0.20
5 Years	10.40	14.43	4.84	17.43	6.31	0.15
10 Years	8.93	11.80	5.47	13.89	6.79	0.26
15 Years	9.14	13.48	6.15	15.64	6.86	0.40
20 Years	9.33	13.24	6.97	15.25	8.06	0.69
Since Inception (12/72)	9.55	13.73	7.85	15.67	7.97	0.76

**Periods ending 06/30/01

Chart G-1: Balanced Portfolio

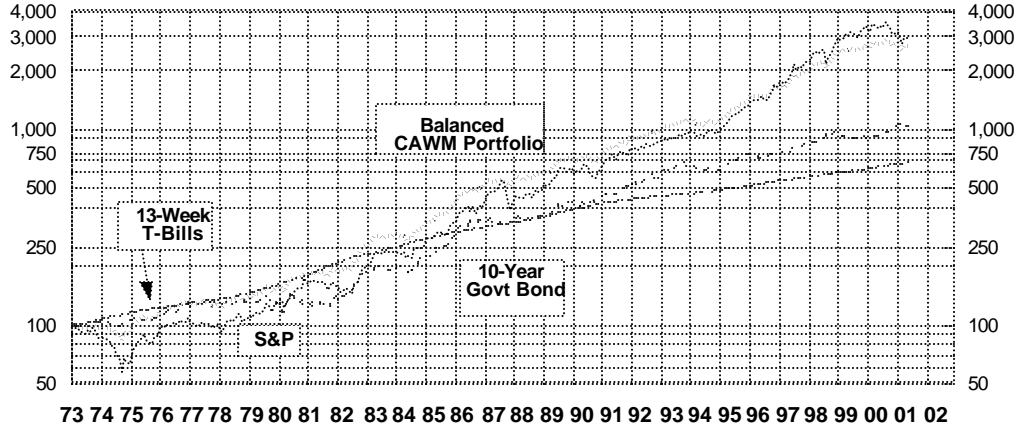


Chart G-2: Equity Portfolio

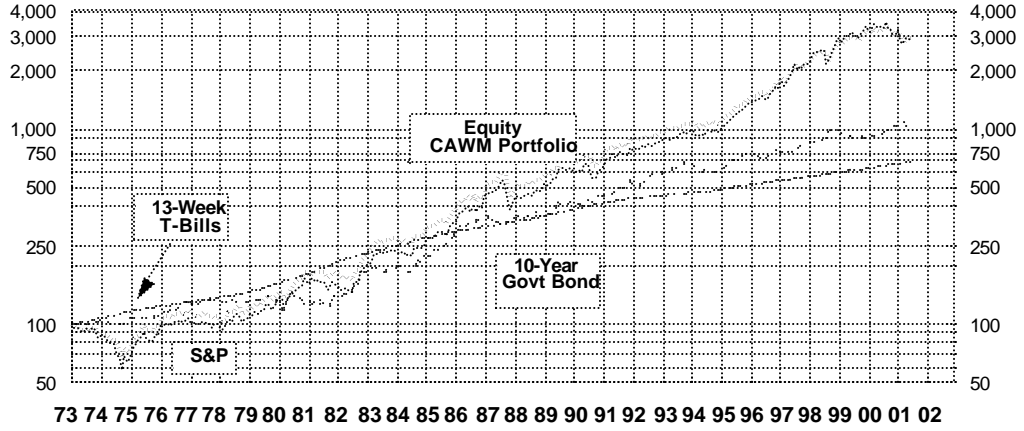
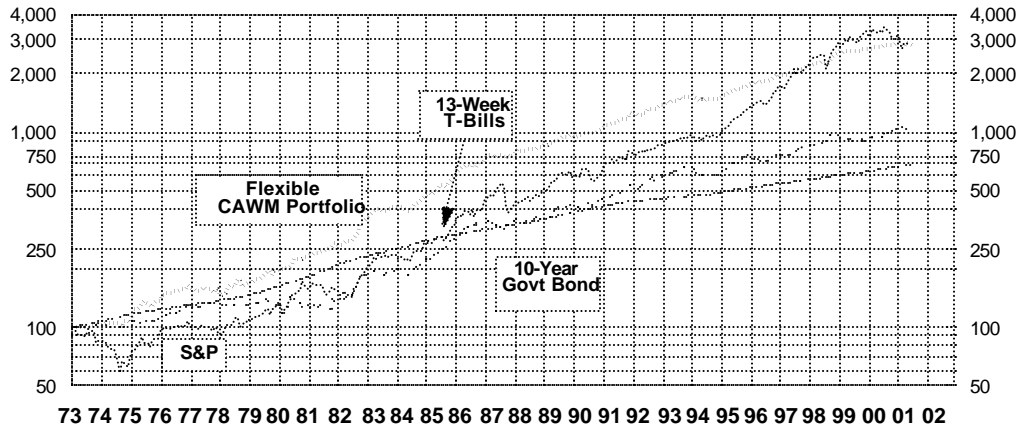


Chart G-3: Flexible Portfolio



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