14

quantify the statistics for each fund. Bogle studies in-depth the large-capitalization blend

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that return-based style analysis is best used when the portfolio investment objective is

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decreases. If two assets

hip, meaning that as one

ovariance of zero, then

venty-year annual return

d in Table 4.1.

sell 00 ue	S&P 500 / BARRA Growth	S&P 500 / BARRA Value	NAREIT - REIT ALL	Goldman Sachs Commodity Index
.8	28.32	32.4	44.92	-22.07
0	69.05	85.6	85.50	-44.74
.8	-9.80	-3.4	5.66	-6.01
.5	130.55	117.7	-40.07	9.76
2	267.62	164.9	65.94	84.10
2	69.63	140.8	191.07	-9.19
6	326.80	152.1	-15.40	-22.09
.8	152.18	138.9	77.50	20.83
.0	-15.4043	77.5	249.03	51.75
.1	-22.099	20.8	51.75	412.03

classes.

sel 00 ue	S&P 500 / BARRA Growth	S&P 500 / BARRA Value	NAREIT - REIT ALL	Goldman Sachs Commodit Index
6	0.23	0.41	0.42	-0.16
1	0.28	0.54	0.40	-0.16
4	-0.19	-0.10	0.13	-0.10
0	0.32	0.45	-0.11	0.02
5	0.74	0.70	0.21	0.21
	0.22	0.69	0.70	-0.03
2	1	0.71	-0.05	-0.06
9	0.71	1	0.42	0.09
0	-0.05	0.42	1	0.16
3	-0.06	0.09	0.16	1

For example, this table shows that the Goldman Sachs Commodity Index and the Merrill Lynch 3-5 Year Government Bond Index share a negative relationship since their correlation coefficient is negative. The S&P 500/BARRA Growth Index and the Russell 2000 Growth Index share a positive relationship. The Russell 2000 Value and the U.S. 30-Day Treasury Bills have a low covariance indicating that these assets have very little effect on each other.

In this study, Microsoft's Excel Solver 2000 was used to solve the mean-variance portfolio model. Annual returns of the ten asset classes were used to calculate the risk and return levels. The first portfolio point on the efficient frontier was obtained by minimizing the risk thus giving the minimum return. The last portfolio was obtained by maximizing return thereby giving the maximum risk that is on the efficient frontier. The range on the return was then divided by twenty-nine to give the intervals to increase the return in an effort to generate thirty portfolios. The model was solved each time by minimizing risk subject to a certain return level. The results were used to trace out the efficient frontier as shown in Figure 4.1.

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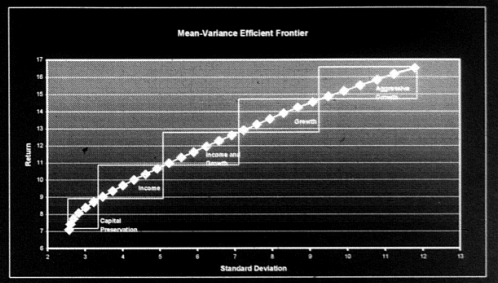

Figure 4.1 Mean-Variance Efficient Frontier

The efficient frontier ranges from a minimum return of seven percent at a risk level of two and a half percent to a maximum return of sixteen and a half percent at an eleven and half percent risk level. The efficient frontier is divided into five segments, each consisting of six portfolios, to position the asset allocation mixes for the investor profiles. The mid-point of each segment is chosen and the average of the middle two portfolios represents the recommendation for the respective risk portfolio. In this case, the risk and return are based on the sample standard deviation and sample average, respectively, of the yearly returns of the asset classes. The results for each investor profile are summarized in Table 4.3.

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