

17. Performance Evaluation and Management

- What is abnormal performance?
 - How can we adjust for risk?
- Measures of portfolio performance
 - Sharpe, Treynor, Jensen, M^2 , T^2
- Performance Attribution
 - Security Selection
 - Asset Allocation (sector/industry/asset class)
- Style Analysis

\bar{r}_p = average return on portfolio

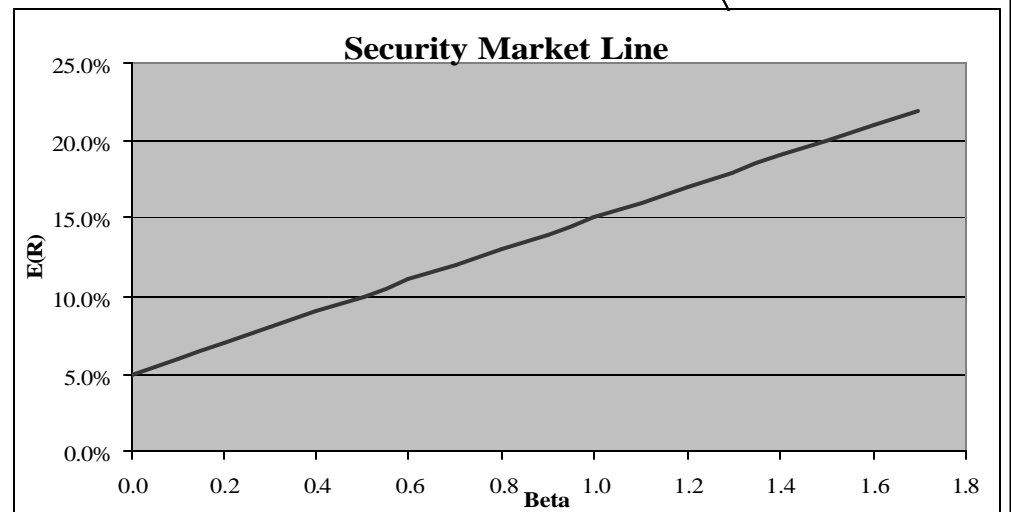
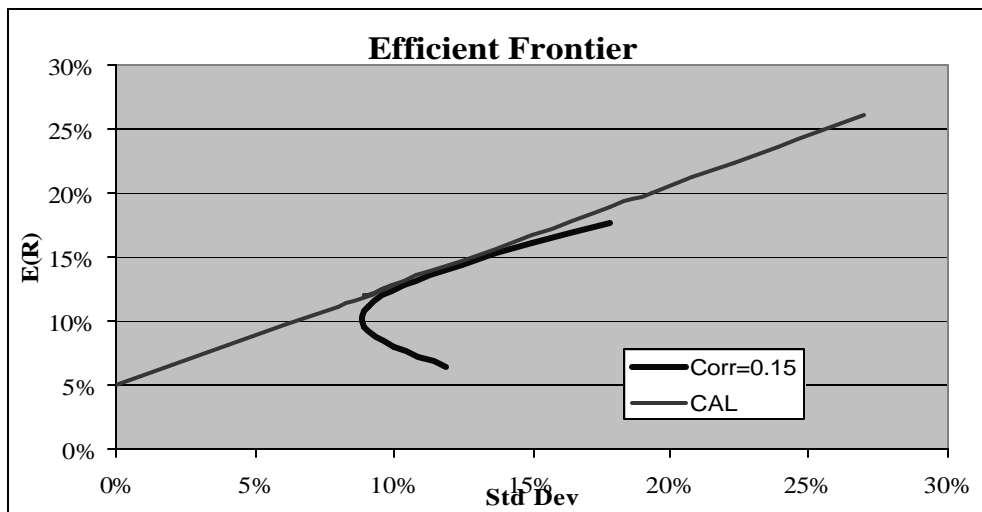
\bar{r}_f = average risk free rate

s_p = standard deviation of portfolio

b_p = weighted average beta for portfolio

a_p = alpha for portfolio

\bar{r}_m = average return on market



Abnormal Performance

- - Adjusting for risk is difficult and depends on assumptions.
- What is abnormal performance? Measure portfolio return versus...
 - benchmark portfolio?
 - adjusted market return?
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- Which risk measure is appropriate?
 - Diversified portfolios – should have std dev similar to mkt, so analyze beta.
 - If *Fund* is investor's entire investment, use std dev measures (Sharpe, M^2)
 - If *Fund* is fraction of investments, analyze beta (systematic) risk (α , Treynor, T^2).
- Limitations of Performance Measures
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Risk Adjusted Performance Metrics

- Sharpe ratio – return per unit of “total” risk (CAL).

$$\frac{\bar{r}_p - \bar{r}_f}{\mathbf{s}_p}$$

- Treynor ratio – return per unit of “systematic” risk (SML).

$$\frac{\bar{r}_p - \bar{r}_f}{\mathbf{b}_p}$$

- Jensen’s alpha – return in excess that predicted by CAPM (SML).

$$\mathbf{a}_p = \bar{r}_p - [\bar{r}_f + \mathbf{b}_p (\bar{r}_m - \bar{r}_f)]$$

- M² – measures extra return after scaling target portfolio to match std dev of market.

- $M^2 = r_p^* - r_m$, where $E(r_p^*) = w E(r_p) + (1-w)E(r_f)$ with $w = \mathbf{s}_M / \mathbf{s}_p$.

- T² – measures extra return after scaling target portfolio to match beta of market.

- $T^2 = r_p^* - r_m$, where $E(r_p^*) = w E(r_p) + (1-w)E(r_f)$ with $w = \mathbf{b}_M / \mathbf{b}_p$.

- Q: What measure would be used to evaluate a market neutral (long-short) hedge fund?

- A:

Risk Adjusted Performance Example

	Elder Fnd	Market	T-Bill
Return	20.0%	15.0%	5.0%
Std Dev	26.0%	13.0%	0.0%
Beta	0.50	1.00	0.00
Sharpe	0.58	0.77	NA
Treynor	0.30	0.10	NA
Jensen alpha	10.00%	NA	NA
M2	-2.50%	15.0%	NA
T2	20.00%	15.0%	NA

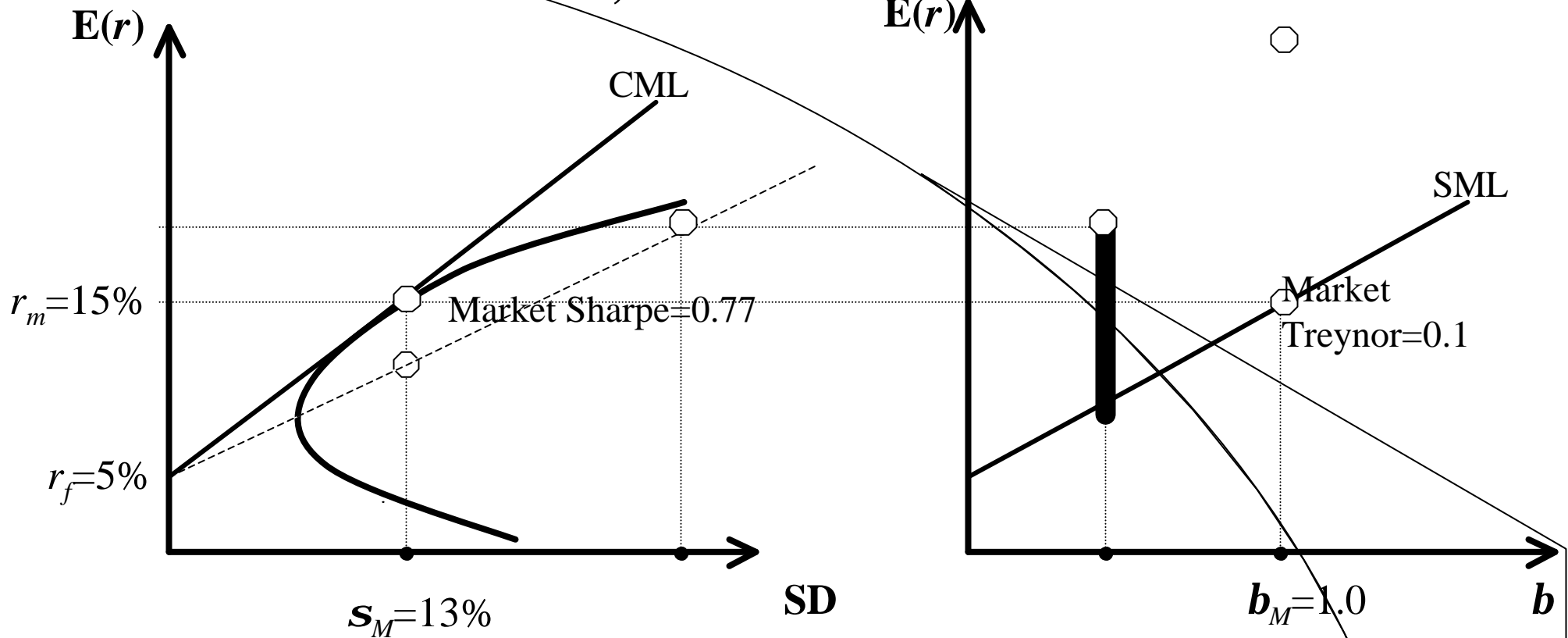
$$Sharpe = \frac{\bar{r}_p - \bar{r}_f}{s_p}$$

$$Treynor = \frac{\bar{r}_p - \bar{r}_f}{b_p}$$

$$a_p = \bar{r}_p - [\bar{r}_f + b_p(\bar{r}_m - \bar{r}_f)]$$

- M² – measures extra return after scaling target portfolio to match std dev of market.
 - M²=r_p^{*}-r_m, where E(r_p^{*}) = w E(r_p) + (1-w)E(r_f) with w=s_M/s_p.
- T² – measures extra return after scaling target portfolio to match beta of market.
 - T²= r_p^{*}-r_m, where E(r_p^{*}) = w E(r_p) + (1-w)E(r_f) with w=b_M/b_p.
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Performance, the CML and the SML



- Sharpe ratio – return per unit of “total” risk (CAL).
- Treynor ratio – return per unit of “systematic” risk (SML).
- Jensen’s alpha – return in excess that predicted by CAPM (SML).
- M^2 – measures extra return after scaling target portfolio to match std dev of market.
- T^2 – measures extra return after scaling target portfolio to match beta of market.

Performance Attribution

- Performance attribution – Why did some managed portfolio beat the market?
 - Was it due to superior asset allocation? Or superior security selection?
- Suppose Bogey is 60% equity, 30% bonds, 10% cash, with index for each. If Elder Fnd:
 - has identical asset allocation, then return deviation
 - has identical assets as indexes, then return deviation

Bogey Portfolio				Elder Fund		
	Weight	Return	Contribute	Weight	Return	Contribute
Equity	0.60	5.81%	3.49%	0.70	7.28%	5.10%
Bonds	0.30	1.45%	0.44%	0.07	1.89%	0.13%
Cash	0.10	0.48%	0.05%	0.23	0.48%	0.11%
Return on Bogey			3.97%	Return		5.34%
				Excess Return		1.37%
Contribution of Asset Allocation				Contribution of Security Select		
	Excess Weight	Bogey Return	Contribute to Excess Return	Portfolio Weight	Excess Return	Contribute to Excess Return
Equity	0.10	5.81%	0.58%	0.70	1.47%	1.03%
Bonds	-0.23	1.45%	-0.33%	0.07	0.44%	0.03%
Cash	0.13	0.48%	0.06%	0.23	0.00%	0.00%
Total			0.31%	Total		1.06%

But what if both asset allocation and security selection differ?

Active Portfolio Management

- Are markets totally efficient?
 - Some managers outperform the market for extended periods
 - Abnormal performance is not large, but too large to be solely noise
 - Evidence of some anomalies exists (e.g., Jan effect, neg stub values)

- Roles for active management
 - Market timing – large adjustments to asset classes (stocks, bonds, cash).
 - Superior asset allocation (by sector, industry or asset class)
 - Superior security selection
 - Tax efficiency

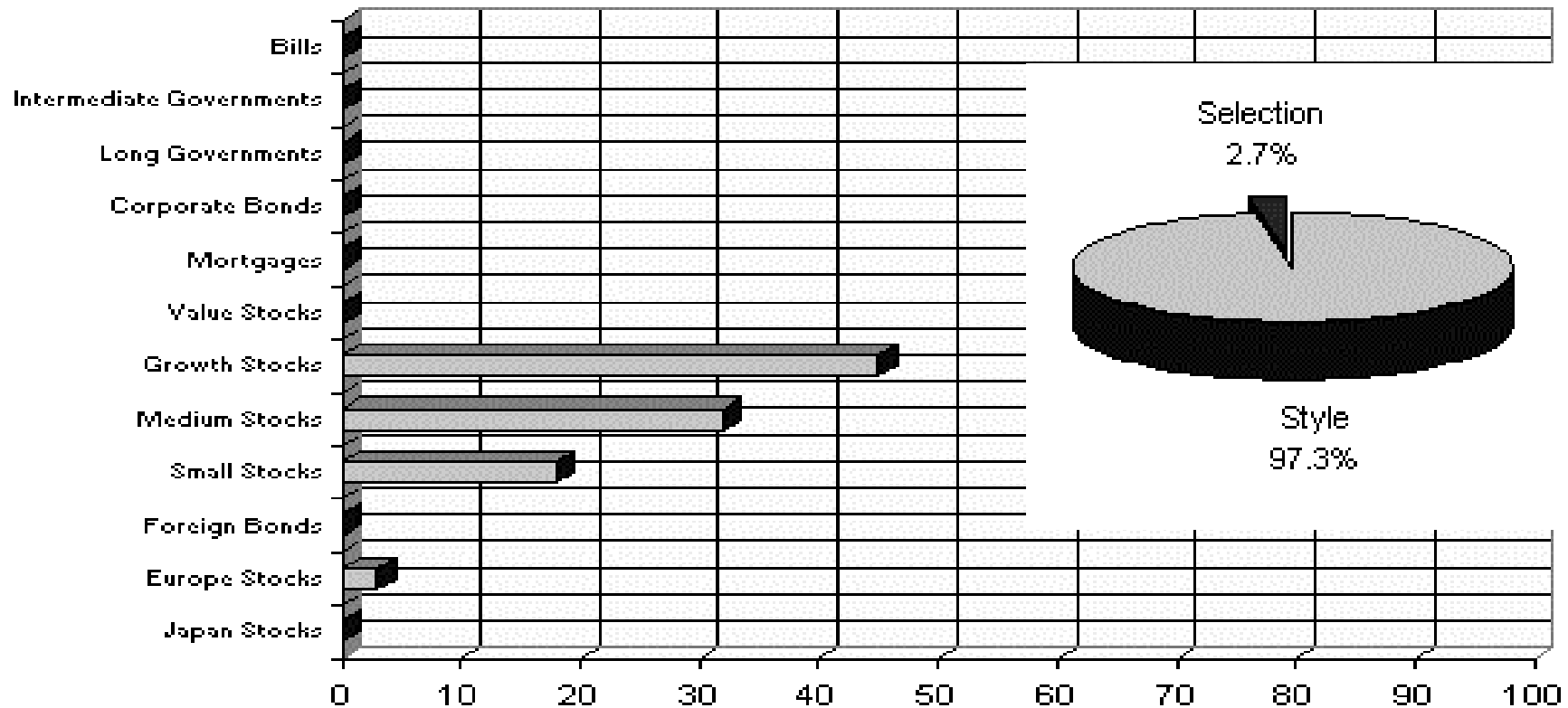
- Market Timing –
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	S&P 500	Perfect Timing	Almost Perfect
2004	10.7%	10.7%	10.7%
2003	28.5%	28.5%	28.5%
2002	-22.2%	4.0%	-22.2%
2001	-12.0%	4.0%	4.0%
2000	-9.1%	4.0%	4.0%
1999	21.1%	21.1%	21.1%
1998	28.6%	28.6%	28.6%
1997	33.2%	33.2%	33.2%
1996	22.9%	22.9%	22.9%
1995	37.5%	37.5%	4.0%
Avg	13.9%	19.4%	13.5%

Style Analysis

- Style Analysis – a form of performance attribution based on linear regression.
 - Run linear regression of portfolio return on “style factors” or benchmarks.
 - R^2 represents portion of return on portfolio due
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**FIDELITY MAGELLAN FUND
JANUARY 1985 - DECEMBER 1989**



Summary on Portfolio Evaluation and Management

- Measures of portfolio performance
 - Sharpe, Treynor, Jensen, M^2 , T^2
 - Which measure is appropriate?

- Performance Attribution
 - Security Selection
 - Asset Allocation (sector/industry/asset class)

- Performance Attribution via Style Analysis
 - Regression based method for attributing performance.

- Roles for active management
 - Market timing – large adjustments to asset classes (stocks, bonds, cash).
 - Superior asset allocation (by sector, industry or asset class)
 - Superior security selection
 - Tax efficiency