Active Management

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A. Investment decision objectives

- 1. Risk-return trade-offs
  - Taste
  - Age and opportunities
    - Investment professionals typically advise young people to take more risk than people close to retirement age
      - Young people have more time to adjust their consumption and leisure-work decision based on their realized returns
    - Blue-collar workers typically have less career flexibility than white-collar workers
      - Perhaps this contributes to the limited participation of blue-collar workers in the stock market

Investment objectives..

- 2. Non-investment risks
  - Most (young) people's largest asset is their human capital
  - Many people have a substantial fraction of their wealth invested in real estate
  - Some people have claims on other substantial cash flows, such as trusts and inheritances
  - These considerations should affect the quantity and type of portfolio risks they should choose
- 3. Non-pecuniary considerations
  - Typically, social concerns

B. Constraints on investment decision

- 1. Liquidity
  - Ability to sell an asset quickly at a reasonable price
  - Demand for liquidity determined by uncertainty about needed cashflows
- 2. Investment horizon
  - Closely related to liquidity
  - With long horizon, might invest in less liquid assets
- 3. Regulations
  - Restrictions on foreign investments
- 4. Taxes
  - Tax exempt investments should be held only by taxable investors – and in the highest tax brackets

Taxes: taxable assets have high pre-tax return

- Put high-tax assets in tax-sheltered portfolios
  - Corporate bonds (highest effective tax rate)
  - Treasury bills, note, and bonds
  - Actively managed stock portfolios
  - Small and value-structured stock portfolios
  - Big and growth structured stock portfolios
  - Market or index portfolios
  - Municipal bonds (tax-sheltered: zero nominal tax rate)
- Put low-tax rate assets in taxable portfolio
  - If you have stock in your tax-sheltered portfolio, you would be better off holding the stock in your taxable portfolio and buying corporate bonds (or possibly Treasuries) in your tax-sheltered portfolio

Tax rules for mutual funds

- Mutual fund income is taxed at the personal level
- A fund must distribute dividend and interest income (in excess of fees and expenses), and realized capital gains at least once a year
- Netting capital gains and losses at the fund level works as at the personal level
- Net realized losses cannot be distributed to the fund's shareholders. They are carried forward to offset future gains

Effect of mutual fund taxes

- They create a substantial difference between pre- and post-tax returns on mutual funds
- The effect of taxes can be particularly large when a fund's returns are dominated by interest and dividends
- The effect is also large if a fund systematically realizes capital gains

Average returns for US equity mutual funds relative to Vanguard 500 index, 1980-2000

	10 years		15 years		20 years	
Return	Survivors	All	Survivors	All	Survivors	All
Pre-tax	-3.1	-3.5	-3.5	-4.2	-1.8	-2.1
After-tax	-4.2	-4.5	-4.6	-5.1	-2.6	-2.8

C. Asset allocation

- 1. Specify potential investments
- 2. Specify expectations
  - Expected returns, volatilities, correlations
    - Historical data; scenario analysis
  - These expectations should capture tax effects, liquidity effects, etc
- 3. Determine efficient frontier
  - May or may not include a riskless assets
- 4. Determine optimal risk-return trade-off on efficient frontier

D. Other assets

- 1. Real estate
  - Without taxes and transaction costs, we would expected investors to go to the point where the expected return just compensates them for the effect of the investment on their overall risk
    - Return includes an important service flow
  - Expect some risk premium because people's homes are typically an important part of their portfolio
    - Agency problems make diversification expensive. However, diversification is not impossible. The risk premium is limited by entry by corporations into the rental market

Real estate, cont'd

- How does the tax deductibility of mortgage interest affect expected returns?
  - To a first approximation, it should have little effect on the after-tax return, but it should lower the expected before-tax return
  - Elimination of the mortgage interest deduction would make commercial ownership more attractive.
  - Because of agency problems, however, we would expect some decline in the price of homes

Real estate, cont'd

- Does the tax deductibility of mortgage interest imply you should borrow against your home to make investments?
  - For most investors the answer is no
    - Simple case: mortgage home at before-tax R_M and buy taxable corporate bonds yielding R_B.
    - For same risk: $R_M(1\text{-}t)=R_B$, so $R_M>R_B$
    - So, lose after-tax spread between mortgage rate and corporate bond rate
  - Strategy makes sense only for investors who want to lever up stock portfolio
    - Expected stock returns exceed mortgage rate

Other assets..

- 2. Art
  - Again, must include non-pecuniary flow in total return
    - If you are not going to enjoy the painting more than most other potential owners, then you probably should not buy it
  - Should we expect a risk premium?
    - Perhaps
- 3. precious metals
  - These assets seem to provide insurance agains geo-political catastrophes
  - If so, their risk premium should be negative

Portfolio tracking and index management

- You want to follow a passive portfolio strategy, but, you do not want to hold the market portfolio due to transaction costs
- Assuming you cannot purchase a futures contract on the index, what should you do?
- Construct a tracking portfolio that mimics as closely as possible the market index (e.g., the S&P500, the Whilshire 5000, the Russell 2000 small cap index, etc.)
- Minimize tracking error $TE=\sigma(r_p-r_I)$

- Find the weights $\mathbf{x}=x_1,\dots,x_N$ in the tracking portfolio, where N is the total number of securities you are using to track the index:

  $\min(\mathbf{x})\ TE=\sigma([\Sigma_i x_i r_i]-r_I)$

- From: $r_p = \alpha_p + \beta_p r_M + \varepsilon_p$

  we get: $r_p - r_M = \alpha_p + (\beta_p - 1) r_M + \varepsilon_p$

  giving: $TE = [\sigma^2_\varepsilon + (\beta_p - 1)^2 \sigma^2_M]^{1/2}$

- Thus, if you have a portfolio with a beta of one, then the only difference in risk between the index and your tracking portfolio is the tracking portfolio's residual risk

- How many, and which, securities should you use to form the tracking portfolio?
- The best securities to include
  - have low residual risk
  - have high liquidity (low transaction costs)
- The number of securities is a tradeoff between lower tracking error and higher total transaction costs
- Morgan Stanley international indices interesting example

Performance enhancement

- Most index-fund managers claim they do some performance enhancement simply because, if they did not, they would underperform the index (due to transaction costs)
- Since traditional market indices are not MVE, a manager can reliably beat, say, the S&P500
- Thus, max $E(r_p - r_I)$ subject to a maximum constraint on $\sigma(r_p - r_I)$:

$$\max(\mathbf{x}) \quad E(r_p - r_I) = E([\Sigma_i x_i r_i] - r_I)$$

s.t.

$$TE = \sigma(r_p - r_I) = \sigma([\Sigma_i x_i r_i] - r_I) < \sigma^*$$

This problem is equivalent to minimizing the variance of $(r_p - r_I)$ subject to a given $E(r_p - r_I)$. Also, since the weights sum to one, we can write this as:

$$\min(\mathbf{x}) \; \sigma(\Sigma_i x_i [r_i - r_I])$$

s.t.

$$E(r_p - r_I) = E[\Sigma_i x_i (r_i - r_I)] > r^*$$

- This problem is identical to our earlier MV portfolio optimization. However, rather than solving the minimum-variance problem for the asset returns themselves (r_i), we are solving the problem for asset returns relative to the benchmark (r_i-r_I)
- We can also include transaction costs. This makes the constraint above

$$E(r_p-r_I) = E[\Sigma_i x_i(r_i - r_I)] - C(x_1,\ldots,x_N) > r^*$$

Tilting and market timing

- You believe you can forecast the market and that other investors are not forecasting correctly
- You may be using variables like the dividend yield, business cycle indicators and macroeconomic analysis to forecast returns
- You shift funds between a market index portfolio and the riskfree asset based on your forecasts

$$r_{pt} = x_t r_{Mt} + (1-x_t) r_{Ft}$$

At time t, r_{pt} has a beta of $x_t \beta_{Mt}$

- With CAPM as your benchmark:

$$r_p - r_F = \beta_{Mt}([E(r_M) + \varepsilon_{Mt}] - r_F) + \varepsilon_p$$

- Even if ε_{Mt} is on average zero, the market timer's average return would be

$$E(r_p - r_F) = \beta^*_M [E(r_M) - r_F] + \text{cov}(\varepsilon_{Mt}, \beta_{Mt})$$

- Here, β^*_M is the time series average portfolio beta
- You would earn superior returns if cov(ε_{Mt}, β_{Mt}) is positive

Fig 1: Market timing

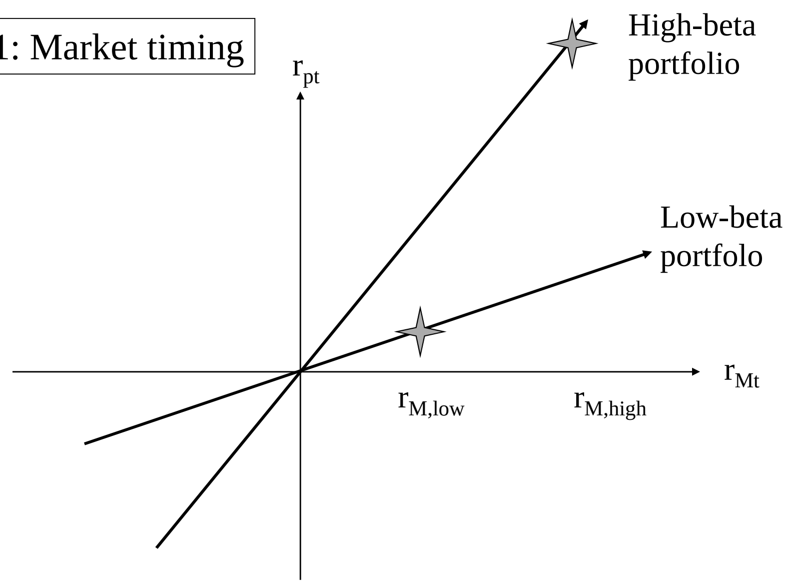
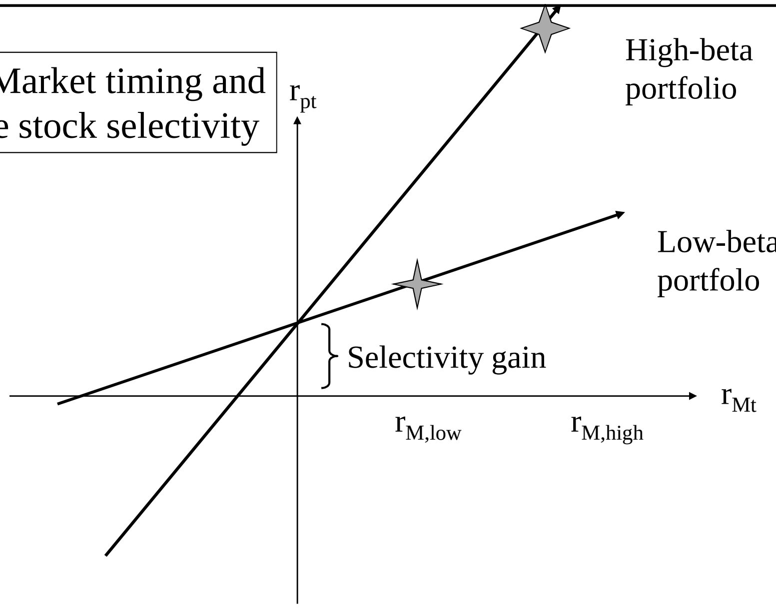


Fig 2: Market timing and positive stock selectivity



- Thus, market timing is the ability to switch to a high-beta portfolio before the market goes up and to a low-beta portfolio before the market goes down
- Stock selectivity is the ability to purchase under-priced securities or sell (short) overpriced ones
- Little evidence in favor of superior timing or selectivity
  - Hedge funds
  - Insiders on the OSE

Tilting under the APT

- Under the APT we are forecasting K rather than one factor (M).
- Suppose there are two factors and three securities:

  $r_1 = 0.12 + 1f_1 + 1f_2 + e_1$

  $r_2 = 0.12 + 1f_1 + 2f_2 + e_2$

  $r_2 = 0.12 + 3f_1 + 2f_2 + e_3$
- Factor 1 is foreign income factor and factor 2 is a US earnings price ratio factor

- You believe strongly that Japan will come out of its recession over the next couple of months and therefore export of US goods will be higher than the market expects
- You also believe that the earnings price ratio factor will not change at all over this period
- Using the above three securities, construct ANY portfolio that takes advantage of all these facts. Give the portfolio composition, the betas, and the expected portfolio return

- We want to construct a portfolio with a lot of factor 1 exposure and no factor 2 exposure
- For example, a factor loading of 10 on factor 1 and 0 and factor 2
- Solve the three equations:

  $1x_1 + 1x_2 + 3x_3 = 10$

  $1x_1 + 2x_2 + 2x_3 = 0$

  $1x_1 + 1x_2 + 1x_3 = 1$
- Alternatively:

$1x_1 + 1x_2 + 3(1\text{-}x_1\text{-}x_2) = 10$

$1x_1 + 2x_2 + 2(1\text{-}x_1\text{-}x_2) = 0$

- Solution: x_1=2, x_2=-5.5, x_3=4.5
- This portfolio has a factor loading of 10 on factor 1 and zero on factor 2
- Alternatively, you could have put 1000% of your wealth into the first factor-mimicking portfolio, and -900% in the risk-free asset. Why would this work?
- If you believe the foreign income factor will rise by 2%: $E(r_p)$ = 2(.12)-5.5(.12)+4.5(.12) +10(.02) = 0.32

Stock selection

- Presumes superior knowledge about expected returns
- If you have superior information, why not form an arbitrage portfolio?
- Active portfolio managers try to hold a well diversified portfolio of positive alpha stocks
- That is, combine an active portfolio A of "mispriced" stocks with a passive benchmark portfolio M to diversify
- Calculate the new CAL and select the optimal portfolio

- Mathematically, the (Black-Treynor) problem is:

  $\max(x_A)\ SR_p = [E(r_p)-r_F]/\sigma_p$

  where

  $r_p = x_A r_A + (1-x_A) r_M$
- Assuming a positive α_A, this portfolio will plot above the SML: $r_A = \alpha_A + \beta_A r^e_M + e_A$
- An α_p either >0 or <0 means that a combination of A and the benchmark has a higher Sharpe ratio than the benchmark

- The optimal amount to put into the active portfolio is

  $x^*_A = x_0/[1+(1-\beta_A)x_0]$

  where

  $x_0 = [\alpha_A/\sigma^2(e_A)]/E(r_M-r_F)/\sigma^2_M$
- For this investment, the Sharpe Ratio for the resulting portfolio is maximized, and

  $SR^2_p = SR^2_M + AR^2_A$

  $SR_p = (SR^2_M + AR^2_A)^{1/2}$

  where $AR_A = \alpha_A/\sigma(e_A)$

  is called the Appraisal Ratio of portfolio A

- If you are combining n active sub-portfolios with uncorrelated residuals, then the net improvement in the Sharpe Ratio will be the sum of the squared AR's:

  $SR^2_p = SR^2_M + \Sigma_i AR^2_i$
- Why is the improvement greater for a larger number of active sub-portfolios?

Using the CAPM in active portfolio management

- How to combine your “views” on future expected returns with optimal portfolio selection?
- Small perturbations of expected returns lead to unreasonably large portfolio weight changes under the full (Markowitz) MV-optimization
- Instead: use equilibrium expected returns

- (1) Compute individual stock betas, β_i
- (2) Compute $E(r_i) = r_F+\beta_i[E(r_M)-r_F]$ as well as the individual covariances σ_{ij}, i.e., assuming the CAPM hold exactly
- (3) Incorporate your private information by perturbing the values of $E(r_i)$ and σ_{ij} away from their equilibrium (CAPM) values
- (4) Use the perturbed values as input to a full (Markowitz) MV portfolio optimization

- Note: if you do steps (1), (2), and ignore (3), then step (4) gets you the market portfolio weights (M) (Why?)
  - If the portfolio manager holds no “views”, then she holds the equilibrium/market portfolio
  - If her views are high variance (high uncertainty), then she will hold close to the equilibrium portfolio
  - If her views are strong (low variance), then she will move considerably away from the market portfolio weights

- Next: Systematic evidence on actively managed portfolios