PEVA

Day 3 Slides

Measuring Market-Timing Ability
- Various Approaches -

The Problem with Regression-Based Performance Measures

- It is generally more difficult to measure performance when part of the performance is due to timing abilities
  - Measured performance may actually be **negative or zero**, when the manager, in truth, has superior abilities
  - This is due to the mathematics of regression models

Why Don't Conditional Regression Models Correct This Problem?

- The conditional models constructed by Ferson and others allow the factor loadings ("beta") to change over time
- This is the general problem with models like the unconditional Jensen model
- However, the Ferson conditional Jensen model cannot capture changes in factor loadings ("betas") due to the managers **private** information on the future market return (only changes due to public economic variables are captured)

- For example, Jensen's alpha is negatively biased (and the beta is positively biased) in the presence of timing ability
  - See Grinblatt and Titman "Performance Evaluation Chapter, page 597

Do Specification Errors Affect Inferences...? - by Naveen Daniel -

- This is a very useful paper, in that it fills a big gap in the performance literature
  - Addresses the level of the biases in measuring timing vs. selectivity abilities in the Treynor-Mazuy and Henriksson-Merton models
  - Runs simulations to do this

Background

- Portfolio managers have two types of ability
  - selectivity (stock-picking) ability
  - timing ability

- Selectivity ability – invest in stocks with positive "alpha" (example, using the Jensen model):

$$r_t = \alpha + \beta\ r_{mt} + \varepsilon_t,$$

$$\text{where } r_t = \mathrm{R}_t - \mathrm{R}_{F,t} \text{ and } r_{mt} = \mathrm{R}_{mt} - \mathrm{R}_{F,t}$$

- Timing ability – adjust portfolio beta in response to forecast of r_{mt}

$$\partial\beta_{pt} / \partial r_{mt} > 0$$

Treynor Mazuy Timing + Selectivity Model (Designed for a "Magnitude Timer")

Assumptions

- Remember that benchmark excess return is r_{mt}
- Timing strategy is known by us: "magnitude" timer
  - Manager forecasts the magnitude of excess return on the internal benchmark

$$r_{fmt} = r_{mt} + \varepsilon_t, \text{ where } \varepsilon_t \sim N(0, \sigma_\varepsilon)$$

  - Manager chooses beta that is linear in her forecast

$$\beta_t = b + \gamma\ r_{fmt}$$

- TM model is designed with the magnitude timer in mind—it is properly specified according to that assumption of timing ability:

TM Model (Magnitude timer)

- Treynor-Mazuy model implies that the manager has a **linear** beta response functional:

$$\beta_t = b + \gamma r_{mt} \quad (\gamma \text{ is a constant})$$

$$r_t = \alpha + \beta_t r_{mt} + \varepsilon_t = \alpha + (b + \gamma r_{mt}) r_{mt} + \varepsilon_t$$

$$\text{Therefore, } r_t = \alpha + b\, r_{mt} + \gamma\, r_{mt}^2 + \varepsilon_t$$

TM Model (Magnitude timer)

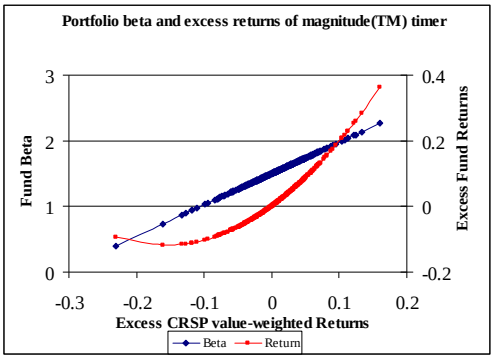
- Measure of timing is then:

$$\gamma \bullet \text{var}(r_{m,t})$$

TM Model (Magnitude timer)

- With a Treynor-Mazuy type market timer, here are the fund returns (and betas) you would expect:

$$r_t = \alpha + b\, r_{mt} + \gamma\, r_{mt}^2 + \varepsilon_t$$



Merton-Henriksson Model (Designed for a "Direction Timer")

Assumptions

- Benchmark excess return is r_{mt}
- Timing strategy is known by us: "direction" timer
  - Manager forecasts the direction of r_{mt}

$D_{ft} = 1$ *if forecast is for* r_{mt} *to be positive* (market beats riskfree)

$= 0$ *otherwise*

  - Manager's portfolio beta is given by

$\beta_{pt} = \delta_p + \gamma_p D_{ft}$

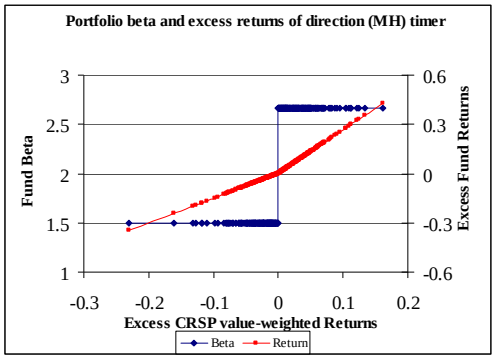
[D_{ft} equals 1 only if mkt expected to beat riskfree]

- For a direction timer, MH model is well specified, and TM model is misspecified

MH Model (Direction timer)

- Merton-Henriksson (1988; MH) regression

$$r_t = \alpha + \delta\, r_{mt} + \gamma\, Max(0, r_{mt}) + \eta_t$$



HM Model (Direction timer)

- Measure of timing is then:

$$\gamma \bullet \text{value of call option on } r_{m,t}$$

Motivation

- Two implicit assumptions underlying the models, which are typically unobservable
  - Benchmark being timed by the manager is known
  - Timing strategy adopted by the manager is known, or at least estimable from observing returns vs. the market return

Contributions of the Daniel study

- **Using simulated mutual fund data**
  - Magnitude of bias arising from timing strategy mis-specification and benchmark mis-specification
  - Effect of mis-specification on the power of the tests
  - Does model mis-specification result in spurious negative correlation between selectivity and timing?
- **Using actual mutual fund data**
  - Is there evidence of misspecification bias?

Simulation Methodology

1. Simulate excess benchmark returns assuming joint normality (could also be done using bootstrapped distributions)
2. Simulate the portfolio beta given the manager's timing strategy (for a chosen hypothetical timing strategy)
3. Simulate the manager's realized returns
4. Estimate performance measures using the Jensen model, the TM model and the MH model

Then:

- Compute
  - Bias = (Estimated – True) performance measure, where true values are set by simulation
- Repeat the whole simulation procedure 10,000 times
- Compute the following:
  - Average bias – average of bias over 10,000 simulations
  - Rejection frequency – the % of simulations in which the bias was significantly positive or negative

Results from the Simulations

- Overview:
  - Timing strategy mis-specification results in severely biased measurement of both selectivity and timing components
    - For example, measuring performance of a "magnitude timer" using the MH model (which is designed for a "direction timer")
    - However, overall performance is unbiased (sum of selectivity plus timing)

- Even worse, benchmark mis-specification results in severely biased selectivity and overall ability
- Daniel concludes by pointing out: "…the current practice of adapting the latest advances in asset pricing to performance evaluation does not guarantee an unbiased estimate of ability." (if timing strategies are not properly captured by the model)

Fig 2.a. MH Model

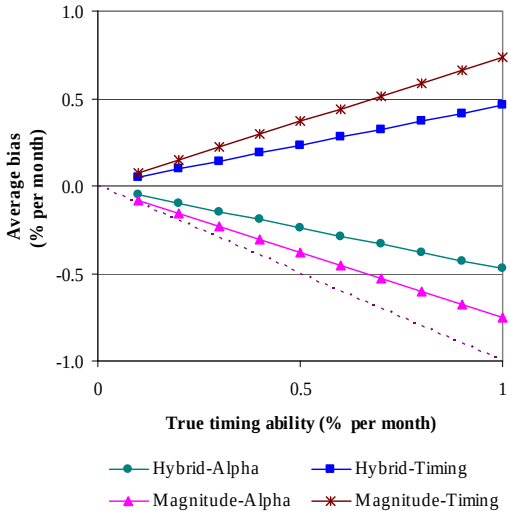


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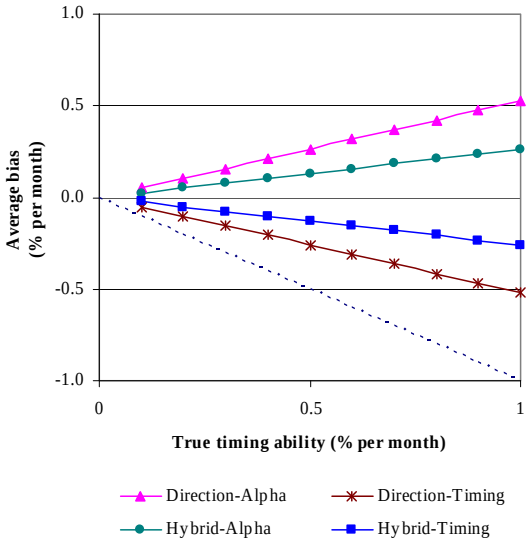
Fig 2.b. TM Model



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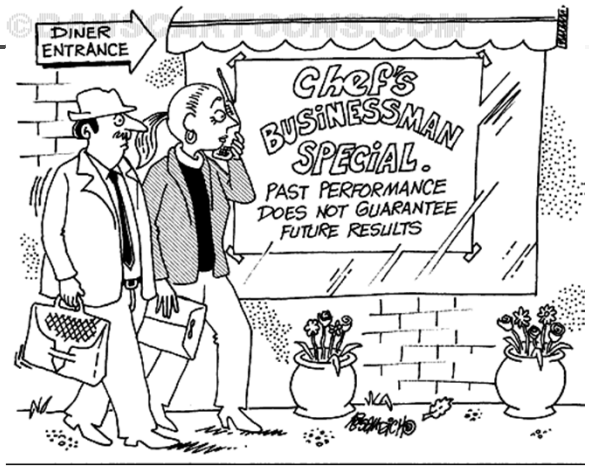
- Conclusions:
  - If we only have net returns of managers to work with (regression-based models of performance), then we need to know something about the timing strategy

- If we do not know the timing strategy, then it makes sense to:
  - Estimate this from the past relation between market (benchmark) returns and manager returns
  - This will give a (noisy) estimate of the timing strategy of the manager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