
Stellenbosch University : Economics Department

Financial Econometrics Practical Test

Practical Examination: Semester II

Lecturer: NF Katzke

Internal Moderator: Prof. G Liu

2024

TOTAL MARKS: 60

TIME ALLOWED: 48 HOURS

INSTRUCTIONS TO CANDIDATES

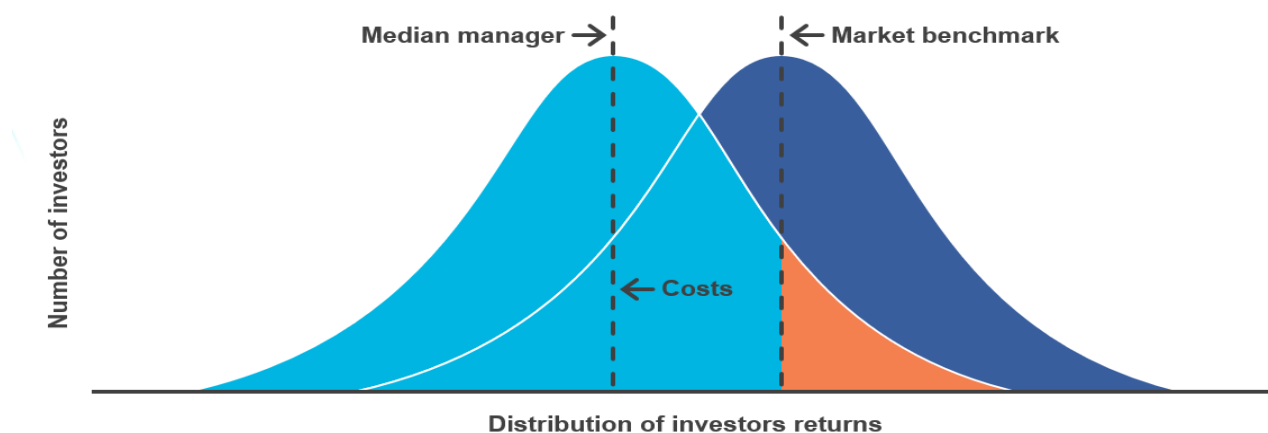
1. Download the paper here https://www.fmx.nfkatzke.com/Test/FMX_24.pdf
2. Download and use this folder structure: https://www.fmx.nfkatzke.com/Test/Folder_Structure_2024.zip
3. Download and unzip the following to your data folder https://www.fmx.nfkatzke.com/Test/Data_24.zip
4. Put all the data in your data folder, and do not commit the data folder on github (add this folder to your .gitignore).
5. Answer all the questions by creating a new folder for the question using Texevier's folder construction functions.
6. EMAIL me the link to your project at **nfkatzke@gmail.com**
7. Data shown in chunks are suggestions - you may use any of the data available in your answers.

Question 1: Systematic AI Fund (10 marks)

You are preparing a presentation where you are showcasing the performance of your fund (called AI_Implementer). You are tasked with putting your fund's performance into perspective by comparing it to the benchmark (Capped SWIX) as well as to industry peers (ASISA active managers).

As this is a systematic Artificial Intelligence fund - you want to argue that active managers struggle to outperform the benchmark, as well as your AI fund, after fees.

You came across this old schematic in your textbook - from Bill Sharpe's work on actively managed funds - which argues that investors in a market utilising actively managed funds - tend to underperform their benchmarks after fees:



Consider using a rolling period approach to place the performance of your AI fund into perspective by doing something similar. Put together a few slides (maximum of 4) in **Powerpoint** using **AI.pptx** in your data folder (focus being on graphical representation or table, not text) to show off the performance of your fund. You can be creative in how you replicate Sharpe's insights (whether it is a distribution plot say of rolling N-period returns), or whether you add other insights (you can e.g. stratify your period as well).

```
library(tidyverse)

ASISA <- read_rds("data/ASISA_Rets.rds")
BM <- read_rds("data/Capped_SWIX.rds")
AI_Fund <- read_rds("data/AI_Max_Fund.rds")
```

Question 2: Currency Hedging Analysis (10 marks)

Suppose you recently read a study (see it [here](#)) around currency hedging - and that there is a paradox in volatility in that negatively correlated assets may produce portfolio volatilities that are lower than the sum of its parts.

You've been tasked with replicating the results of the study and produce a few additional figures / tables (use your discretion) to make a case for not applying long-term (systematic) currency hedging. In your own study, compare the rolling realized volatilities of a 60 / 40 (Equity / Bond) portfolio (with a 70 / 30 local global split) for both a fully hedged and unhedged portfolio alternative.

To get the returns series for the assets, see `data/Cncy_Hedge_Assets.rds`. Note that the MSCI ACWI and the Global Bond Aggregate are in USD returns, while the Capped SWIX (J433) and ALBI indexes are in ZAR. Use the `Monthly_zar.rds` if you want to convert your ZAR to USD or vice versa.

```
Indexes <- read_rds("data/Cncy_Hedge_Assets.rds")
ZAR <- read_rds("data/Monthly_zar.rds")
```

Question 3: Portfolio Construction (10 marks)

Using the information on the ALSI (J203) and SWIX (J403) Indexes, write a brief research report in Texevier where you:

- Compare the SWIX and ALSI methodologies by looking at the performance of different size indexes (large, mid and small caps), sector exposures and stock concentration over time. Use your discretion in writing a short report highlighting differences in the return profiles
- You may use stratification of **data/Monthly_zar.rds** to provide insight into the different return profiles of both methodologies during different periods of currency performance and volatility.
- Respond to the JSE's question on applying capping to the indexes - in particular looking at the impact different capping levels would have had on both the SWIX and ALSI (e.g. 5%, 10% and uncapped). Use **data/Rebalance_days.rds** to identify the Rebalance Days during past quarterly rebalances.

```
ALSI <- read_rds("data/ALSI.rds")  
RebDays <- read_rds("data/Rebalance_days.rds")
```

Question 4: Portfolio Commentary (10 marks)

You have been tasked to provide some perspective on the positioning and performance of a fund that is managed by a colleague of yours.

The fund is a long-only domestic equity strategy (SnakeOil Capital) that tracks the FTSE/JSE Capped SWIX.

You've been provided with the holdings and the returns of the underlying constituents of the fund (data/Fund_Holds.rds & data/Fund_Rets.rds) as well as the benchmark strategy (data/BM_Holds.rds & data/BM_Rets.rds). The strategy has a quarterly rebalancing frequency.

You are tasked with creating a few slides in a PowerPoint deck that gives the fund manager quantitative information that he can speak to following his short talk about the fund's *secret sauce* strategy for identifying companies to invest in (fortunately, you don't have to speak to why he holds the stocks he holds). In particular, his clients have been asking for more information around:

- Relative risk (from a returns and holdings perspective)
 - Think: Tracking Error, Active Share, Rolling downside risk, etc.
- Relative Performance (returns)
 - Think: Performance comparison, Information ratio comparison, Rolling performance, etc.
- Fund positioning
 - Think: stock & sector under / overweights
- Performance attribution
 - Which stocks drove relative and absolute performance, overall success of under / overweight calls, etc.
 - Any other fund performance insights you wish to share in a concise, visual way.

You can be creative in how you position the fund's 5 year overall performance (use any other information, e.g. other data points in your data folder that you feel may add value).

```
Port_Holds <- read_rds("data/Fund_Holds.rds")
Port_Rets  <- read_rds("data/Fund_Rets.rds")
BM_Holds   <- read_rds("data/BM_Holds.rds")
BM_Rets    <- read_rds("data/BM_Rets.rds")
```

Question 5: Volatility and GARCH estimates (10 marks)

Using the currency data set (all relative to the USD) - I want you to comment on the following statements:

- The South African rand (ZAR) has over the past few years been one of the most volatile currencies;
- The ZAR has generally performed well during periods where G10 currency carry trades have been favourable and currency valuations relatively cheap. Globally, it has been one of the currencies that most benefit during periods where the Dollar is comparatively strong, indicating a risk-on sentiment.

Use your discretion on what you use to measure volatility, which currencies you compare and how you arrive at your conclusions. Be creative in using tables, graphs, stratification and statistics to argue your points.

```
cncy <- read_rds("data/currencies.rds")
cncy_Carry <- read_rds("data/cncy_Carry.rds")
cncy_value <- read_rds("data/cncy_value.rds")
cncyIV <- read_rds("data/cncyIV.rds")
bbdxy <- read_rds("data/bbdxy.rds")
```

Question 6: Portfolio Construction (10 marks)

```
MAA <- read_rds("data/MAA.rds")
msci <-
  read_rds("data/msci.rds") %>%
  filter(Name %in% c("MSCI_ACWI", "MSCI_USA", "MSCI_RE", "MSCI_Jap"))
```

You have been tasked to construct a Global Balanced Index Fund portfolio using a mix of traded global indexes. The total return series has been provided to you under data/MAA.rds and data/msci.rds (as given above). See MAA.jpg and msci.txt for a description of the funds you are using.

You have essentially been given the following to consider in your analysis by your superiors, who have indicated their hope to achieve a balanced index fund with the following considerations:

- Long-only strategy;
- When using covariance and mean forecasts, use a look-back of less than 3 years;
- Do not hold any assets with less than 3 years' returns data;
- Apply Quarterly Rebalancing;
- Limit exposure to Bonds and credit instruments at 25%;
- Limit exposure to Equities at 60%;
- Limit single asset exposure at 40%;

You decide to use monthly numbers in your analysis, and estimate a covariance matrix using data after 2010.

You can be creative in how you approach this - providing as many angles and perspectives as you like.

END OF PAPER