EC 901: Analysis of Financial Data

The Empirical Project

Introduction

As part of the course, you are required to write an individual project demonstrating your ability to use the empirical techniques taught in this course in a practical context. This written project will count for 50% of the course grade.
You will be expected to analyse one of three data sets provided using the computer and write up an empirical project on the basis of this. The handout "Writing an Empirical Project" (Appendix A of the textbook, but also included below) provides a description about how you should organise your project. Also included is a discussion of project topics (including information on data sets). You should select one of these project topics.

Organisational Details for the Empirical Project

- The final submission date for the written project report is 5PM on Friday, 8 May 2009. Late submission (except in exceptional circumstances and with prior agreement) will be penalized. 2 marks will be deducted for each day (or part of a day) by which the project is late.

- The empirical project should be a maximum of 8 pages (not including the title page, bibliography and up to two pages of tables and/or graphs). The project must be word processed and double spaced using 12 point font and margins of at least an inch at top/bottom/left/right. Projects which violate these constraints will be not be accepted. You would then be required to resubmit the project in a form that does satisfy the constraints, and this may entail you incurring penalties for late submission.

General Considerations

Below I will provide a brief discussion of three data sets and the types of issues you might want to consider in writing your report. However, I do not want to be prescriptive, telling you exactly what to do with the data sets. My intention is that, within the general framework of the instructions below, you decide on what issues you want to emphasize, what methods you want to use, etc.

On the issue of how results should be presented, I cannot stress enough the importance of clarity and brevity. Whether it is a good thing or a bad thing, it is undoubtedly the case that university lecturers, civil servants, policymakers and employers are busy people who do not want to spend a lot of time reading long, poorly organized and verbose reports. One key skill that writers of good reports show is selectivity. For example, you may have many different coefficient results and tests statistics from your various regression runs. An important part of any report is to decide what information is important and what is unimportant to your readership. Select only the most important information for inclusion in your report and report honestly and openly the results that you obtain (even if your results go against your theory).

The data sets for Project Topics 1 and 2 are available on the book's website (www.wiley.com/go/koopafd). The link for the data set for Project Topic 3 is given below.

Warning: This empirical project is due on 8 May. In late April/early May you may be busy with exams and exam preparation. I strongly recommend that you not leave your project too near the deadline. Ideally, the month of April (i.e. the period containing the break between terms plus weeks 11 and 12) is when you should allocate time to work on the project. I will try to complete most of the lecture material by the end of week 10. However, it is probable that I will not be able to lecture on the material on financial volatility until week 11. Keep this in mind if you want to choose Topic 3 (which involves financial volatility) for your project.

Contacting me: I am an email person and find the most productive way of offering advice about your project is through email. Please feel free to email me at Gary.Koop@strath.ac.uk.
During term time I have office hours. However, out of term I am not always in my office (but will still be reachable over email).

Project Topic 1: What moves the stock and bond markets?

In Chapter 11 of the textbook, an example was presented based on the paper by Campbell and Ammer, "What moves the stock and bond markets? A variance decomposition for long-term asset returns" (Journal of Finance in 1991). The data used in this paper is in VAR.XLS. This data set contains the following six variables (see the textbook, the original paper and VAR.XLS for more details about the data):

- er is the excess stock return.
- r is the real interest rate.
- dy is the change in the return on a short-term bond.
- s is the yield spread (difference in yields between a 10 year and a two month bond).
- dp is the log of the dividend-price ratio.
- rb is the relative bill rate (a return on a short term bond relative to the average returns over the last year)

At the broadest level of generality, this project topic asks you to build on the example in the textbook using VARs. You are free to push the project in several directions. Here are a few examples of the types of issues/questions you may wish to focus your project on:

Are the statistical modeling choices (e.g. the use of a VAR as opposed to a VECM, lag length selection, treatment of deterministic trends, etc.) in the textbook examples correct?

Use VAR methods to investigate whether excess stock returns and bond returns are predictable. If they are, what explanatory variables are good for predicting them?

Use VAR methods to address Granger causality issues.

Or think of some other direction to push this topic.

Project Topic 2: The Effect of Wealth on Consumption

In Chapter 11 of the textbook, an example was presented based on the paper by Lettau and Ludvigson: “Understanding trend and cycle in asset values: Reevaluating the wealth effect on consumption" (American Economic Review in 2004). The data used in this paper is in CAY.XLS. This data set contains three variables: consumption, assets and income (see the textbook, the original paper and CAY.XLS for more details about the data).

At the broadest level of generality, this project topic asks you to build on the example in the textbook using the techniques associated with unit roots, cointegration testing and VECMs. You are free to push the project in several directions. Here are a few examples of the types of issues/questions you may wish to focus your project on:

The conclusions of Lettau and Ludvigson are based on a finding of one cointegrating relationship between these variables. Investigate this in more detail using different lag lengths, different treatments of the deterministic terms, different tests (i.e. Johansen test and Engle-Granger test). Confirm the original finding of Lettau and Ludvigson that all variables have unit roots, etc.

Estimate a VECM and interpret the results. Which explanatory variables are good for predicting which variables?

Use VECM methods to address Granger causality issues.

Or think of some other direction to push this topic.

Project Topic 3: Univariate Properties of Asset Prices

This project topic uses the data from the book **Nonlinear Time Series Models in Empirical Finance** by Philip Hans Franses and Dick van Dijk (Cambridge University Press). The data is available through
http://www.few.eur.nl/few/people/djvandijk/nltsmef/nltsmef.htm.
This data contains stock price indices from Amsterdam (EOE), Frankfurt (DAX), Hong Kong (Hang Seng), London (FTSE100), New York, (S&P 500), Paris (CAC40), Singapore (Singapore All Shares) and Tokyo (Nikkei). It also has exchange rates for the Australian dollar, British pound, Canadian dollar, German DeutschMark, Dutch guilder, French franc, Japanese yen and the Swiss franc, all expressed as number of units of the foreign currency per US dollar. The sample period for the stock indices runs from January 6, 1986 until December 31, 1997, whereas for the exchange rates the sample covers the period from January 2, 1980 until December 31, 1997.

Note that this data is available at a daily frequency. You may want to work with the data at this frequency or at a weekly (e.g. by just using data every Wednesday) or monthly frequency (e.g. by just using data from the last day of each month).

At the broadest level of generality, this project topic asks you to investigate the univariate time series properties of some (or all) of these variables using the tools of Chapters 9 and 12 of the textbook. Do not feel you have to use all of the variables. You might, e.g., want to focus on stock prices only (or exchange rates only). Or you may want to choose a few key countries for comparison.

You are free to push the project in several directions. Here are a few examples of the types of issues/questions you may wish to focus your project on:

Investigate the random walk hypothesis using this data. Do stock prices appear to follow a random walk in every country? Do exchange rates?

Investigate financial volatility using this data with ARCH and GARCH models. Do stock returns appear to exhibit time varying volatility? Do exchange rates?

Does volatility in financial markets differ depending on the frequency a financial market is observed? For instance, stock markets might be more volatile when observed every day than when observed weekly or monthly. Investigate this issue using this data set.

Writing an Empirical Project

This handout offers general guidelines on writing an empirical paper or project. Note that, in your Analysis of Financial Data project, you do not have to include every section I talk about below (I make explicit what you do not have to do below). However, I include a complete discussion of what an empirical paper involves since you may have to do one as a student (e.g. for your dissertation) or in your future job. Hence, I think it useful that you see the complete picture, rather than just the precise steps necessary for the Analysis of Financial Data project.

Description of a Typical Empirical Project

Financial analysts are engaged in research in a wide variety of areas today. Graduate students, academics, policymakers working in the civil service and central banks, financial analysts working in private sector banks or industry -- may all need to write reports that involve analyzing financial data. Depending on the topic and intended audience, the form of these reports can vary widely, so that there is no one correct format for an empirical paper. With this in mind, we provide common elements of reports below as a guideline for future empirical work. Note, however, that, in the context of your own projects or careers, it may not be necessary for you to include all of these elements in your report(s).

1. **Introduction**. Most reports begin with an introduction that briefly motivates and describes the issue being studied and summarizes the main empirical findings. The introduction should be written in simple non-technical language, with statistical and financial jargon kept to a minimum. A reader who is not an expert in the field should be able to read and understand the general issues and findings of the report or paper. [For this course this can be very brief, 1 page at most]

2. **Literature Review.** This should summarize related work that others have done. It should list and very briefly describe other papers and findings that relate to yours. [For this course, you do not have to include this section.]

3. **Financial Theory.** If the report is academic in nature and involves a formal theoretical model, then it is often described in this section. For policy reports you may not need to include a formal mathematical model, but this section allows you to describe the financial or institutional issues of your work in more detail. This section can be more technical than the preceding ones and will typically include some mathematics and financial jargon. In short, you can address this section solely to an audience of experts in your field. [For this course, you do not have to include this section. If you base your project on a paper such as the Campbell and Ammer one, then you may wish to offer a very brief summary of the paper here. 1 page at most]

4. **Data**. In this section you should describe your data, including a detailed discussion of its sources. [For this course, since I am giving you the data, you do not have to include this section]

5. **The Model to be Estimated.** In this section you should discuss how you use the data to investigate the financial theory outlined in section 3. The exact form of this section might vary considerably, depending on the topic and on the intended audience. For instance, you may want to argue that a certain model (e.g. a VAR or VECM) is of interest for the study, that certain variables will be the dependent variable and that other variables will be the explanatory variables. Similarly, in a time series exercise, you may wish to argue that your financial theory implies that your variables should be cointegrated and that, for this reason, a test of cointegration will be carried out. Or, if you are interested in pricing financial derivatives, you can use this to motivate a particular model of financial volatility. In short, it is in this section that you should justify the techniques used in the next section. [This is an important section for this course. Perhaps 2 pages long.]

6. **Empirical Results.** This section is typically the heart of any report. At this stage you should describe your empirical findings and discuss how they relate to the financial issue(s) under investigation. It should contain both statistical and financial information. By "financial" information we refer, for example, to coefficient estimates or to a finding of cointegration between two variables, and what these findings may imply for financial theory. In contrast, "statistical" information may include: results from hypothesis tests that show how coefficient estimates are significant; a justification for choice of lag length; an explanation for deleting insignificant explanatory variables; a discussion of model fit (e.g. the R^2 or outliers); etc. Much of this information can be presented in tables or graphs. For instance, tables should be used to present results from a more formal statistical analysis, such as coefficient estimates, together with t-statistics (or P-values), R^2s and F-statistics for testing the significance of the regression as a whole. [This is the most important part of the project, perhaps 3-4 pages long]

7. **Conclusion.** This should briefly summarize the issues addressed in the paper, specifically, its most important empirical findings. [For this course, this can be brief, probably less than 1 page]