**AD 685 Project – Spring 2023**

**Instructions:**

* **Please complete the guided project by Wed, May 10, 11:59 PM (Via Blackboard)**
* **Write your answer below each question and upload a “word doc” named LastName\_FirstName.doc using the link on Blackboard.**
* **Also, you must upload the work files from R (LastName\_FirstName.prg). One for Part 1 and one for Part 2. Excel is not suitable for this project, and it will not be accepted.**

**This project consists of two parts:**

* **Part 1: Predicting Stock Returns.**
* **Part 2: Forecasting models for the rate of inflation.**

# Part 1: Predicting Stock Returns.

**Data Description:**

Documentation for Stock\_Returns\_1931\_2002

This file contains 2 monthly data series over the 1931:1-2002:12 sample period.

* ExReturn: Excess Returns
* ln\_DivYield: 100×ln(dividend yield). (Multiplication by 100 means the changes are interpreted as percentage points).

The data were supplied by Professor Motohiro Yogo of the University of Pennsylvania and were used in his paper with John Campbell:

* “Efficient Tests of Stock Return Predictability,” Journal of Financial Economics, 2006.

(Double click in the window below to access the data)



***Some Background***

**exreturn:** is the excess return on a broad-based index of stock prices, called the CRSP value-weighted index, using monthly data from 1960:M1 to 2002:M12, where “M1” denotes the first month of the year (January), “M2” denotes the second month, and so forth.

* The monthly excess return is what you earn, in percentage terms, by purchasing a stock at the end of the previous month and selling it at the end of this month, minus what you would have earned had you purchased a safe asset (a U.S. Treasury bill). The return on the stock includes the capital gain (or loss) from the change in price plus any dividends you receive during the month.

***Calculating k-period stock returns:***

One-period holding return:

Two-period holding return:

Other way

Three-period’s returns:

k-period’s returns:

**When to apply a “buy and hold” strategy:**

* If you have a reliable “forecast” of future stock returns then an active “buy and hold” strategy will make you rich quickly by beating the stock market.
* If you think that the stock market will be going up, you should buy stocks today and sell them later, before the market turns down. Forecasts based on past values of stock returns are sometimes called “momentum” forecasts: If the value of a stock rose this month, perhaps it has momentum and will also rise next month.
* If so, then returns will be autocorrelated, and the autoregressive model will provide useful forecasts. You can implement a momentum-based strategy for a specific stock or for a stock index that measures the overall value of the market.
* From another point of view, we can use autoregressive models to test a version of the efficient markets hypothesis (EMH). A strict form of the efficient markets hypothesis states that information observable to the market prior to period should not help to predict the return during period . If the (EMH) is false, then returns might be predictable. If so, then returns will be autocorrelated, and the autoregressive model will provide useful forecasts.
* For example, if you want to find out if returns are predictable (even if it is just a bit), estimate the following AR(1)
* A positive coefficient means “momentum,” past “good returns” mean higher future returns.
* A negative coefficient means “overreaction” or “mean reversion”. In this case, previous “good returns” mean lower future returns.
* Either way, if , then returns will be autocorrelated, and the autoregressive model will provide useful forecasts.

Note: In all your calculations use Huber-White heteroskedasticity consistent standard errors and covariance.

1. Repeat the calculations reported in Table 15.2, using the following regression specifications estimated over the 1960:M1–2002:M12 sample period.

AR(1) Model

AR(2) Model

AR(4) Model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Autoregressive Models of Monthly Excess Stock Returns, 1960:M1–2002:M12** | | | | | |
|  |  |  |  |  |  |
| **Dependent variable: Excess returns on the CRSP value-weighted index** | | | | | |
|  | (1) |  | (2) |  | (3) |
| **Specification** | **AR(1)** |  | **AR(2)** |  | **AR(4)** |
| **Regressors** |  |  |  |  |  |
| **Excess Ret(t-1)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Excess Ret(t-2)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Excess Ret(t-3)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Excess Ret(t-4)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Intercept** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Adj R^2** |  |  |  |  |  |
|  |  |  |  |  |  |
| Wald **F-statistic** |  |  |  |  |  |
| p-value |  |  |  |  |  |
| T= |  |  |  |  |  |

1. Are these results consistent with the theory of efficient capital markets?
2. Can you provide an intuition behind this result?
3. Repeat the calculations reported in Table 15.6, using regressions estimated over the 1960:M1–2002:M12 sample period.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Autoregressive Distributed Lag Models of Monthly Excess Stock Returns, 1960:M1–2002:M12** | | | | | |
|  |  |  |  |  |  |
| **Dependent variable: Excess returns on the CRSP value-weighted index** | | | |  |  |
|  | (1) |  | (2) |  | (3) |
| **Specification** | **ADL(1,1)** |  | **ADL(2,2)** |  | **ADL(1,1)** |
| **Eatimation Period** | **1960:M1–2002:M12** |  | **1960:M1–2002:M12** |  | **1960:M1–1992:M12** |
| **Regressors** |  |  |  |  |  |
| **Excess Ret(t-1)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Excess Ret(t-2)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Change\_ln\_DP(t-1)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Change\_ln\_DP(t-2)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **ln\_DP(t-1)** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Intercept** |  |  |  |  |  |
| Std. Error |  |  |  |  |  |
| p-value |  |  |  |  |  |
|  |  |  |  |  |  |
| **Adj R^2** |  |  |  |  |  |
|  |  |  |  |  |  |
| **F-statistic** |  |  |  |  |  |
| p-value |  |  |  |  |  |
| **Obs =** |  |  |  |  |  |

1. Does the have any predictive power for stock returns?
2. Does “the level of the dividend yield” have any predictive power for stock returns?
3. Construct pseudo out-of-sample forecasts of excess returns over the 1993:M1–2002:M12 period, using the regression specifications below that begin in 1960:M1.

ADL(1,1) specification:

Constant Forecast: (in which the recursively estimated forecasting model includes only an intercept)

Zero Forecast: the sample RMSFEs of always forecasting excess returns to be zero.

|  |  |
| --- | --- |
| Model | RMSFE |
| Zero Forecast |  |
| Constant Forecast |  |
| ADL(1, 1) |  |

1. Does the ADL(1,1) model with the log dividend yield provide better forecasts than the zero or constant models?

**Part 2**

**Forecasting models for the rate of inflation - Guidelines**

Go to FRED’s website (<https://fred.stlouisfed.org/>) and download the data for:

* Consumer Price Index for All Urban Consumers: All Items (CPIAUCSL) - Seasonally adjusted – Monthly Frequency – From 1947:M1 to 2017:M12

In this hands-on exercise you will construct forecasting models for the rate of inflation, based on CPIAUCSL.

For this analysis, use the sample period 1970:M01–2012:M12 (where data before 1970 should be used, as necessary, as initial values for lags in regressions).

1. Compute the (annualized) inflation rate,
2. Plot the value of Infl from 1970:M01 through 2012:M12. Based on the plot, do you think that Infl has a stochastic trend? Explain.
3. Compute the first twelve autocorrelations of
4. Plot the value of from 1970:M01 through 2012:M12. The plot should look “choppy” or “jagged.” Explain why this behavior is consistent with the first autocorrelation that you computed in part (i) for .
5. Compute Run an OLS regression of on . Does knowing the inflation this month help predict the inflation next month? Explain.
6. Estimate an AR(2) model for ­Infl. Is the AR(2) model better than an AR(1) model? Explain.
7. Estimate an AR(p) model for . What lag length is chosen by BIC? What lag length is chosen by AIC?
8. Use the AR(2) model to predict “the level of the inflation rate” in 2013:M01—that is, ­.
9. Use the ADF test for the regression in Equation (14.31) with two lags of to test for a stochastic trend in .
10. Is the ADF test based on Equation (14.31) preferred to the test based on Equation (14.32) for testing for stochastic trend in ? Explain.
11. In (i) you used two lags of . Should you use more lags? Fewer lags? Explain.
12. Based on the test you carried out in (i), does the AR model for contain a unit root? Explain carefully. (Hint: Does the failure to reject a null hypothesis mean that the null hypothesis is true?)
13. Use the QLR test with 15% trimming to test the stability of the coefficients in the AR(2) model for “the inflation” . Is the AR(2) model stable? Explain.
14. Using the AR(2) model for with a sample period that begins in 1970:M01, compute pseudo out-of-sample forecasts for the inflation beginning in 2005:M12 and going through 2012:M12.
15. Are the pseudo out-of-sample forecasts biased? That is, do the forecast errors have a nonzero mean?
16. How large is the RMSFE of the pseudo out-of-sample forecasts? Is this consistent with the AR(2) model for estimated over the 1970:M01–2005:M12 sample period?
17. There is a large outlier in 2008:Q4. Why did inflation fall so much in 2008:Q4? (Hint: Collect some data on oil prices. What happened to oil prices during 2008?)