

# Applied Econometrics for Macro and Finance

## Introduction

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## Course Goals

- This course provides an introduction to time-series econometrics for studying various empirical topics in macroeconomics and finance.
- This course aims to provide students with
  1. knowledge how to conduct an empirical research in the field of macroeconomics, international finance, and financial economics.
  2. research literacy to evaluate an empirical study.
  3. ability to finish a research paper in empirical macroeconomics and finance.

## Course Requirements

- Homework Assignments: 30%
- Midterm Exam: 30%
- Presentation and Term Paper: 40%

## Important Dates

- Midterm: April 12, 2023
- Proposal: May 3, 2023
- Term Paper: Before noon, June 7, 2023

## Reading Materials

- 陳旭昇 (2022), 應用總體與財金時間序列分析 (第 3 版)

EViews

### 時間序列分析 三版

總體經濟與財務金融之應用

陳旭昇 ——— 著



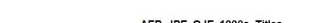
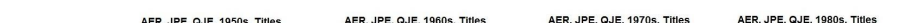
*Applied Time Series Econometrics  
for Macroeconomics and Finance*

<https://homepage.ntu.edu.tw/~sschen/Book/Book.html>

## Why Empirics in Macroeconomics and Finance?

- If we would like to study Economics and Finance **scientifically**.  
⇒ To devise/refine approximate descriptions (models) of **the economy**.
- The feature distinguishing science from other means of doing so is its characteristic method:
  - observing and then asking a question
  - formulating a hypothesis, testing it
  - rejecting or failing to reject the hypothesis
- A hypothesis which could not be falsified by any empirical data is not scientific

- effect review public production case credition  
inflation labor international behavior public  
inflation distribution welfare time business costs



## Example 1: 台灣的匯率政策 (官方說法)

根據《中央銀行年報》(2016), 央行對於外匯市場的管理, 採取所謂的「彈性匯率政策」:

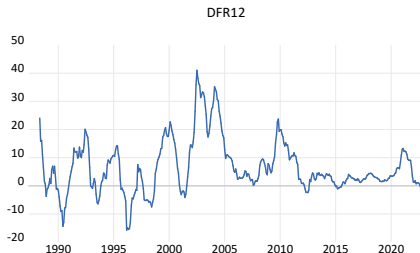
“本行採行管理浮動匯率制度, 新台幣匯率原則上由外匯市場供需決定, 如遇不規則因素 (如短期資金大量進出) 及季節因素, 導致匯率過度波動與失序變動, 而有不利於經濟與金融穩定之虞時, 本行將本於職責維持外匯市場秩序。”



## Example 1: Asymmetric Intervention

### (1) Observing and then Asking a Question

- 台灣外匯存底年成長率 (1989:6-2022:12), 謝森中 (1989:6-1994:6), 梁國樹 (1994:6-1995:3), 許遠東 (1995:3-1998:2), 彭淮南 (1998:2-2018:2), 楊金龍 (2018:3-)



- Q: 如果是執行動態穩定, 長期而言, 央行買賣外匯之機率應各半, 為何 1998 迄今存在大量外匯存底累積? 央行是否「阻升不阻貶」?

## Example 1: Asymmetric Intervention

### (2) Formulating a Hypothesis, Testing it

- 根據市場上的經驗，許多人發現央行常有阻止新台幣升值的作為，卻較少有阻止貶值之行動。
- 張元晨 (2007) 整理央行干預匯市報導並篩選出其樣本期間 (2001 年 4 月 16 日至 2003 年 8 月 5 日的日資料) 中，共有 140 次央行干預匯市的明確報導。其中，央行阻止新台幣升值的日期共有 104 天，其餘的只有 36 天是阻止新台幣貶值。
- Hypothesis: 央行「阻升不阻貶」!

## Example 1: Asymmetric Intervention

### (2) Formulating a Hypothesis, Testing it

#### Eyeball Econometrics

- 2014 年 12 月 18 日央行理監事會後記者參考資料

壹、新台幣匯率政策相關議題之說明

一、某些人士認為，央行採「阻升不阻貶」的匯率政策？

說明：

(一)新台幣對美元價位有升有貶，且長期間呈升值的趨勢

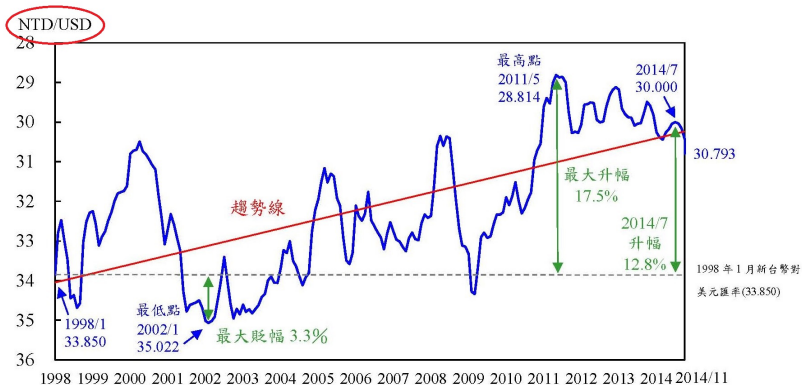
1. 新台幣對美元之走勢有升有貶。1998 年至今，大致在 28 至 35 元之間浮動。
2. 與 1998 年 1 月之 33.85 元相比，升幅最大曾達 17.5%，貶幅最大僅 3.3%(見圖 1)。本(2014)年以來，升值幅度最大達 12.8%。
3. 長期間，新台幣對美元其實呈升值的趨勢(圖 1 紅線)，央行並沒有阻升不阻貶。

# Example 1: Asymmetric Intervention

## (2) Formulating a Hypothesis, Testing it

### Eyeball Econometrics

圖 1 新台幣對美元匯率走勢



資料來源：中央銀行

## Example 1: Asymmetric Intervention

### (3) Rejecting or Failing to Reject the Hypothesis

- 學生不能把「考試成績不及格」當成「沒有作弊」的證據。
- 透過 **SVAR 模型** 認定出外生的結構性匯率衝擊 (structural exchange rate shock), 然後將其分解成升值衝擊 (appreciation shock) 與貶值衝擊 (depreciation shock), 進一步以**時間序列迴歸模型**探討央行是否在外匯市場上採用不對稱的匯率干預政策。
- 結論:
  - 央行阻升不阻貶的證據具有**統計顯著性**
  - 在 1989:5–1998:2 之間, 央行對於外匯市場的干預較小。
  - 1998 年 3 月之後, 央行確有顯著的「阻升不阻貶」之行為。
  - 證據支持統計上有 structural change 存在 (**tests of structural changes**)。Break Date 的估計值: **1998 年 8 月**。

## Example 2: Oil Price vs. Stock Market

### (1) Observing and then Asking a Question

- Hikes in oil prices since 1999 have attracted attention from economists.
- From 1999, oil prices began to rise, especially after 2001, and climbed to record highs (around \$133/barrel) in 2008.

## Example 2: Oil Prices vs. Stock Market

### (1) Observing and then Asking a Question

Figure: Oil Prices: WTI (1986–2023)



## Example 2: Oil Prices vs. Stock Market

### (1) Observing and then Asking a Question

- In the New York Times (June 28, 2008):
  - “Battered by Oil, Dow Touches Bear Territory”.
  - “Dow Moves Into Bear Territory as Oil Hits New High”.
- Q: Do Higher Oil Prices Push the Stock Market into Bear Territory?



## Example 2: Oil Prices vs. Stock Market

### (2) Formulating a Hypothesis, Testing it

- Consider a **Markov-switching model** of stock returns.
- Let  $R_t$  represent the stock return:

$$R_t = \mu_{s_t} + \varepsilon_t, \quad \text{where } \varepsilon_t \sim \text{i.i.d.} \mathcal{N}(0, \sigma_{s_t}^2).$$

- $S_t$  is a state variable

$$S_t = \begin{cases} 0 & \text{bear market} \\ 1 & \text{bull market} \end{cases}$$

## Example 2: Oil Prices vs. Stock Market

### (2) Formulating a Hypothesis, Testing it

- Assume the transition probabilities

$$p_t^{oo} = P(S_t = o | S_{t-1} = o) = \frac{\exp\{\alpha_o + \alpha_1 o_t\}}{1 + \exp\{\alpha_o + \alpha_1 o_t\}},$$

$$p_t^{1o} = P(S_t = o | S_{t-1} = 1) = \frac{\exp\{\beta_o + \beta_1 o_t\}}{1 + \exp\{\beta_o + \beta_1 o_t\}}.$$

where  $o_t$  is the oil price shock.

- Null Hypothesis

$$\alpha_1 > 0 \quad \text{and} \quad \beta_1 > 0$$

## Example 2: Oil Prices vs. Stock Market

### (3) Rejecting or Failing to Reject the Hypothesis

- S&P500 index (1957:M1 to 2009:M5)
- Four different measures of the oil price shocks
- $\hat{\beta}_1 > 0$  significantly, which provides strong evidence that an increase in oil prices raises the probability of switching from a bull market to a bear market.
- $\hat{\alpha}_1 > 0$  but statistically insignificant, which suggests that the evidence that a higher oil price increases the probability of being trapped in a bearish regime is rather weak.

# What does Macroeconometrics Do?

- Data description
  - what does the historical data tell us
- Forecasting
  - exchange rates, inflation rates
- Structural Inference
  - how does the CB conduct monetary policy?
  - does monetary policy respond to house price movements?
- Policy analysis
  - monetary policy vs. house prices
- Statistical Arbitrage
  - uses statistical tools and time series analysis to identify approximate arbitrage opportunities

## Course Outline

1. Introduction
2. Basic Time Series Modelling and Forecasting
3. Bootstrap
4. **Application:** Stock Return Predictability and Exchange Rate Predictability
5. Tutorial in Research Project Design
  - Choosing a Research Topic
  - Literature Search
  - Editing and Writing

## Course Outline

6. Unit Root Econometrics
7. **Application:** Real Exchange Rates and Purchasing Power parity
8. Vector Autoregressions (VARs) and Structural VAR
9. **Application:** Modelling Monetary Policy
10. **Application:** Crude Oil Markets
11. **Application:** Interest Rate Policy and House Prices

# Computation

- To illustrate empirical applications, we use **EViews**.
- **BDSRC** provides computational supports.
- **Data and EViews Codes** for *Applied Time Series Econometrics for Macroeconomics and Finance*