

SGPE Summer School. Tutorial 3.

Q1. Jules is saving up for an around-the-world trip. He currently has £4000 put away for the trip and he estimates that his total expenses will be about £50 per day, so right now he can afford an 80-day trip. Jules is deciding whether he should begin his trip now or wait for a year. If he goes next year, he expects his expenses will be £51 per day (because of inflation), and in the meantime he can lend the £4000 to his cousin at an interest rate of 6% (his cousin is certain to repay the loan).

- (a) How many days can Jules afford to travel if he waits one year before he goes on the trip?
- (b) Use the answer from part (a) to calculate the real interest rate in terms of travel days.
- (c) What is the inflation rate in terms of backpacking expenses?
- (d) Calculate the real interest rate in terms of travel days using the formula $r = i - \pi$. Do you get the same answer? Explain your result.

Q2. A leasing firm is in the business of borrowing money to buy capital and then renting that capital out to other firms (car rental agencies like Hertz and Enterprise operate on this principle). Like all firms, profits (π) are given by $\pi = \text{revenue} - \text{costs}$. And like any good profit-maximising firm, they choose the optimal profit maximising quantity Q by finding $d\pi/dK$ and setting it equal to zero. Your textbook notes that the derivative (the effect of one extra unit of investment in year t on profits in year $t + 1$) is:

$$MPK_{t+1} \times MR_{t+1} + (1 - \delta)P_{t+1} - (1 + i_t)P_t$$

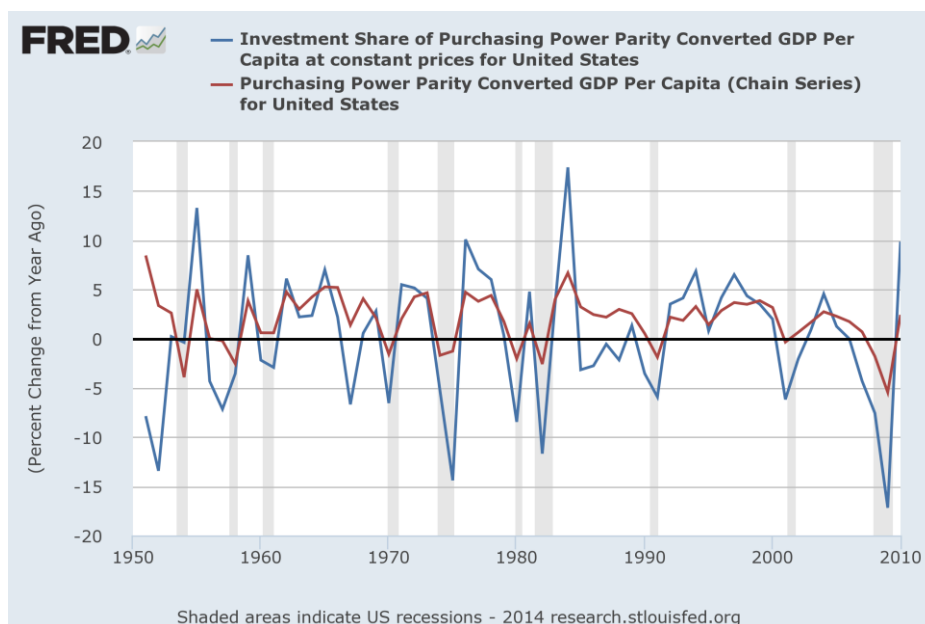
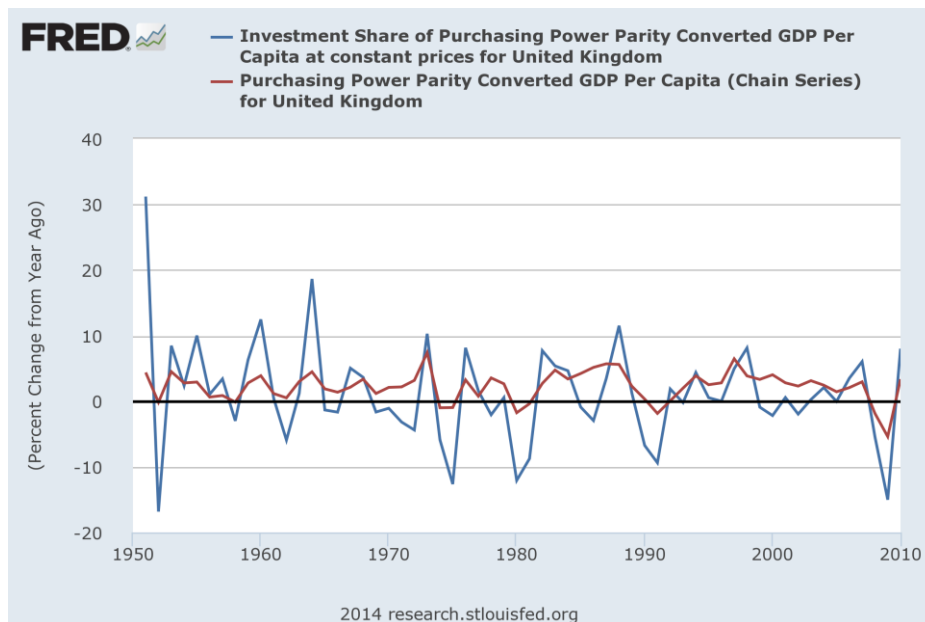
- (a) Give some intuition for this expression, making sure to define the terms as you go along.
- (b) From our earlier analysis of price-setting behaviour, we know that $MR_{t+1} = P_{t+1}/(1 + \mu)$. Given that, and assuming a production function of the form $Y = K^\alpha (EN)^{1-\alpha}$, use the equation above to find an expression for the optimal capital stock.
- (c) For the answer that you found in part (b) - or for the answer that you looked up in the textbook - explain how each parameter and variable in the equation affects the long-run optimal level of capital (K_{opt}).

Q3. What is the accelerator effect? Does a similar mechanism apply to inventory and housing investments?

Q4. The capital intensity of production (α) is 0.3, the mark-up is 20 percent, the depreciation rate is 6 percent and the real interest rate is 4 percent.

- (a) Use the equation for the desired capital stock in the short run [$MPK/(1 + \mu) - \delta = r$] to calculate the desired capital stock relative to production (you may assume a Cobb-Douglas production function if you like).
- (b) Suppose that there is an increase in demand of 3%. Calculate the increase in the desired capital stock as a percent of production.

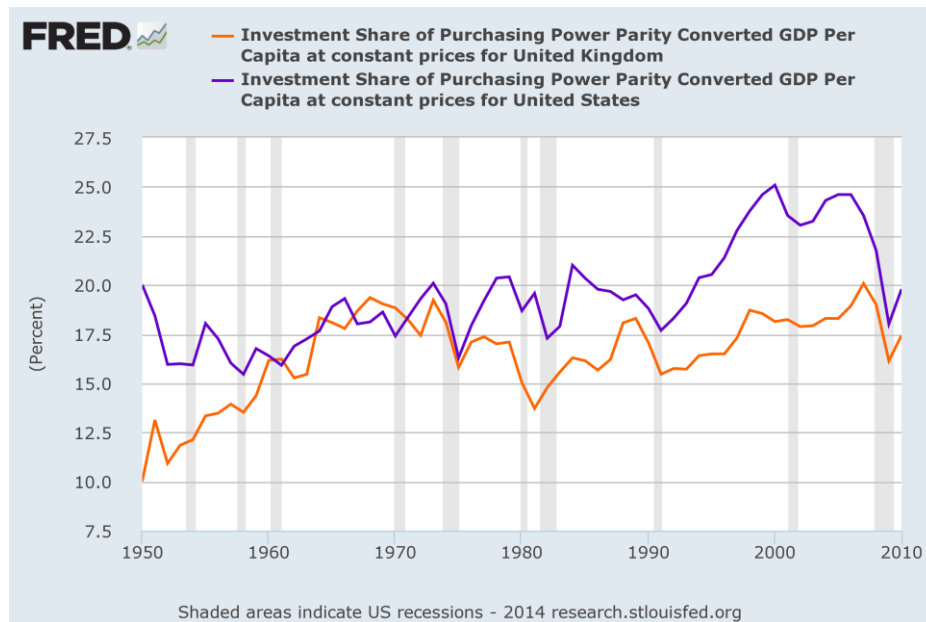
Q5. Below are three plots: the first two show the annual percentage change in investment (blue line) and GDP (red line) since 1950 for the United Kingdom¹ (top) and the United States² (bottom – the US plot also has US recessions shaded in grey). The third plot shows the level of investment as a share of GDP for UK & US³. From the pictures, it's clear that investment is more volatile than GDP. Why?



¹ University of Pennsylvania, *Investment Share of Purchasing Power Parity Converted GDP Per Capita at constant prices for United Kingdom* [KIPPPGGBA156NUPN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/KIPPPGGBA156NUPN/>, December 23, 2014.

² University of Pennsylvania, *Investment Share of Purchasing Power Parity Converted GDP Per Capita at constant prices for United States* [KIPPPGUSA156NUPN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/KIPPPGUSA156NUPN/>, December 23, 2014.

³ University of Pennsylvania, *Investment Share of Purchasing Power Parity Converted GDP Per Capita at constant prices for United Kingdom* [KIPPPGGBA156NUPN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/KIPPPGGBA156NUPN/>, December 23, 2014.



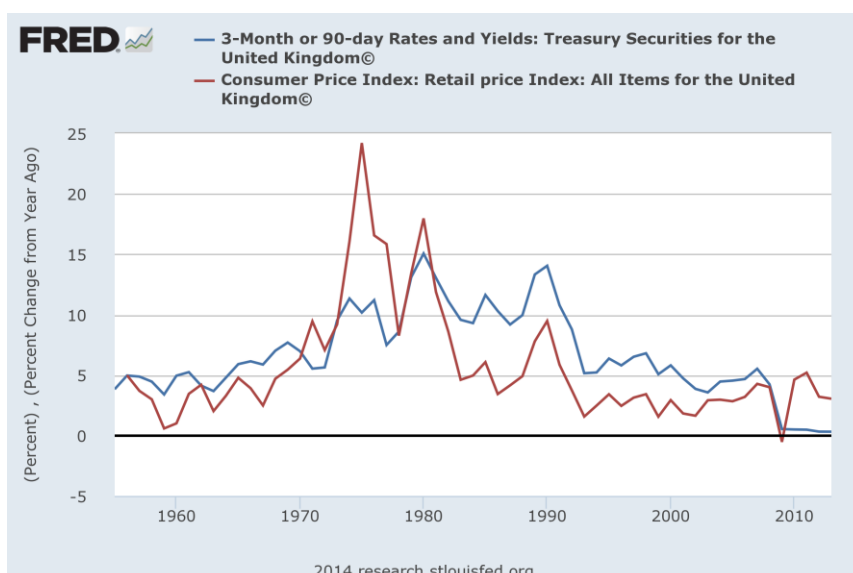
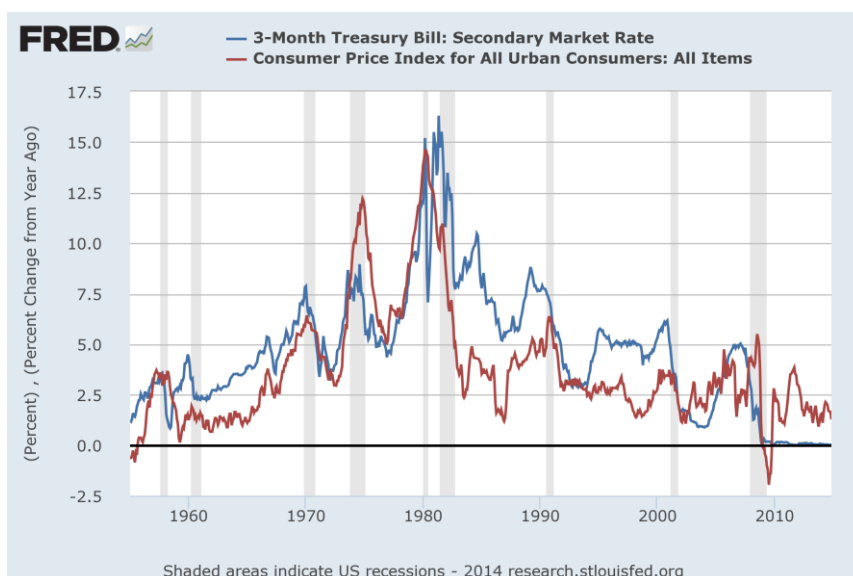
Q6. Analyse how each of the following events might affect investment:

- (a) Inflation increases and the central bank does not seem to care.**
- (b) Inflation increases and the central bank reacts by raising the interest rate more than the increase in the inflation rate.**
- (c) A tax reform induces more workers to enter the labour market.**
- (d) Computers become cheaper and more powerful.**
- (e) A pension reform leads to increased savings as people realise that their pensions will be lower.**

Q7. With the current level of capital at a firm, the marginal product of capital is 0.12. The depreciation rate is 6 percent, the nominal interest rate on corporate loans is 8 percent, and the expected inflation rate is 3 percent. Should the firm increase its capital stock? Answer the question assuming:

- (a) a competitive product market.**
- (b) a monopolistic product market with a mark-up of 20 percent.**

Q8. Consider the data on interest rates (blue lines) and inflation (red lines) shown in the figures below the US⁴ and the UK⁵ over the past 60 years.

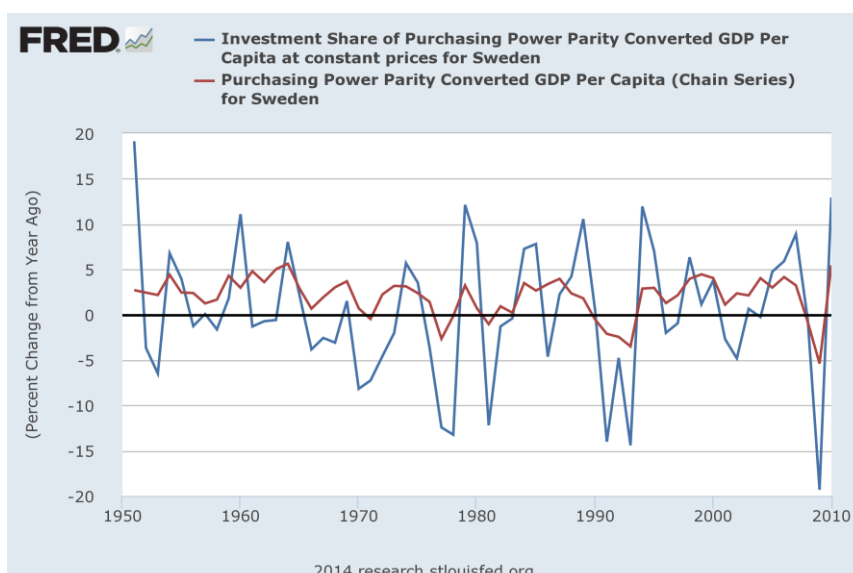
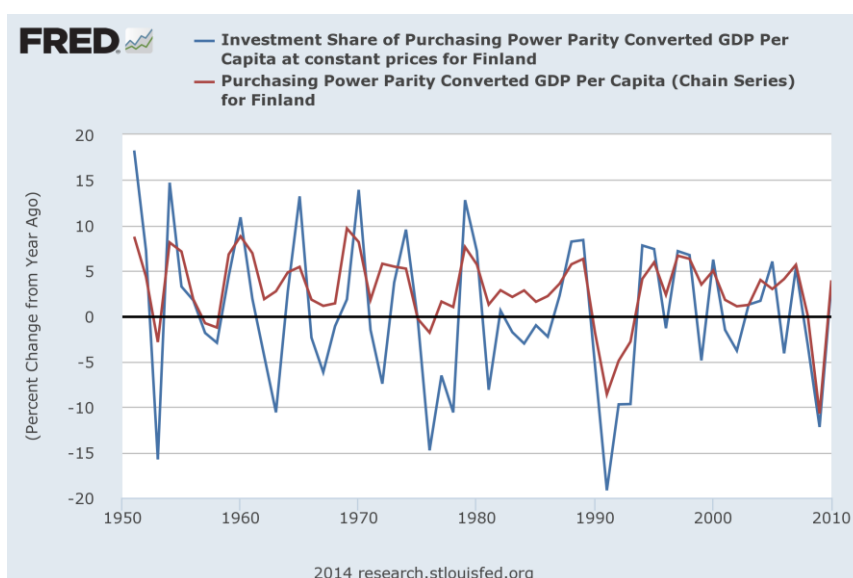


- (a) When was the real interest rate high/low?**
- (b) When did inflation increase/decrease?**
- (c) Compare the answers to (a) and (b). Is there any relation? What could be the reason for this relation?**

⁴ Board of Governors of the Federal Reserve System (US), *3-Month Treasury Bill: Secondary Market Rate* [TB3MS], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/TB3MS/>, December 24, 2014.

⁵ Organisation for Economic Co-operation and Development, *3-Month or 90-day Rates and Yields: Treasury Securities for the United Kingdom©* [IR3TTS01GBA156N], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/IR3TTS01GBA156N/>, December 24, 2014.

Q9. Consider the plots below, which show the annual percentage change in investment (blue line) and GDP (red line) since 1950 for Finland⁶ and Sweden⁷.



- (a) Compare the recent financial crisis in Finland and Sweden to the financial crises in those countries in the beginning of the 1990s. In which case were the recessions deepest and most prolonged? What could the reason be for this?**
- (b) Excluding major financial crises, what is the “normal range” for the growth rates of GDP and investment?**

⁶ University of Pennsylvania, *Investment Share of Purchasing Power Parity Converted GDP Per Capita at constant prices for Finland* [KIPPPGFIA156NUPN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/KIPPPGFIA156NUPN/>, December 24, 2014.

⁷ University of Pennsylvania, *Investment Share of Purchasing Power Parity Converted GDP Per Capita at constant prices for Sweden* [KIPPPGSEA156NUPN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/KIPPPGSEA156NUPN/>, December 24, 2014.