Homework 3

Topics in Asset Pricing
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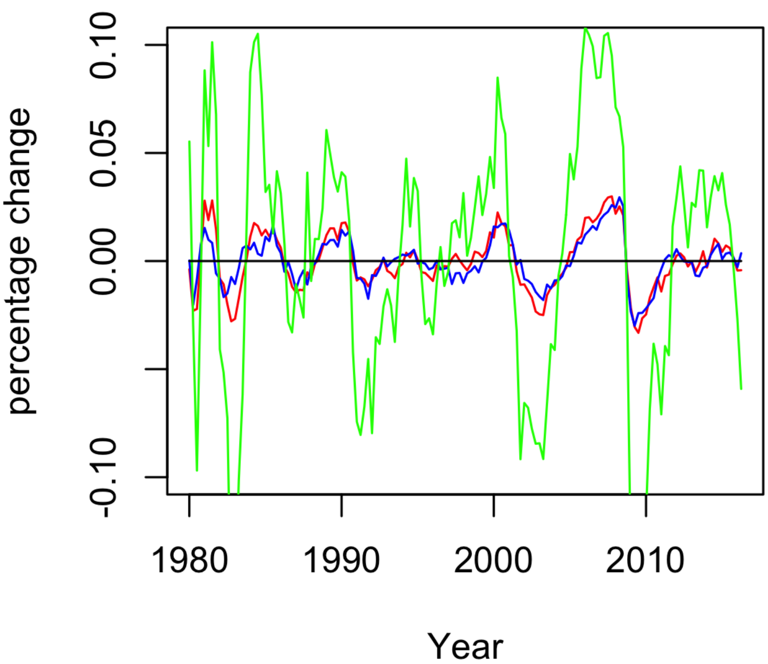
Studying the occurrence and development of business cycles is at the centre of economic research. To analyse those cycles economists study the behaviour of macroeconomic variables such as GDP, investment or consumption. Past research has shown, however, that those presumably closely linked variables do not react to the same extend to external shocks such as e.g. a recession.

To study business cycles one first has to filter the cyclical components out of macroeconomic time series data. To do so a helpful tool is the Hodrick-Prescott-Filter as presented in (1). It was first developed by Hodrick and Prescott (1997) and decomposes a time series by minimising both the squared sum of its cyclical components (c_t) and the second differences of its trend (g_t).

$$min\{\sum_{t=1}^{T}(c_t)^2 + \lambda \sum_{t=0}^{T-1}[(g_{t+1} - g_t) - (g_t - g_{t-1})]^2\} \tag{1}$$

The cyclical components of US-Data for the years 1980-2016 are presented in figure 1. The graphic shows cyclical components of the filtered logarithmized series of US GDP (red), consumption (blue) and investment (green). From looking at the graph it is immediately obvious that investment fluctuates far more than consumption or GDP.

Figure 1: GDP fluctuations



red: GDP; blue: Consumption; green: Investment

These findings are confirmed by the results shown in table 1. The table shows the variance ratios for selected macroeconomic variables compared to GDP. While investment has a variance ratio far above one (indicating more fluctuative behaviour than GDP), consumption varies less than GDP (variance ratio below 1). The results are divergent for different components of consumption however with services consumption being least variant and durable consumption most variant.

Table 1: Variance Ratios

X	SD(X)/SD(GDP)
Consumption	0.81
Durables	2.51
Non-Durables	1.40
Services	0.62
Investment	4.72

The results given are perfectly in line with economic research, which suggests that households try to smooth their consumption over time. This is why consumption reacts less to changes in GDP than e.g. investment. The reason why different parts of consumption react differently has also a more practical explanation. If people lose their job in a recession it is hard for them to cut too much into non-durable, current consumption such as food or electricity. They also might be unable to cut service consumption such as the education cost for their children or health care for their parents. What they can cut into easily, however, is the consumption of durable goods such as a new fridge or a new car. Those purchases can easily be postponed until people have a new job and start to earn money again.

To conclude the empirical findings regarding the behaviour of consumption and investment during business cycles and their respective responses to shocks in GDP can be explained by economic theory. The behaviour of time series filtered using an HP-approach match the patterns one would expect considering the behaviour of households.

References

Hodrick, Robert J, and Edward C Prescott, 1997, Postwar US Business Cycles: An Empirical Investigation, *Journal of Money, Credit and Banking* 1–16.