ECON807 PS5: Business cycle properties in Canada

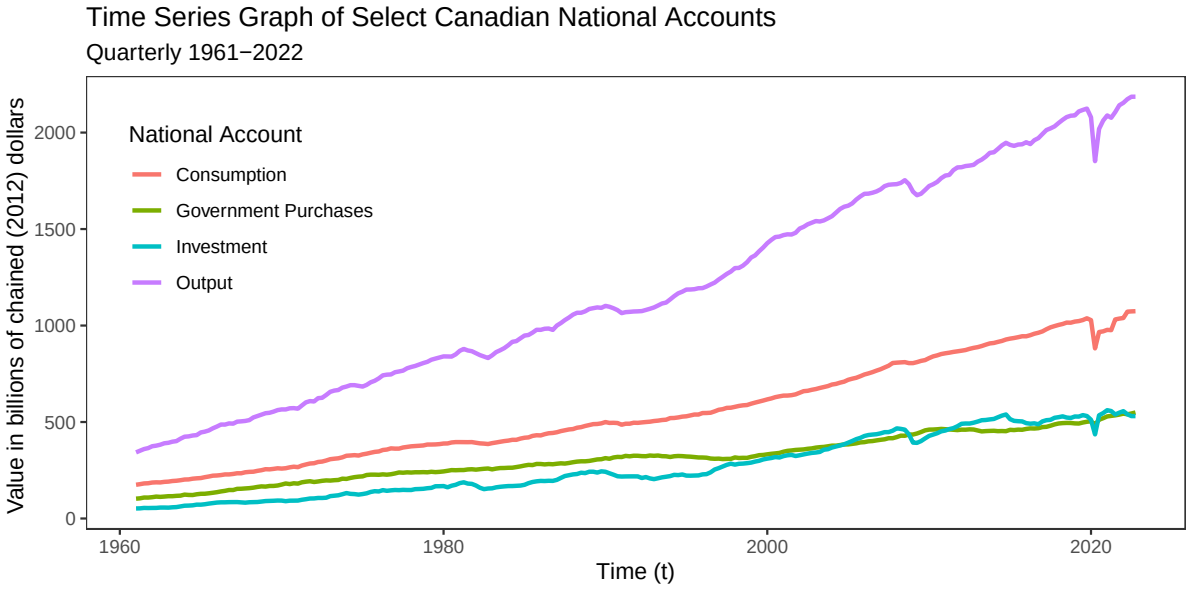
Daniel Sánchez-Pazmiño

In this document I walk through my code, equations and results for the ECON807 PS5.

Preliminaries

(a) Presenting the national account time series

I present graphs with the time series below.



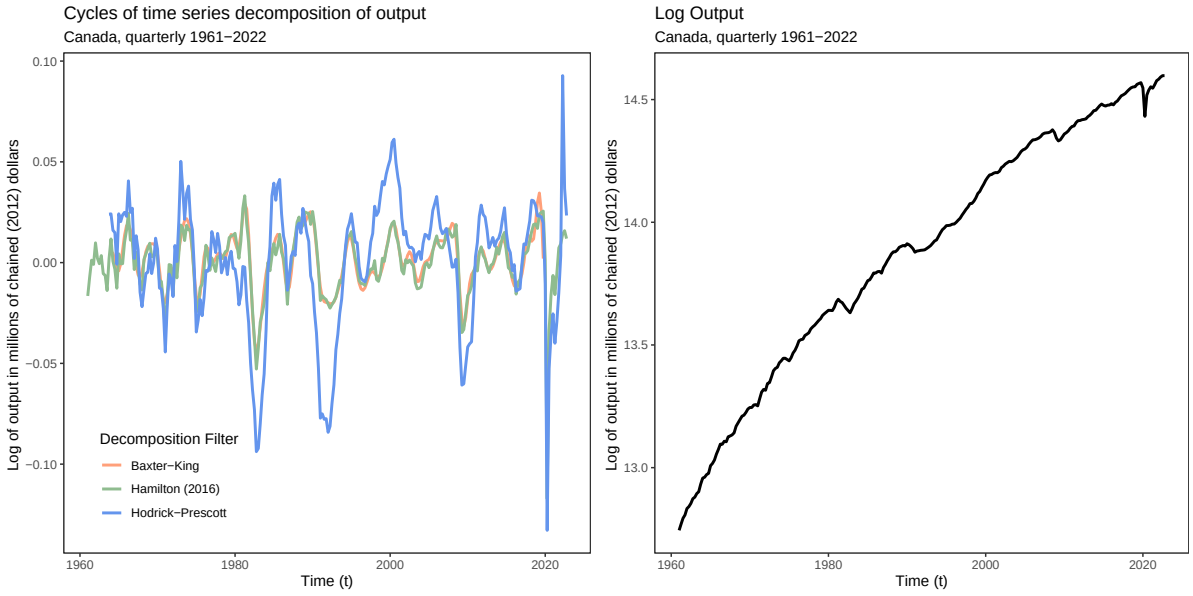
(b) Some transformations

I do the required transformations on the data, but I hide them as they would take too much space. Please see my `.qmd` file (a Quarto source document, which should run in any updated version of R & RStudio). I apply the BK and HP filters, as well as Hamilton's suggested transformation which involves regressing the dependent variables (consumption, investment, government expenditure and output) on their period lags. I use *dplyr*'s function `lag()` for this purpose, and then plot the residuals. All three seem quite similar, and their graphs are shown below.

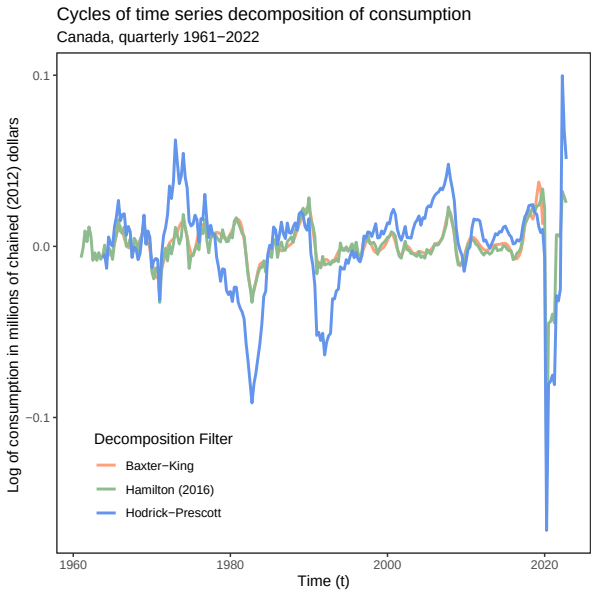
(c) Presenting graphs

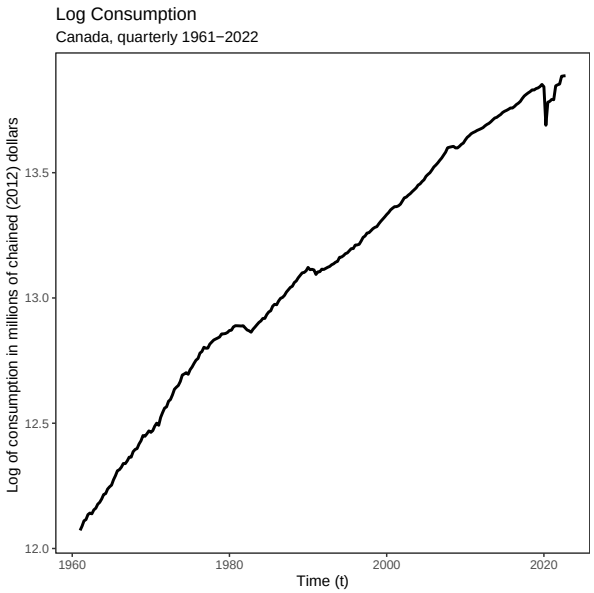
Below, I present four graph panels, with two graphs each. The righmost panel includes the graph of every series decomposed with the BK and HP methods as well as Hamilton's regression approach. The rightmost panel includes the log transformation of the series. I could not include it in the same graph as the magnitued of the decomposed cycles are too small relative to the log, so it is easier to see it in separate graphs.

Output (GDP)

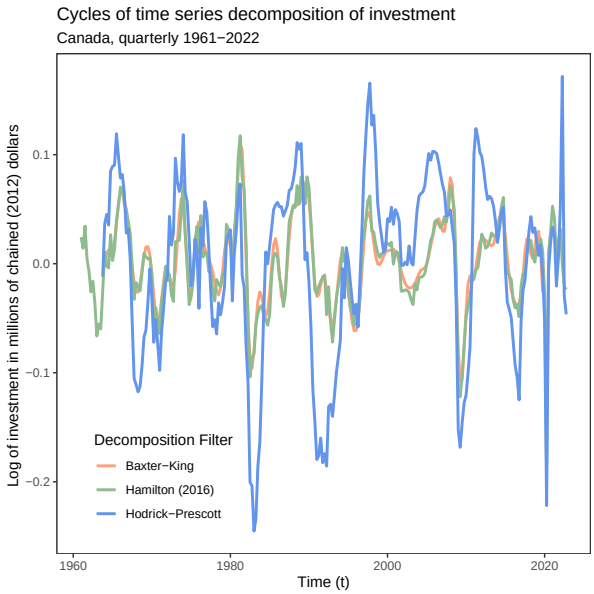


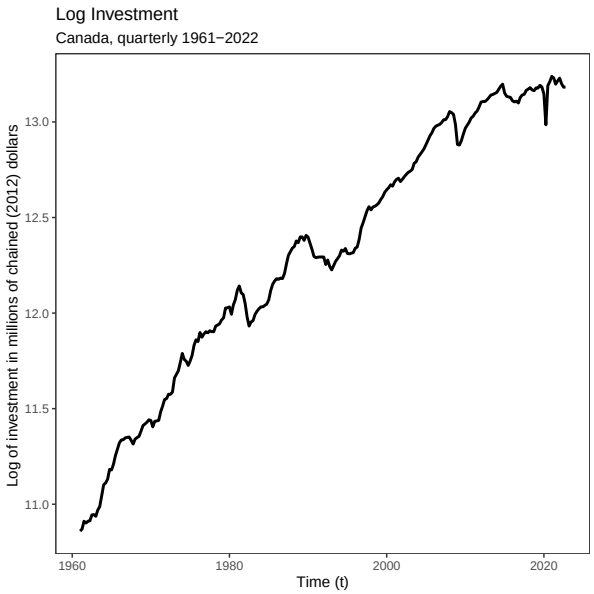
Consumption



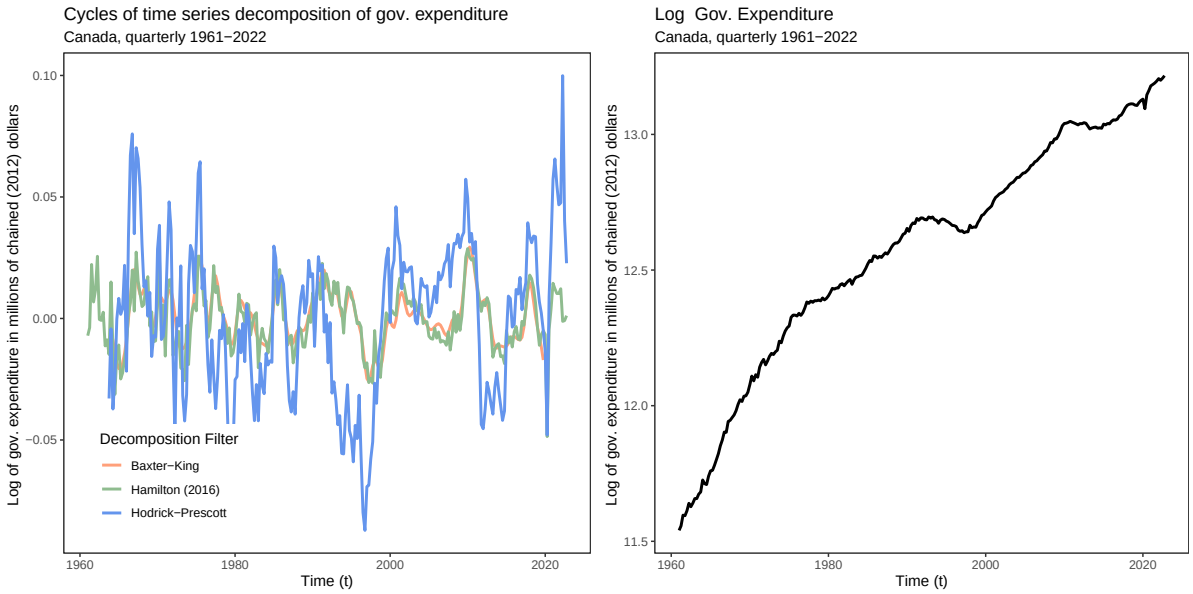


Investment





Government Expenditure



Correlations Table

I perform all calculations necessary to produce the required standard deviation and correlations tables. I compare consumption, investment and government expenditure to output.

Table 1: Standard Deviations Table

	Log	BK Filter	HP Filter	Hamilton (2016)
Output	0.5076010	0.0133301	0.0156414	0.0315477
Consumption	0.5039903	0.0094783	0.0144903	0.0300008
Investment	0.6738751	0.0365974	0.0406321	0.0814497
Government Expenditure	0.4255050	0.0107993	0.0124349	0.0319728

Table 2: Correlation Table (against output)

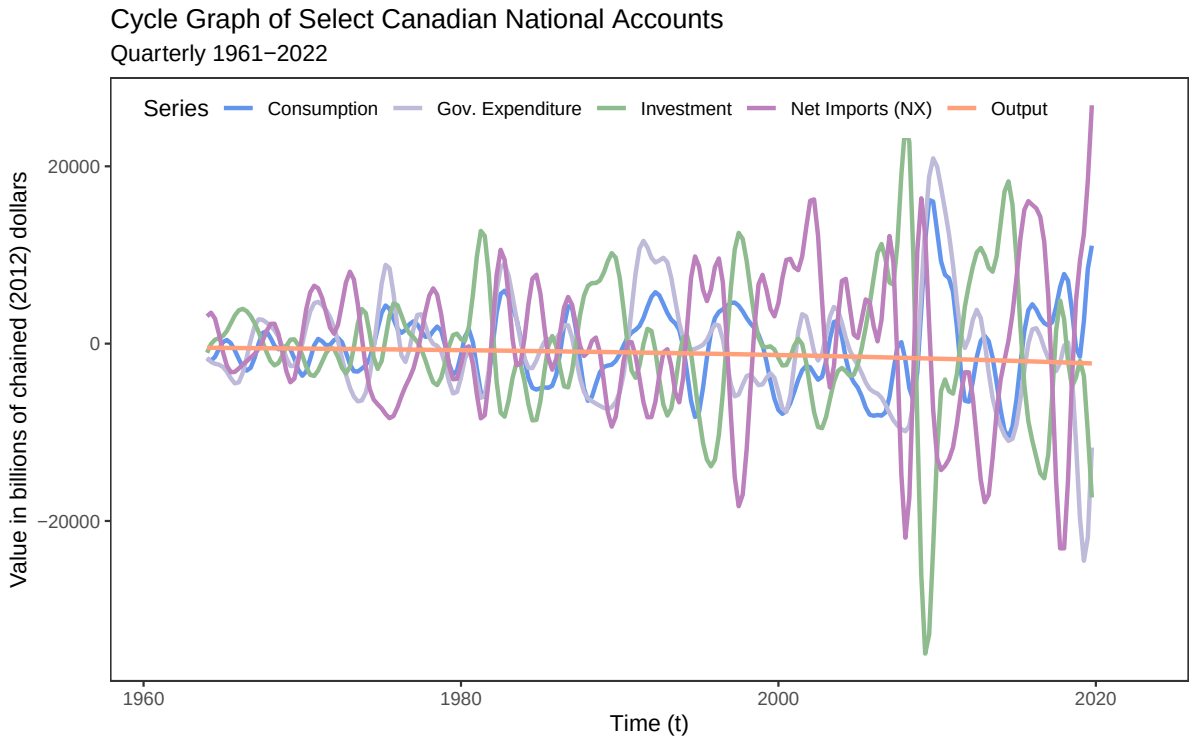
	Log	BK Filter	HP Filter	Hamilton (2016)
Consumption	0.9972160	0.8235766	0.7613107	0.7738119
Investment	0.9968781	0.7915751	0.7467160	0.7917201
Government Expenditure	0.9901711	-0.1345495	-0.1439551	0.1069558

(e) Some comments

According to theory, in general, investment and output tend to be the most volatile components of GDP in terms of the business cycle. Consumption is typically less volatile, while government expenditure can vary depending on the specific context and timing of policy changes. The empirical results that I have presented above show that without decomposing the data, all four series move together closely. We see drops in recessions, but the biggest was the COVID-19 shock in 2020.

It appears that the most volatile component is investment, after having detrended the data. Looking at its graph, it is very volatile (much more than any of the other series). The standard deviations table confirms this. The least volatile series is consumption, which goes according to theoretical predictions. Due to consumption smoothing, people prefer to consume more or less the same on every period, which leads consumption to see the least changes across time. Almost all series across all decomposition types are procyclical, with the exception of government expenditure, which is marginally negatively correlated with output. This makes good sense, considering that governments often try to either fasten or slow down up the economy, so they act against the trend.

(f) Alternative decomposition



Results are quite different now in that first, we cannot accurately observe the cycle of output as it is modeled to be linear in time. Further, the other results seem about the same, although we do observe much smaller volatility in earlier periods of time, unlike all other graphs in (b) (ii). NX seem to be procyclical if compared to consumption, which has proven to be procyclical as well.