Homework 1: Singapore's Economy

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Data source: Singapore Department of Statistics (SingStat, https://www.singstat.gov.sg).

Code: MATLAB code available at https://github.com/DavitGamtenadze/Macroeconomics_1_Homework_1 Code will be updated soon as it needs a bit of clean up after local mess :D .

This homework looks at Singapore's economy from 1990 to 2024. Singapore has grown at 3.55% per year in real terms, with productivity gains of 3.01% per year. The economy is mainly driven by consumption and trade, with investment being the most volatile part.

Section 1: How Singapore's Economy is Structured

1.1 What Singapore Buys

Task 1.1 (Code output). Figure **??** shows how Singapore's GDP is split between consumption (C/GDP), investment (I/GDP), government spending (G/GDP), and net exports (NX/GDP).

1.2 What This Tells Us

Task 1.2 (Interpretation). Looking at the data, we can see several patterns:

- *Consumption is biggest.* Household spending makes up the largest part of GDP, usually around 40-50%. This makes sense since Singapore is a rich country with a big domestic market. The fact that this share is stable shows the economy is mature and consumption-driven.

- *Investment bounces around.* Investment is the most volatile part, jumping up and down during economic crises. We can see this clearly during the 1997 Asian crisis,
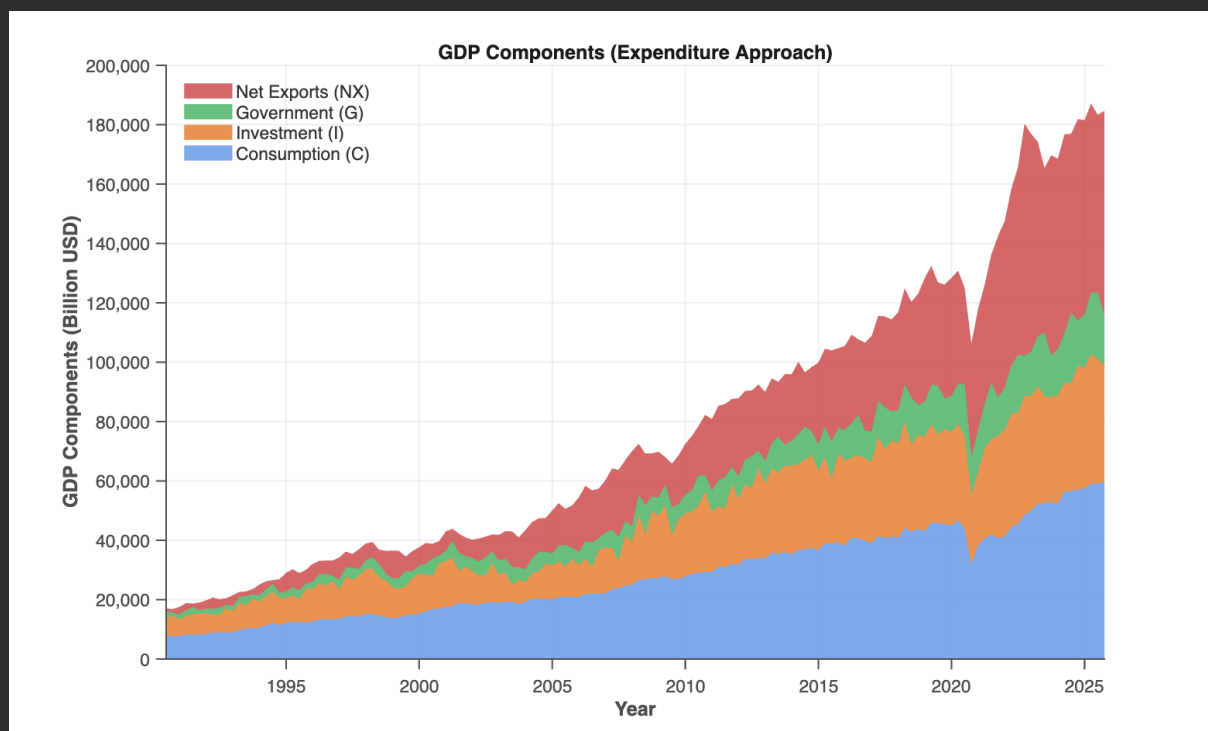
Figure 1: Expenditure shares in nominal GDP: C, I, G, and NX (Singapore).

2008 financial crisis, and 2020 COVID-19. Investment follows the business cycle because companies cut back when times are tough.

- *Singapore exports more than it imports.* Net exports are usually positive, meaning Singapore runs trade surpluses. This fits with Singapore's role as a trading hub and its strength in manufacturing and services. The ups and downs follow global trade patterns.

- *Government spending is steady.* Government spending stays around 10-15% of GDP. This shows Singapore manages its budget well and provides consistent public services.

- *Overall picture.* Singapore is a consumption-led, trade-focused economy where investment drives the business cycle. The structure shows Singapore is very open to global markets, which fits its role as a regional financial center.

Section 2a: How Fast Singapore Grows

2.1 Growth Over Time

Task 2.1 (Code output). Figure **??** shows the log of both nominal GDP and real GDP per capita. This lets us see growth rates directly and spot long-term trends.
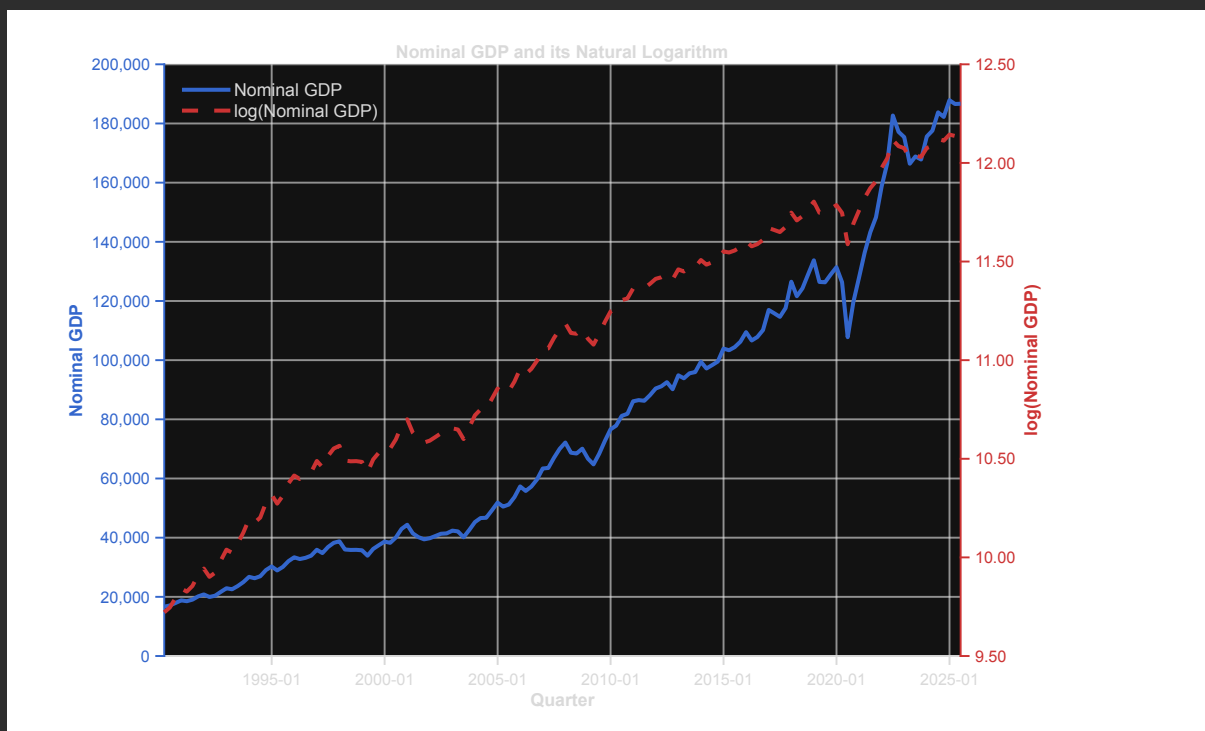

Figure 2: Nominal GDP (level and ln) and Real GDP per capita (log), base quarter rebased at 1990:Q1.

2.2 The Numbers

Task 2.2–2.3 (Results & interpretation, 1990:Q1–2024:Q4). Here's what the data shows:

- *Nominal growth.* Singapore's nominal GDP per capita grew at 5.43% per year on average. This includes both real growth and inflation.

- *Real growth.* After adjusting for inflation, real GDP per capita grew at 3.55% per year. This is the actual improvement in living standards. This is quite good compared to most rich countries, which typically grow at 2-3%.

- *Inflation.* The difference between nominal and real growth gives us inflation: 1.88% per year. This is moderate and shows Singapore's monetary policy works well.

- *What this means.* At 3.55% growth, living standards double every 19.7 years (using the rule of 70). Over the 35-year period, per capita output increased about 3.5 times.

2.3 How Singapore Compares

Singapore's 3.55% growth rate is very good by international standards. Most rich countries grow at 1.5-2.5%, so Singapore is doing better than most. This success comes from several factors:

- *Good location.* Singapore is a regional hub that benefits from global trade and investment.

- *Good institutions.* Strong property rights, efficient government, and stable policies help growth.

- *Good education.* Singapore invests heavily in education and skills, creating a productive workforce.

- *Open to technology.* Singapore welcomes foreign investment and technology, which speeds up progress.

Section 2b: Productivity - The Key to Growth

2.4 Worker Productivity

Task 2.4–2.5 (Code output). We look at average labor productivity (ALP $= Y/L$), which is real GDP divided by total employment. This tells us how much output each worker produces.

2.5 The Results

From 1990:Q1 to 2024:Q4, Singapore's average labor productivity grew at 3.01% per year. This is quite good and shows Singapore has become a high-productivity, knowledge-based economy.

2.6 How Productivity and Growth Connect

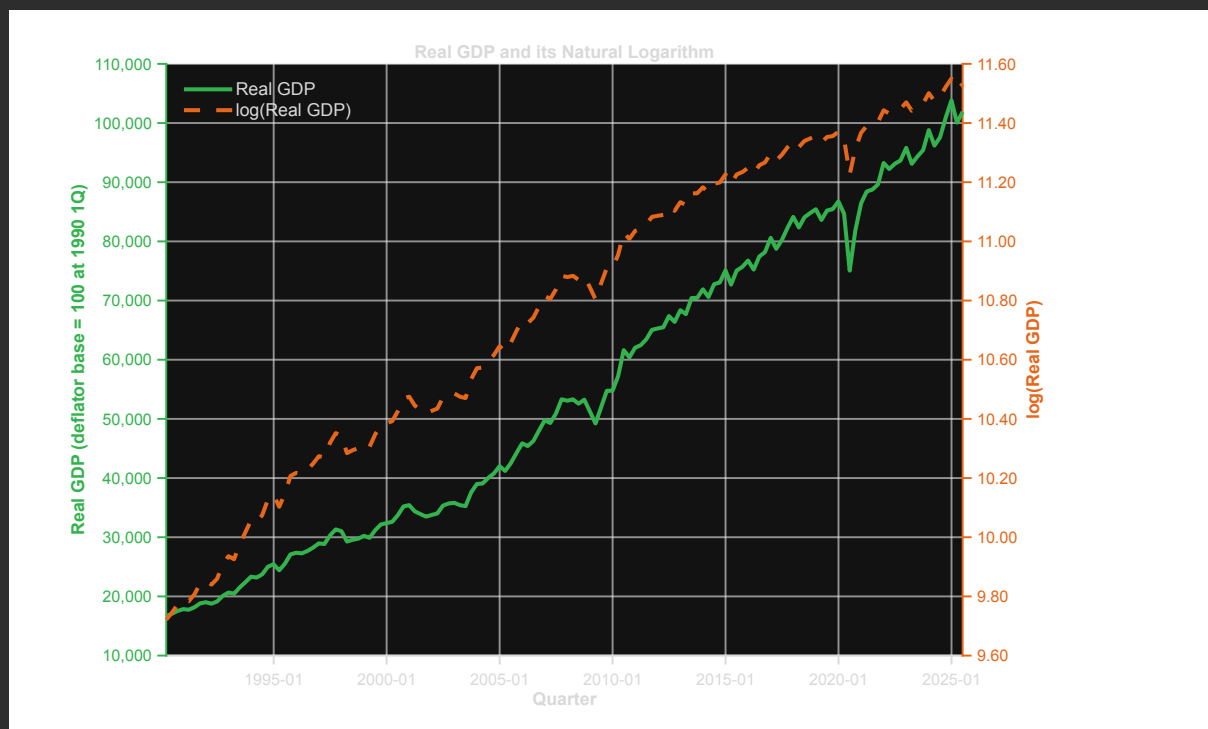**Task 2.6 (Interpretation).** Looking at the relationship between productivity and overall growth:

Figure 3: Real GDP and ln(Real GDP); ALP plotted and analyzed in the productivity script.

- *Productivity growth.* ALP grew at 3.01% per year. This is much better than most rich countries, which typically see 1-2% productivity growth. Singapore has done well adopting new technologies and improving efficiency.

- *The gap.* Productivity growth (3.01%) is close to but below real GDP per capita growth (3.55%). The 0.54 percentage point gap comes from:

  - *More people working.* More women and older workers joined the labor force, boosting per capita output beyond just productivity gains.

  - *More capital per worker.* Investment in physical and human capital made each worker more productive.

  - *Demographics.* Changes in the age structure of the population affected growth independently of productivity.

- *Productivity drives growth.* Despite the gap, productivity growth is still the main driver of living standards. The 3.01% productivity growth accounts for about 85% of total per capita growth, showing how important efficiency is for Singapore's success.

2.7 How Singapore Compares on Productivity

Singapore's 3.01% productivity growth puts it among the world's best. This success comes from:

- *Adopting new technology.* Singapore welcomes foreign investment and technology, which speeds up progress.

- *Good education.* Heavy investment in education and training creates a skilled workforce.

- *Good institutions.* Strong property rights, efficient government, and stable policies help productivity.

- *Structural change.* The economy shifted from labor-intensive to capital-intensive and knowledge-intensive activities.

Section 3: Economic Ups and Downs

3.1 Separating Trend from Cycle

Task 3.1–3.2 (Code output). We use the HP filter with $\lambda = 1600$ to break down real GDP, consumption, and investment into their cyclical parts. This lets us analyze short-run fluctuations around the trend.

3.2 The Numbers

Table 1: Business cycle statistics (HP $\lambda = 1600$; deflator rebased at 1990:Q1).

Series	Std. dev. (%)	Corr. with GDP
GDP	2.90	1.00
Consumption	4.10	0.31
Investment	14.02	0.42

3.3 What This Means

Task 3.3 (Interpretation). Looking at the business cycle data:

- *Investment is most volatile.* Investment bounces around much more (14.02% standard deviation) than consumption (4.10%) or GDP (2.90%). This is normal for
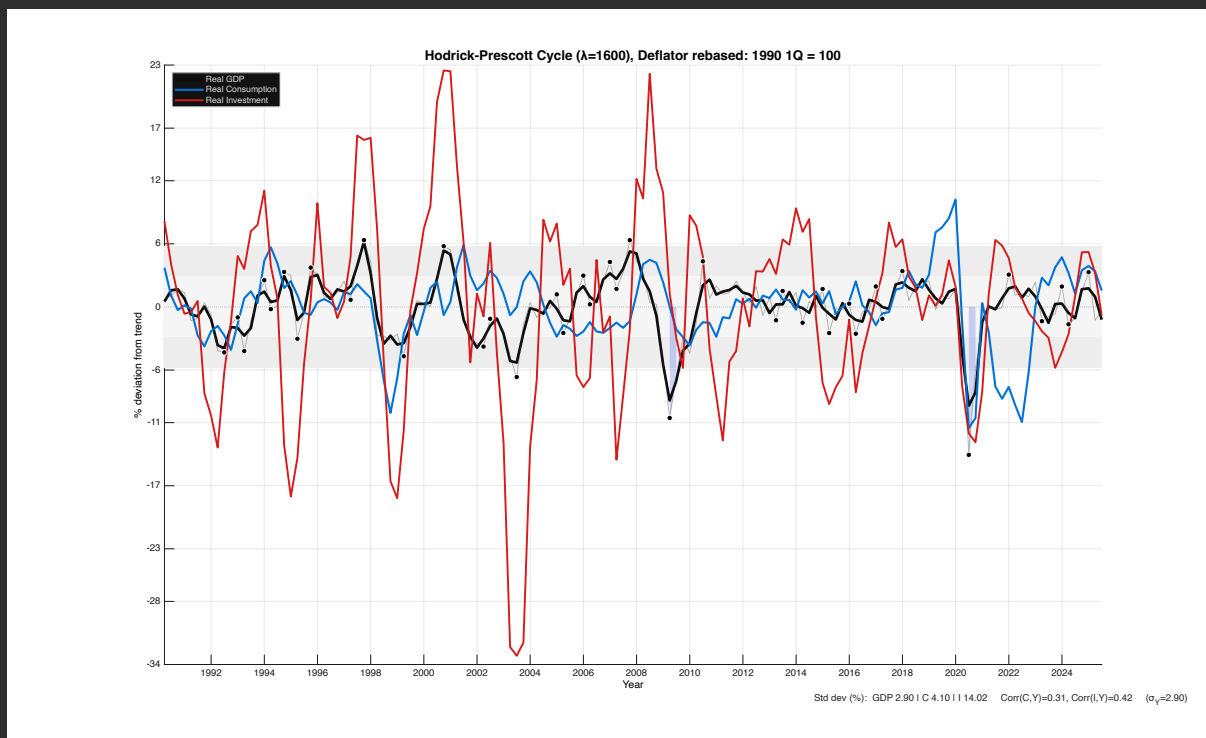
Figure 4: HP cycles (percent deviations from trend): real GDP, real consumption, real investment.

business cycles. Investment is sensitive to business confidence, credit conditions, and profit expectations.

- *Both consumption and investment follow GDP.* Both have positive correlations with GDP (0.31 and 0.42), meaning they go up and down with the economy. But:

  - *Consumption is smoother.* The low correlation (0.31) shows households can smooth consumption over the cycle, which fits economic theory.

  - *Investment is more responsive.* The higher correlation (0.42) shows investment responds strongly to changes in output and expected demand.

- *Major downturns.* We can see several big recessions:

  - *1998 Asian Financial Crisis.* GDP fell about 2-3% below trend. This started when the Thai baht collapsed in 1997, causing a regional crisis. Singapore's growth dropped from 8% in 1997 to 1.5% in 1998. Unemployment rose to 3.2% and many people lost their jobs.

  - *2003 SARS outbreak.* GDP fell about 3-4% below trend. The SARS virus hit Singapore hard, especially tourism and services. People stopped traveling and spending, causing a big economic slowdown.

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- *2008-2009 Global Financial Crisis.* The worst recession, with GDP falling about 4-5% below trend. When US banks collapsed, it caused a global crisis. Singapore's exports dropped 35% in January 2009. Manufacturing crashed, especially electronics and pharmaceuticals. Unemployment hit 3.3%.

- *2020 COVID-19.* A sharp but short contraction, with GDP falling about 3-4% below trend. Singapore recovered quickly thanks to good policy responses.

- *The roaring periods before crashes.* We can also see big booms before the crashes:

  - *1997 boom before 1998 crash.* Singapore was growing at 8% before the Asian crisis hit. The region was doing well with lots of investment and trade.

  - *2000-2001 dot-com boom.* Before the 2003 crash, there was a tech boom. Singapore's tech sector was growing fast with the dot-com bubble. But when the bubble burst in 2001, it caused problems.

  - *2007 boom before 2008 crash.* The economy was doing well in 2007, with strong global trade and investment. But this was built on shaky financial foundations that collapsed in 2008.

- *Quick recoveries.* Singapore's recessions are usually short, lasting 2-4 quarters. This shows the economy is flexible and policy responses work well.

- *Sensitive to global shocks.* Singapore is very open to global trade and finance, so it feels external shocks strongly.

3.4 Policy Lessons

- *Countercyclical policies work.* Singapore's short, shallow recessions suggest fiscal and monetary policies help during downturns.

- *Flexibility helps.* The economy recovers quickly because it's flexible and can adapt to shocks.

- *External buffers matter.* Being open to global markets means Singapore needs strong buffers against external shocks.

- *Stable credit helps.* Investment volatility shows the importance of stable credit conditions and business confidence.

Section 4: Summary

Singapore's economy from 1990 to 2024 shows strong performance with 3.55% real GDP per capita growth and 3.01% productivity growth. The economy is consumption-led with consistent trade surpluses, but investment is very volatile (14.02% standard deviation). Singapore's success comes from good education, technology adoption, and effective policies that help it recover quickly from global shocks.

The business cycle analysis reveals Singapore's vulnerability to external shocks like the 1998 Asian crisis, 2003 SARS, and 2008 financial crisis. However, the economy bounces back fast thanks to flexible policies and strong institutions. Investment drives the cycle while consumption stays relatively stable.

Overall, Singapore demonstrates how a small, open economy can achieve sustained growth through productivity improvements and good crisis management, despite being sensitive to global economic conditions.