



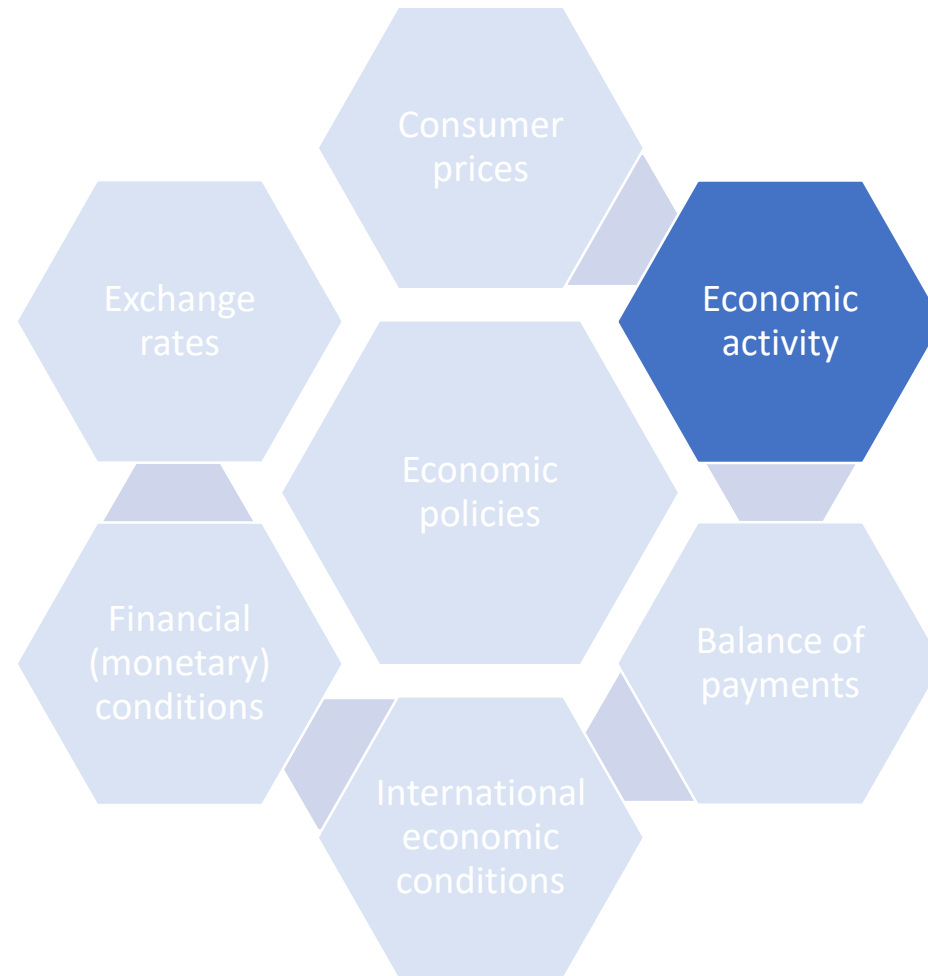
Internal balance assessment: Economic activity

Macroeconomic Analysis Course
Prepared for Capital Alliance, Sri Lanka

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Roadmap for macroeconomic assessment



ECONOMIC NEWS SEPTEMBER 19, 2019

Sri Lanka

COMPANY NEWS SEPTEMBER 25, 2019 / 4:14 PM / 3 MONTHS AGO

* SL
Thu, 1

UPDATE 1-IMF cuts Sri Lanka's 2019 growth target to 2.7%, cites Easter attacks

... low as

Objectives

- Understand why central banks monitor product markets
- Understand where the monitoring sits in terms of overall macroeconomic assessment
- Strengthen essential skills for experts monitoring these sectors
- Learn basic tools for monitoring the sectors

Outline

1. Setting the scene
2. Key measures of economic activity
3. Key economic concepts
4. Key measurement techniques of economic activity trends



Setting the scene

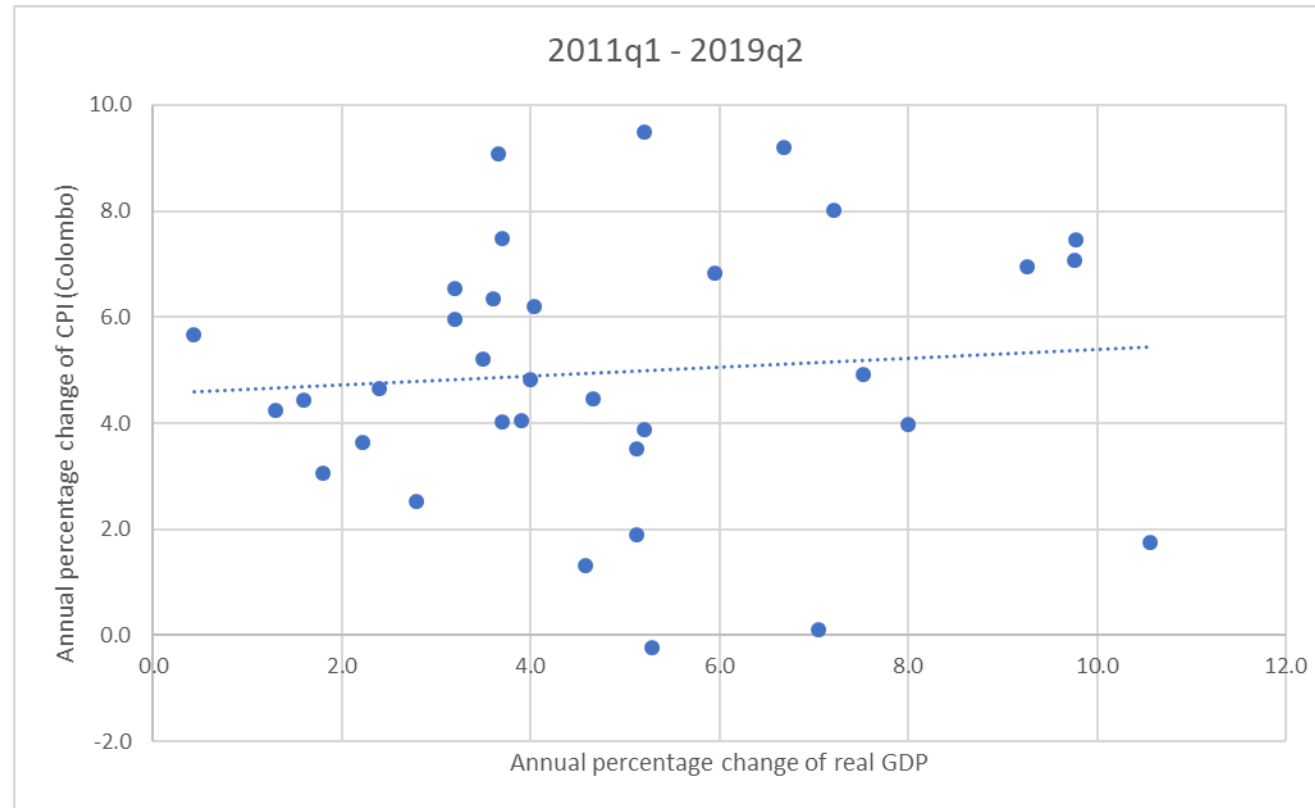
Why do central banks employ experts to monitor the real sector?

What information are the sector experts expected to provide to policymakers?

Why do central banks employ experts for monitoring the real sector?

- It's all about sustainable employment and income -- internal economic balance
- High growth may be (temporarily) good for employment and income, but...
- ... too high growth translates into an inflationary spiral
- Low growth may be (temporarily) good for low inflation, but...
- ... too low growth may translate into a deflationary spiral, and be aggravating for income and employment
- Price stability is interlinked with economic activity. Central banks monitor and exploit that relationship for monetary policy purposes (real channel of monetary policy)

Phillips curve in Sri Lanka



Source: Author's calculations

What information are the sector experts expected to provide to policymakers?

Example of a typical data commentary:

Economy rose in the second quarter, led by a rebound in exports. Growth reached 6.2 percent (yoy), following the unexpectedly weak 5.1 percent (yoy) in the first quarter. It puts the real GDP 2.5 percent above its long-term trend, 0.3 percentage points higher than in the first quarter.

What do you think, how central bankers will understand this information?

- The output gap is positive and increasing (by 0.3 percentage points).
- Inflationary pressures are increasing, and inflation can be expected to accelerate.
- Get ready to revisit monetary policy stance. Maybe get ready to tighten.

What information are the sector experts expected to provide to policymakers?

- Is the economy overperforming or underperforming?
- What implications does it have for consumer prices -- the monetary policy objective?
- What does it imply for CBSL's monetary policy stance?

What information are the sector experts expected to provide to policymakers?

Key information the sector analysts need to process for the policymaker:

Is the increase (decrease) in GDP growth permanent or temporary?

If it is a *temporary* increase (decrease) in growth, then it's likely *demand driven*, and inflation will increase (decrease). Monetary policy should be in **tightening** (loosening) stance.

If it is a *permanent* increase (decrease) in growth, then it is likely *supply driven*, and inflation will decrease (increase). Monetary policy should be in **loosening** (tightening) stance.



Measuring economic activity

Gross domestic product: methods of measures and components

High frequency indicators

Gross domestic product

- The single most important measure of economic activity
- Measures the economic added value created in a given period of time (typically quarter or a year)
- Measured by both volume and value

Measurement methods

Production-based measure of GDP

GDP = sum of added value by individual economic sectors + (taxes – subsidies)

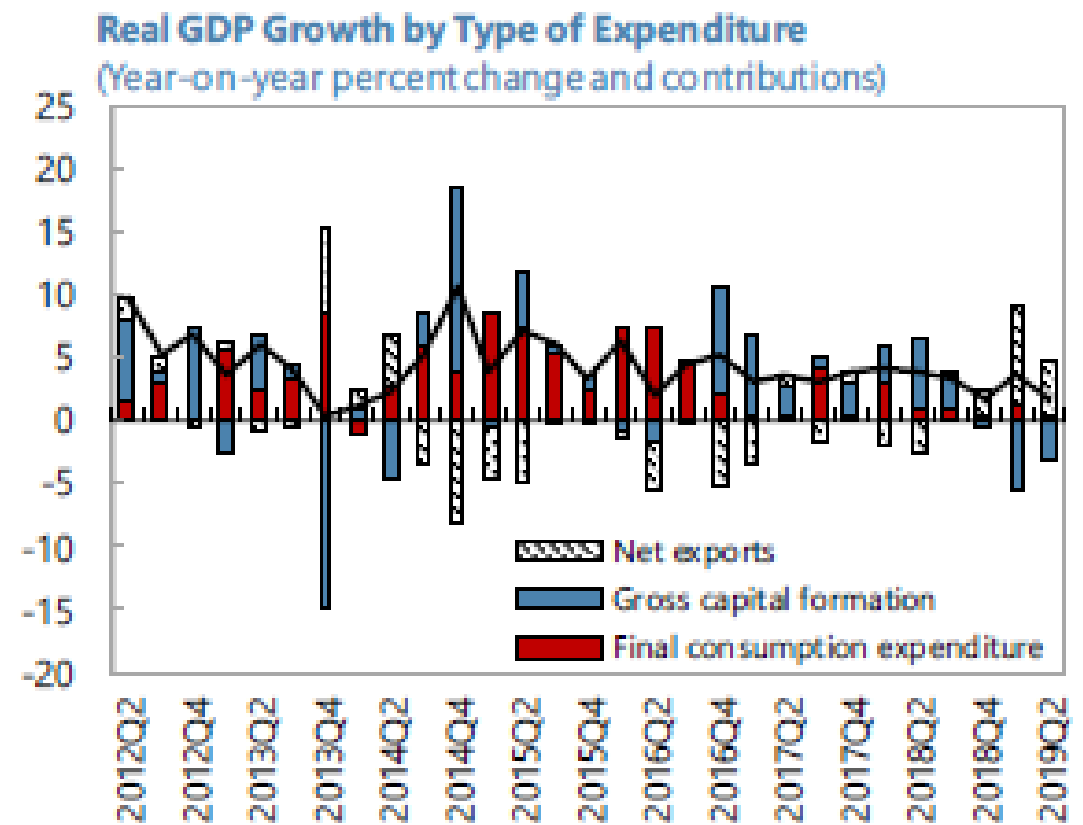
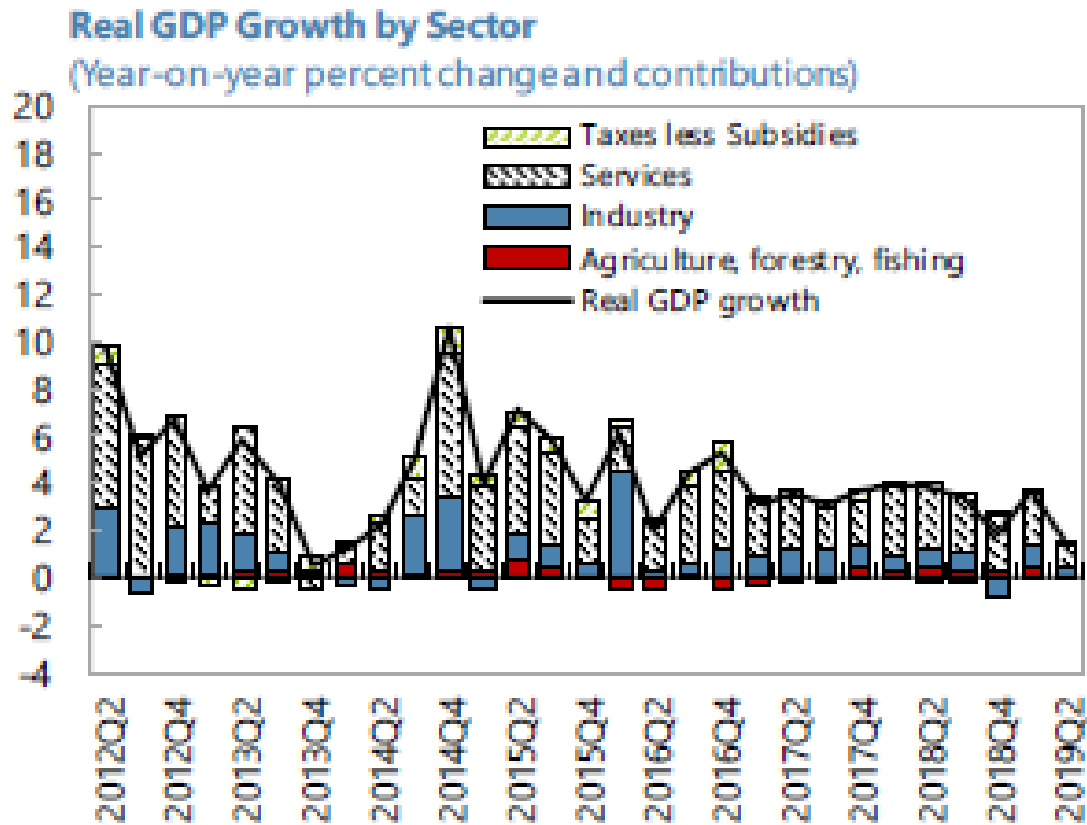
Expenditure-based measure of GDP

$$NGDP = NC + NG + NI + NX - NM$$

$$P_y * GDP = P_c * C + P_g * G + P_i * I + P_x * X - P_m * M$$

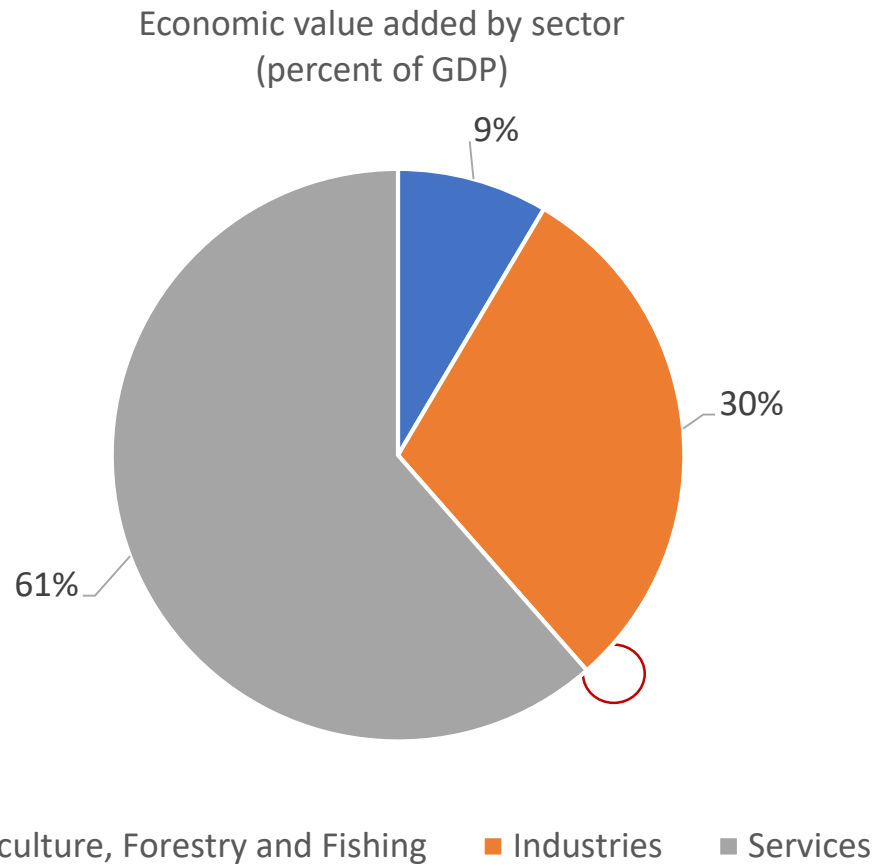
Income measure

Sources of economic growth



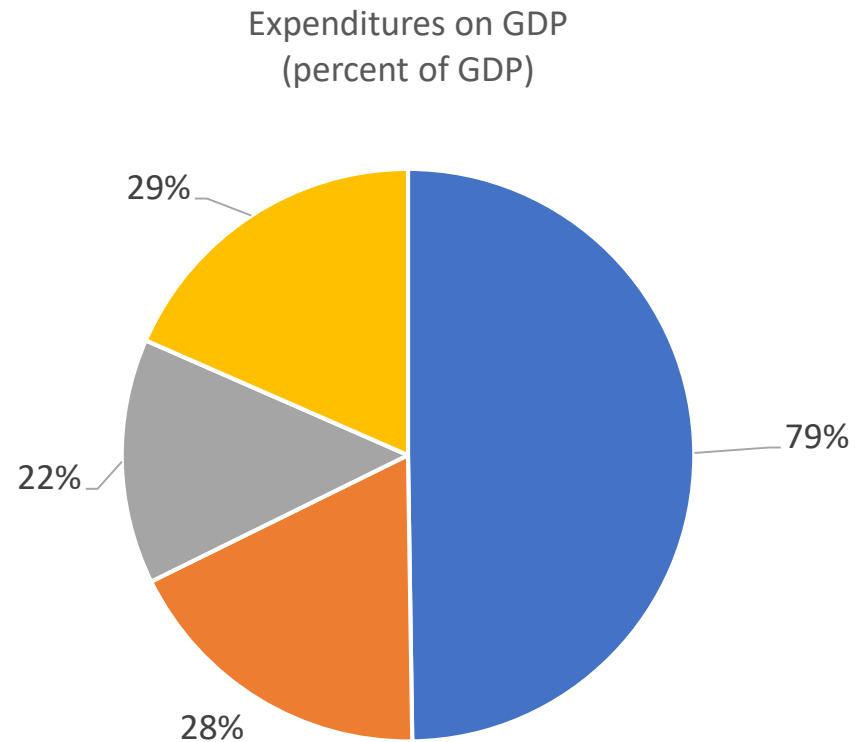
Source: CBSL, IMF Country report 19/335 (Figure 1, page 20)

Sources of economic value



Source: Department of Census and Statistics
Note: Shares computed for 2014-2017

Uses of value



■ Consumption ■ Gross domestic capital formation ■ Exports of goods and services ■ Imports of goods and services

Source: General Statistics Office
Note: Shares computed for 2015

It is hard to monitor everything. We have to prioritize...

Monitoring priorities depend on three factors:

- relative importance of a particular sector and GDP component
- relative volatility of a particular sector and GDP component
- intra-/inter-temporal correlation of a component vis-à-vis the whole (pro-/counter-cyclical behaviour; leading/lagging/contemporaneous)

Timeliness of GDP data is an issue for real time analysis

- Central banks need to know the state of economic activity now, at this very moment
- Need for timely detection changes (turning points) in economic activity so that monetary policy can quickly react
- Statistics offices typically supply first (reasonable) estimates with two or three months lags
- Therefore there is a need to “**nowcast**” GDP
- That’s why economists are data savvy, and monitor any news about the economy

Questions for discussion

What is the publication calendar for GDP by the Department of Census and Statistics in Sri Lanka?

Are there any publication lags for preliminary and first estimates?

What is the quality of these estimates?

DCS's advanced release calendar for national accounts

Serial No.	Theme	Data Release		Proposed date of web release	Proposed date of printed publication release
		Name	Corresponding Period		
1. National Accounts					
1.1	National Accounts	Quarterly GDP Estimates by Production Approach (Base year: 2010)	3 rd Quarter 2018	14-Dec-2018 Released on 18-Dec-2018	web release only
1.2	National Accounts	Quarterly GDP Estimates by Expenditure Approach (Base year: 2010)	3 rd Quarter 2018	21-Dec-2018 Released on 31-Dec-2018	web release only
1.3	National Accounts	Quarterly GDP Estimates by Production Approach (Base year: 2010)	4 th Quarter 2018	19-Mar-2019 Released on 19-Mar-2019	19-Mar-2019 (press release & web release)
1.4	National Accounts	Quarterly GDP Estimates by Expenditure Approach (Base year: 2010)	4 th Quarter 2018	26-Mar-2019 Released on 26-Mar-2019	26-Mar-2019 (web release only)
1.5	National Accounts	Annual GDP Estimates by Production Approach (Base years: 2010)	2018	19-Mar-2019 Released on 19-Mar-2019	19-Mar-2019 (press release & web release)
1.6	National Accounts	Annual GDP Estimates by Income Approach and Expenditure Approach (Base years: 2010)	2018	26-Mar-2019 Released on 02-Apr-2019 27-Mar-2019	26-Mar-2019 (web release only)
1.7	National Accounts	Quarterly GDP Estimates by Production Approach (Base years: 2010)	1 st Quarter 2019	19-Jun-2019 Released on 19-Jun-2019	19-Jun-2019 (press release & web release)
1.8	National Accounts	Quarterly GDP Estimates by Expenditure Approach (Base years: 2010)	1 st Quarter 2019	26-Jun-2019 Released on 01-Jul-2019	26-Jun-2019 (web release only)
1.9	National Accounts	Quarterly GDP Estimates by Production Approach (Base years: 2010)	2 nd Quarter 2019	18-Sep-2019	18-Sep-2019 (press release & web release)
1.10	National Accounts	Quarterly GDP Estimates by Expenditure Approach (Base years: 2010)	2 nd Quarter 2019	25-Sep-2019	25-Sep-2019 web release only
1.11	National Accounts	Quarterly GDP Estimates by Production Approach (Base years: 2010)	3 rd Quarter 2019	18-Dec-2019	web release only

Source: DCS

Lack of timeliness of GDP is typically re-solved by nowcasting

- Univariate timeseries models (e.g. ARIMA)
 - Easy to use but not very precise
- Multivariate models (e.g. indices, correlation models, bridge equations, FVAR)
 - Deeper analysis and performance monitoring is required but benefit is a better precision

General rule: average performs better than any single method

Selected high frequency indicators for Sri Lankan economy – for data savvy economists

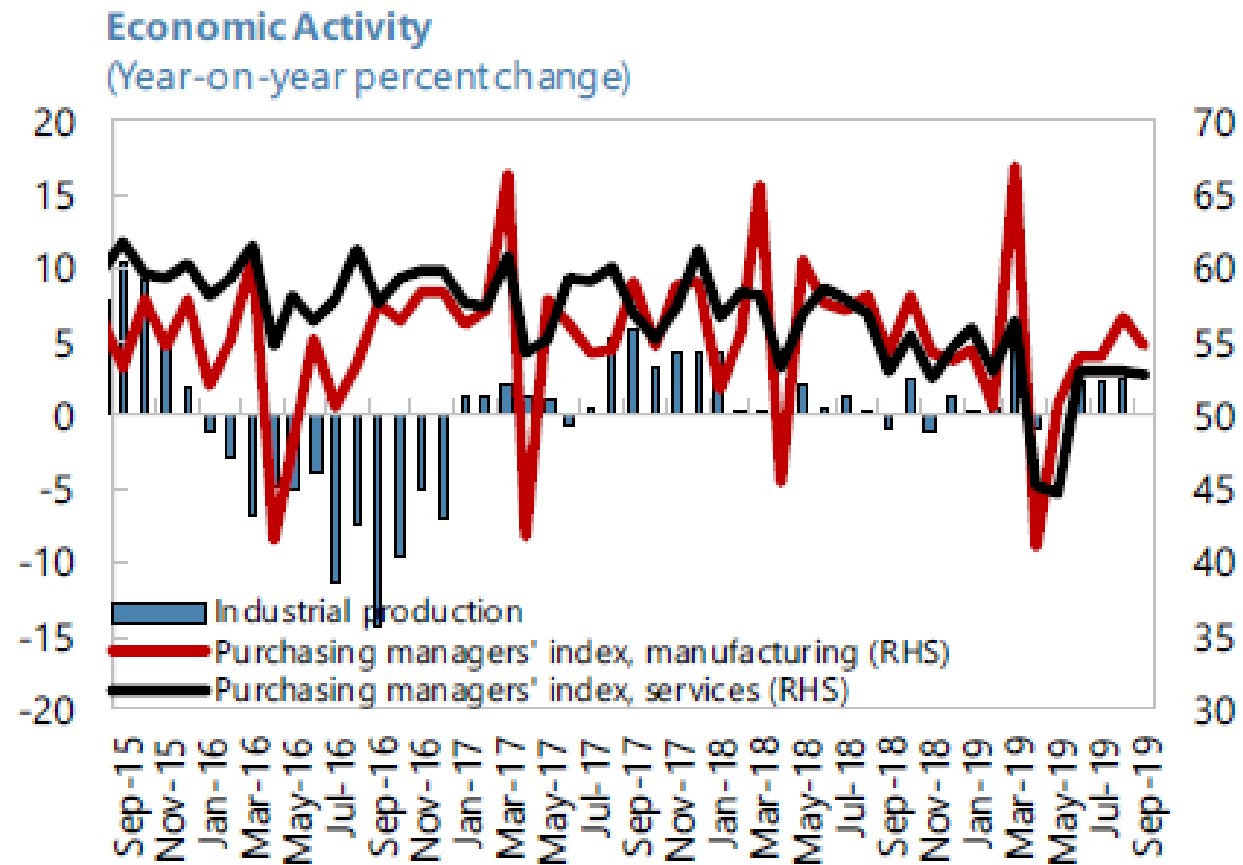
Main indicators

- Retail sales of goods and services
- Index of industrial production
- Manufacturing PMI

Other indicators (maybe noisy)

- Electricity, gas, water production/consumption
- Agricultural production
- Tourist arrivals, hotel nights bookings
- Sea ports container traffic
- Real estate activities
- Credit growth
- ... and many more

Nowcasting industrial production



Source: CBSL, IMF Country report 19/335 (Figure 1, page 20)

Tourist arrivals and earnings from tourism



Source: Central Bank of Sri Lanka and Sri Lanka Tourist Development Authority (SLTDA)

Combining a high-frequency indicators into a composite index of economic activity (CIEA)

- There is a trade-off between how much data you can cover, and how much of a relevant story about aggregate economic activity they tell (signal vs. noise)
- A simple and popular way to aggregate indicators is by constructing composite indices of economic activity
- They can be coincidence, leading, or lagging indices – depends how early or late they predict turning points in economic activity.



Key economic concepts

Long-term GDP (trend, potential output, non-accelerating inflation output)

Output gap

Okun's law (economic activity and (un)employment)

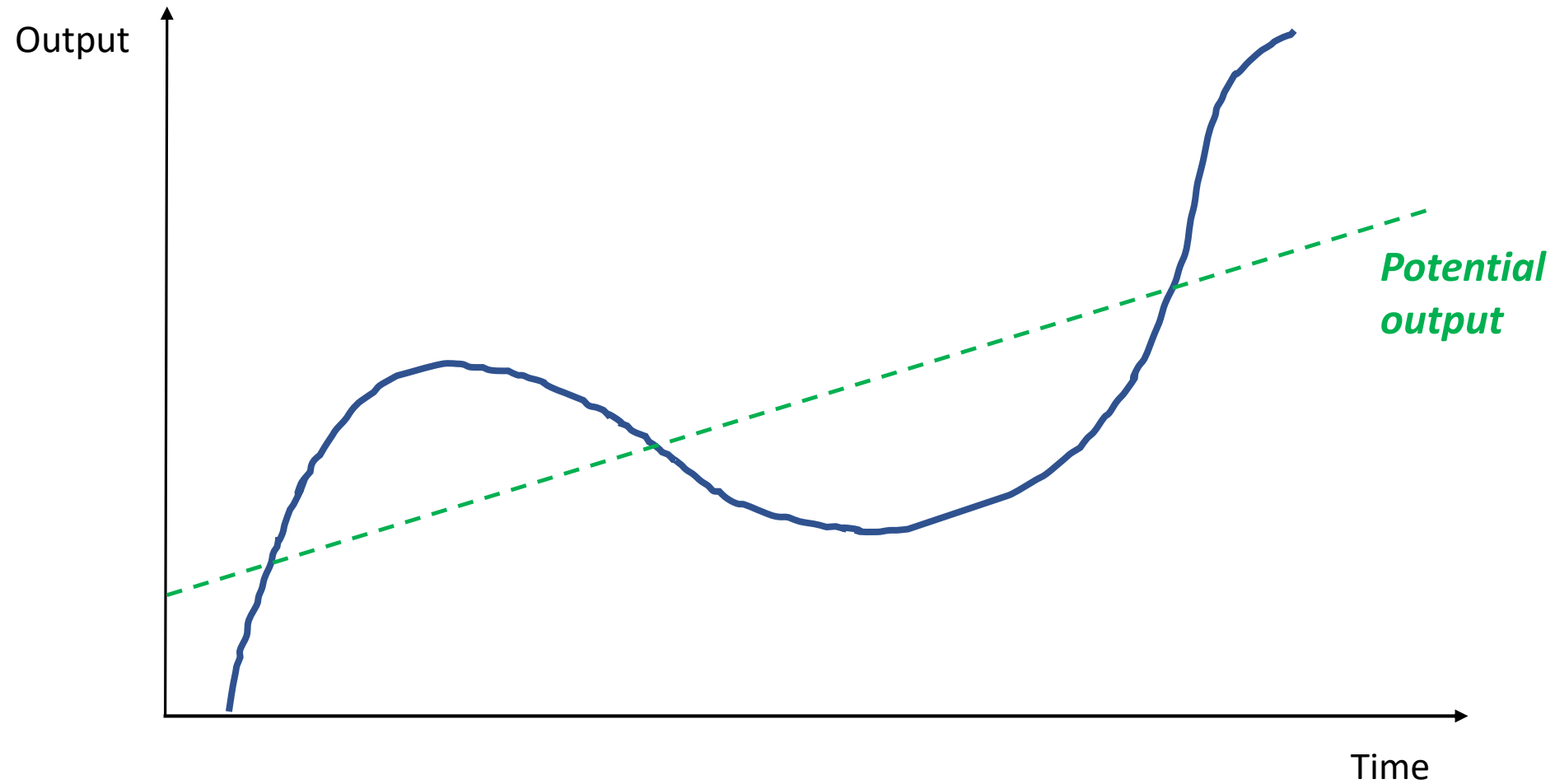
Benchmarking GDP levels and growth

- Without a benchmark, we can't say whether GDP is high or low, and how monetary policy should react
- For this purpose, economists use the concept of *long-term economic trend*, *potential output*, or *non-accelerating inflation output*
- These measures help indicate whether the economy is performing at a sustainable level, or it is unsustainably overheating, or there is large spare capacity – **internal imbalance!**

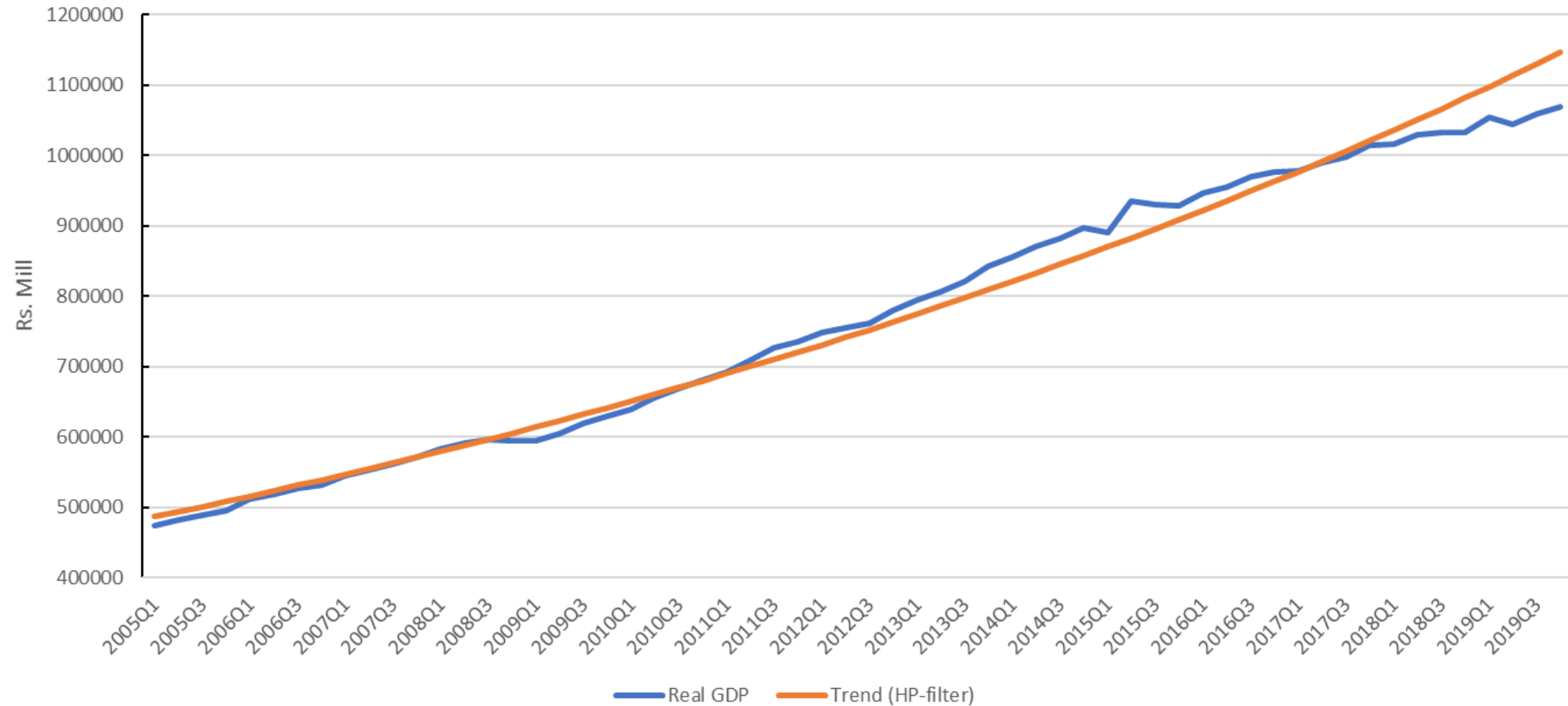
Potential output

Potential output is the level of output that is consistent with full capacity utilization of all production factors, with a “natural rate” of unemployment and stable inflation.

GDP and potential output



Real GDP and trend GDP for Sri Lanka



Source: DCS, author's calculations

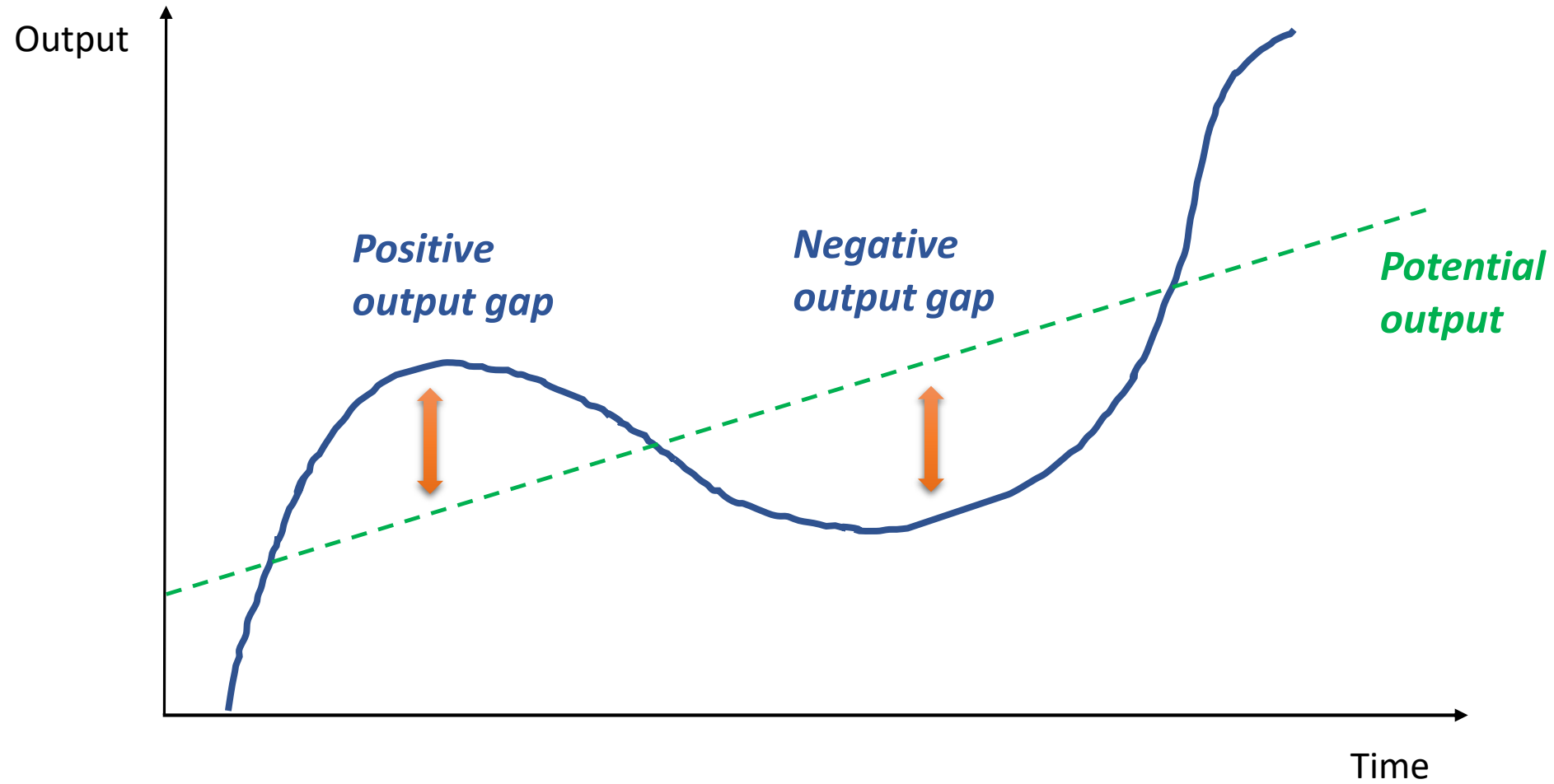
Output gap

- Output gap is a measure of economic slackness – factors of production are not fully utilized
- It is the single most important summary statistics about domestic economic activity that monetary policy decision makers look at
- Output gap is measured as

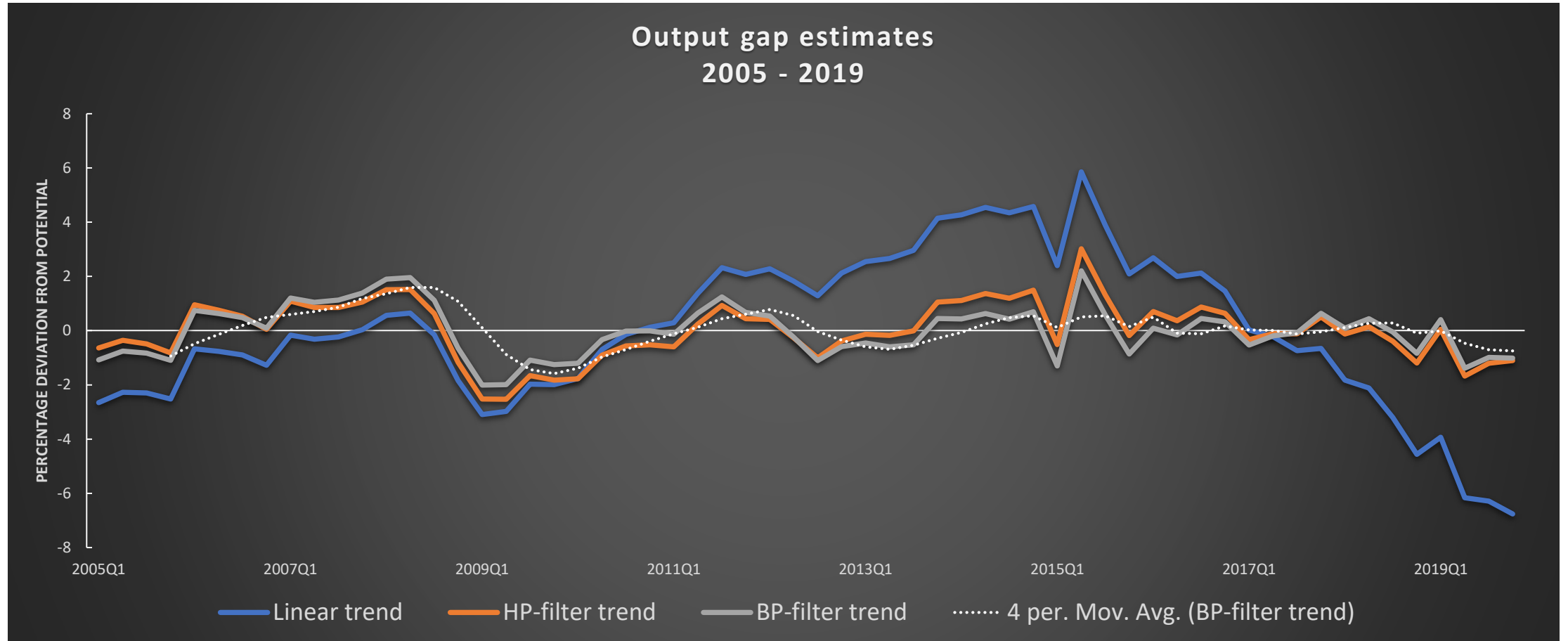
$$\text{Output gap} = 100 * \frac{GDP - \text{Potential GDP}}{\text{Potential GDP}}$$

- Its units are percentage points of potential (trend) GDP

Output gap



Measures of output gap for the Sri Lankan economy



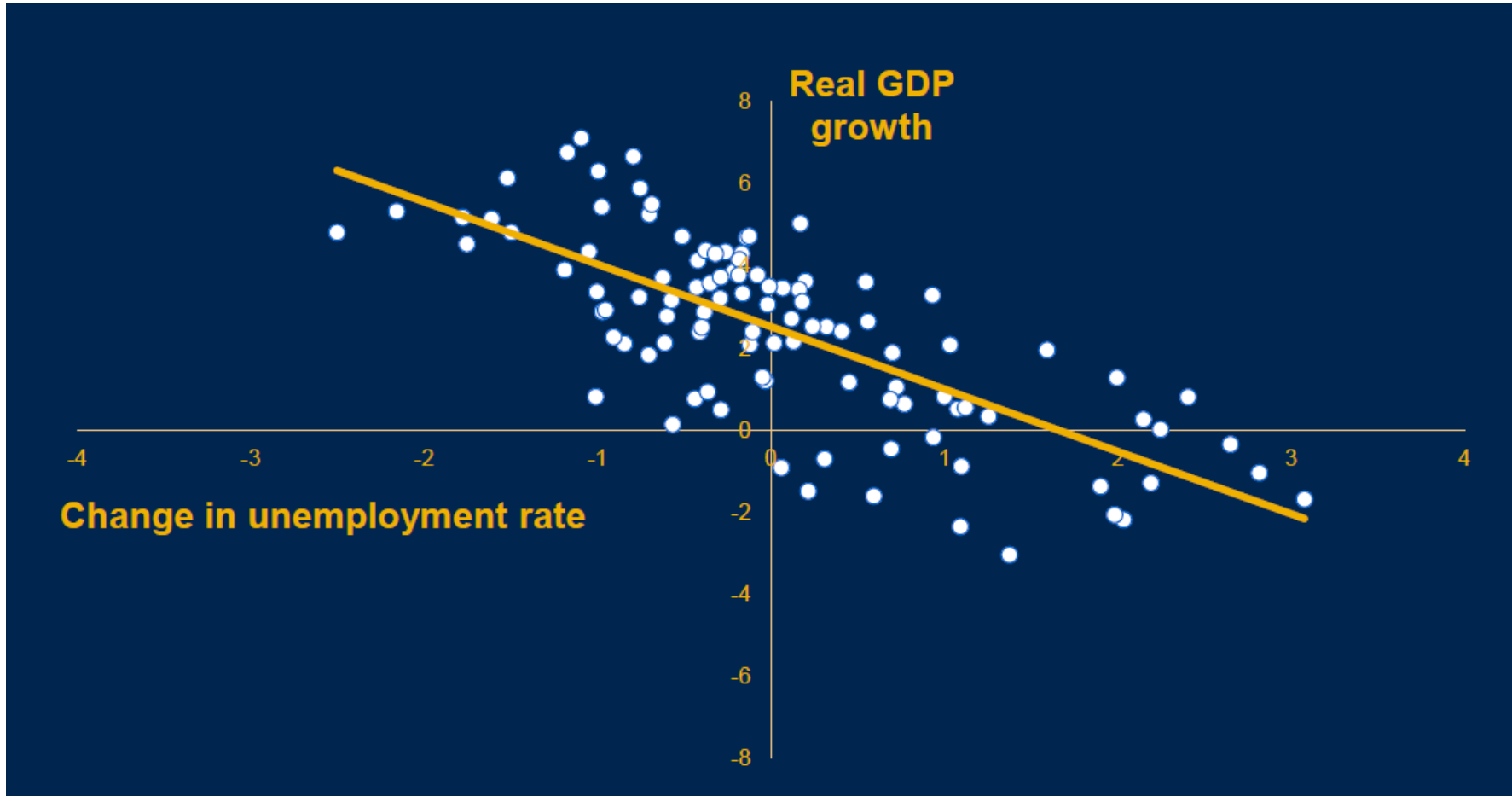
Source: Author's calculations

Okun's law – a link between economic activity labour market activity (un/employment)

- (Robust) empirical relationship between economic activity and (un)employment (Okun, 1962; Cowles Foundations)
- Useful “rule of thumb” for translating economic growth to expected changes in unemployment rate – pressures on the social security budget and fiscal position

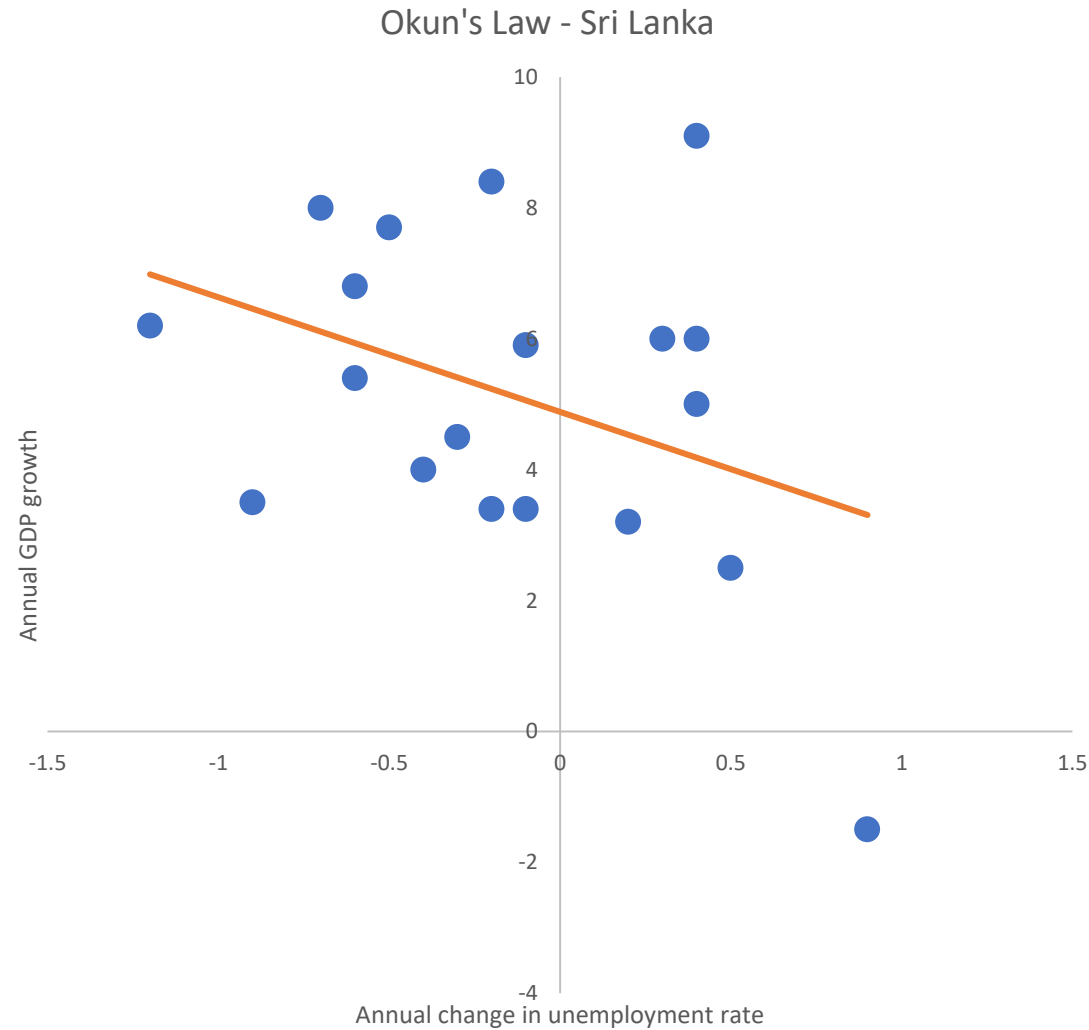
Illustration on Okun's Law in New Zealand

$$\Delta y_t = 2.5^{***} - 1.5^{***} \Delta U_t + e_t$$



Source: Fukac and McGauley (2014)

Can we observe the Okun's law in Vietnam data?



$$\Delta GDP_t = 4.6 - 1.75\Delta UR_t + \varepsilon_t$$

Source: Author's calculations



Key measurement techniques

Estimation of long-term GDP trends, and potential GDP

Ways how to measure GDP trend or potential

Pure statistical methods:

- simple or moving averages of growth
- linear, broken linear trends
- non-linear trends – estimated using filters like Hodrick-Prescott (HP) filter, band-pass (BP) filter, or multivariate (MV) filters

(Semi-) structural methods:

- stochastic trend models – (univariate/multivariate) unobserved component models (use the Kalman filter)
- production function models

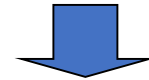
Hodrick-Prescott filter for estimating trends and cyclical components in time series

The HP filter finds the series y^* that solves:

$$\min \sum_{t=0}^T (y_t - y_t^*)^2 + \lambda \sum_{t=2}^{T-1} \left[(y_{t+1}^* - y_t^*) - (y_t^* - y_{t-1}^*) \right]^2$$



Output gap



Measure of trend variation

where:

$y^* = \log(\text{trend output})$; $y = \log(\text{actual output})$;

λ determines the degree of smoothness of the trend.



Main takeaways

You should remember from this lecture that...

- real GDP is the key measure of economic activity
- GDP is measured with a time lag; that is why sector analysts need to monitor high-frequency indicators of economic activity and use it to predict (nowcast) today's values of GDP
- economic activity is benchmarked to a potential
- output gap is the relative difference between the actual and potential level of GDP
- output gap is a key measure of internal economic balance
- output gap is the key measure of economic activity that central bankers monitor



Annex

Constructing composite index of economic activity (the U.S. Conference Board methodology)

- 1) Select candidate indicators that capture economic activity and are likely to contain relevant information about GDP
- 2) Seasonally adjust the series, e.g. by using the US Census Bureau X-13 approach
- 3) Compute growth rates of the seasonally adjusted data using log-differencing. Log-differencing treats relative changes symmetrically and helps reduce volatility.
- 4) Compute standard deviations of each transformed series and use them to compute weights for individual growth series.
- 5) Weight each growth series by a respective weight.
- 6) Sum the weighted series together to obtain a normalized CIEA growth series using the following formula:

$$\Delta \ln(CIEA_t) = \frac{1}{n} \sum_{i=1}^n \frac{1}{\sigma_{\Delta \ln(x_i)}} \Delta \ln(x_{i,t}),$$

where $\Delta \ln(CIEA_t)$ is the growth rate of CIEA index (computed as log-difference). $\Delta \ln(x_{i,t})$ is the growth rate of indicator x_i , $\sigma_{\Delta \ln(x_i)}$ is the standard deviation of the indicator x_i . n is the total number of indicators forming the CIEA index.

Nowcasting current levels of GDP using bridge equation

Bridge equation:

uses historical correlation to translate the current indicator values to GDP growth

$$\Delta \widehat{GDP}_{t|t} = \widehat{\beta}_0 + \widehat{\beta}_1 * \Delta CIEA_t$$

- where $\widehat{\beta}_0$ and $\widehat{\beta}_1$ are parameters (elasticities) estimated using OLS, given a data sample
- they translate the percentage change in CIEA to percentage changes in GDP

Nowcasting current levels of GDP using bridge equation

Advantages:

- simple and fast
- good approximation

Disadvantages:

- sensitive to structural breaks (eg. recent consumers' shift from classical store to on-line shopping)