MACQUARIE University

Business Forecasting

Business Indicators

Cycles

MACQUARIE University

Many of the time series studied have obvious trend and/or seasonal components with relevant models suggested to incorporate these components into forecasts

Additionally, many time series particularly those **relating to economic activity** also exhibit **cyclical behaviour**, fluctuating around some non-cyclical level

Typically, the cyclical behaviour of the time series are related to the **broad economic or business cycles** that characterise economies

Complete cyclical fluctuations are generally only observable over **a number of years**

Business Cycles

MACQUARIE University

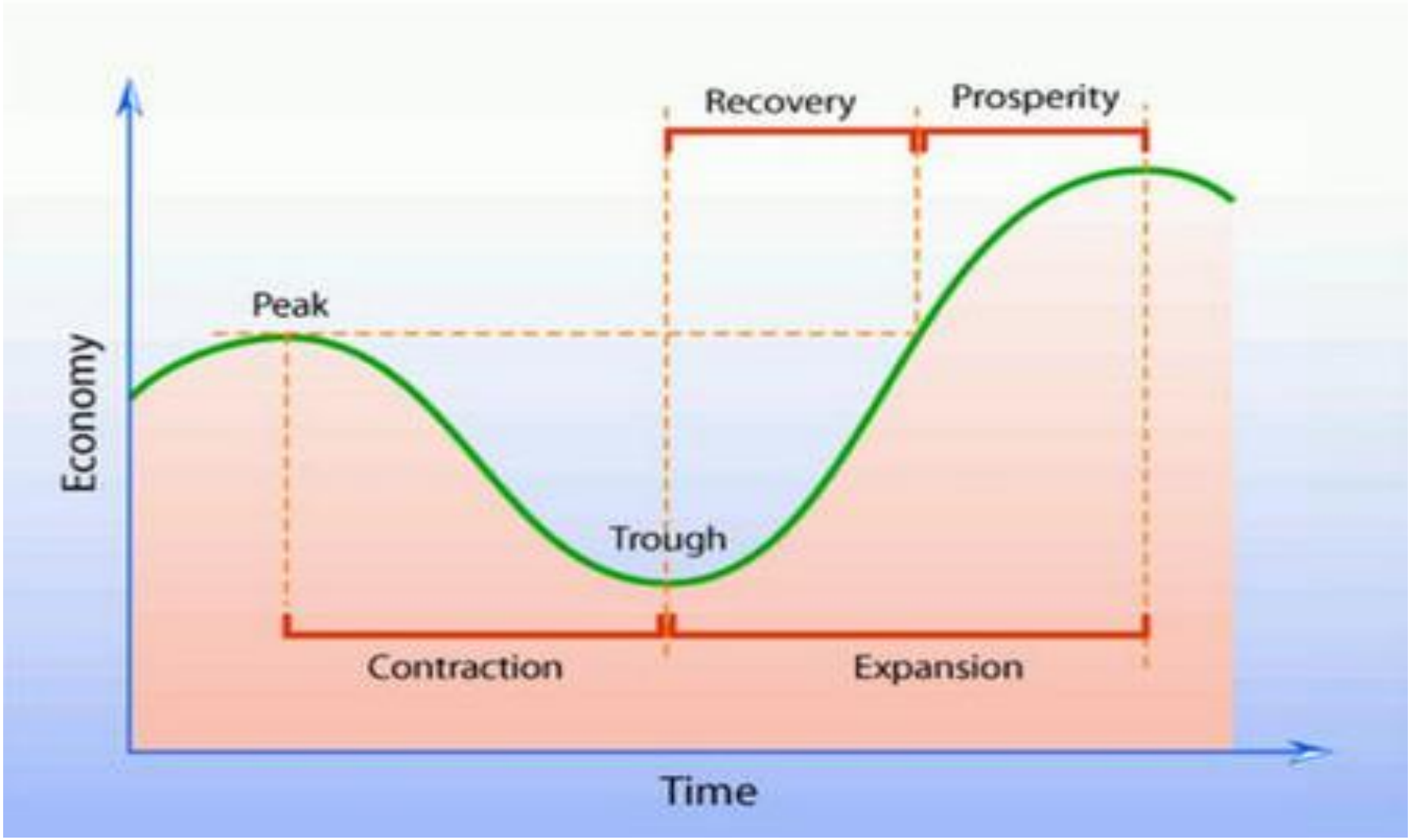
A business cycle is a type of **fluctuation** found in **aggregate economic activity**, adjusted for **long-run trends**

A cycle consists of **expansion** occurring at about the same time in **many economic activities**, followed by **general recessions, contractions, and revivals** which merge into the expansion phase of the next cycle

In duration business cycles vary from more than one to ten or twelve years

They are **not divisible into shorter cycles** with similar characteristics and amplitudes

General Cycle Path



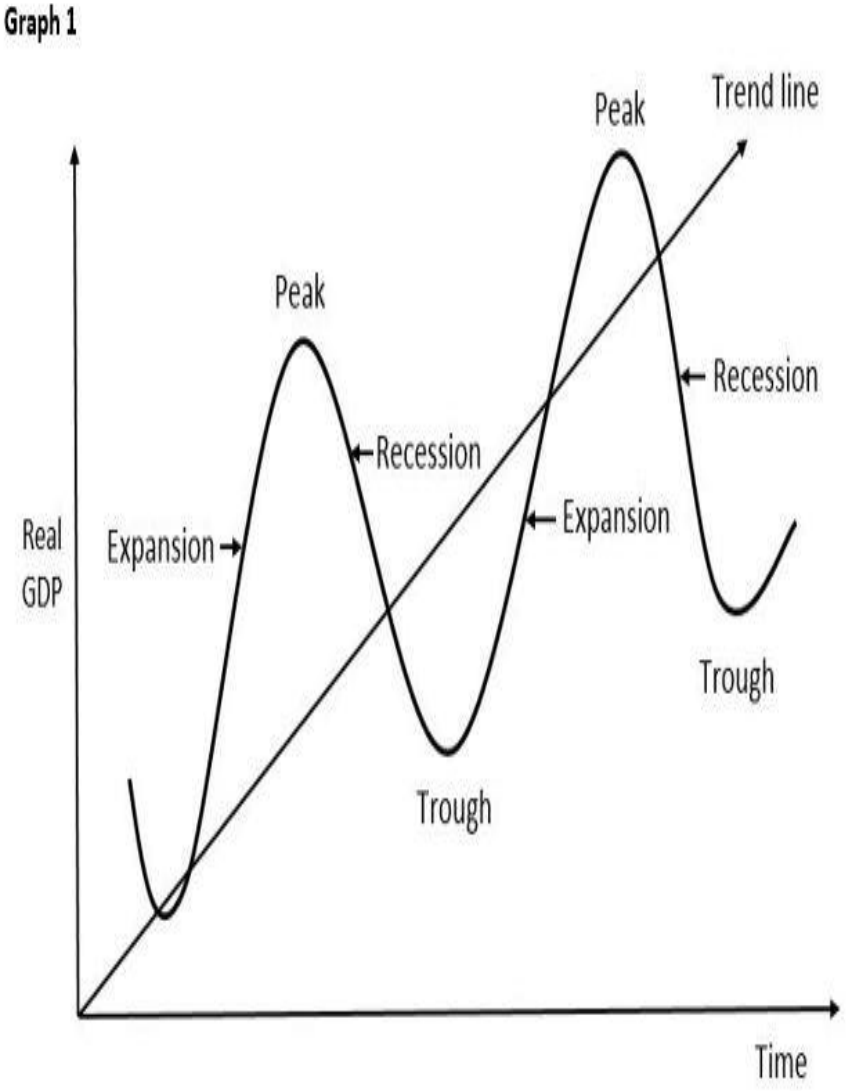
Classical and Growth Cycles

MACQUARIE University

•Generally we classify general business cycles into;

•**Classical cycles** are the peaks and troughs in a plot of the levels of the statistical time series representing the **general level of economic activity**

•**Growth cycles** are defined as recurring fluctuations in the rate of growth of aggregate economic activity relative to the **long-run trend rate of growth**



Analysing Business Cycles

MACQUARIE University

First step in incorporating cycle analysis into forecasting is to **identify the cycle history** and in particular the **current cyclical circumstance**

ABS regularly produces four indicators of **past** economic activity through measures of gross domestic product (GDP)

Income based GDP (I);
Expenditure based GDP (E);
Production based GDP (P);
Average of above measures, GDP (A)

The average of these which is **GDP (A)** appears to be the best of these series for cycle analysis

Cycles and Forecasting

MACQUARIE University

Since product sales may fluctuate with fluctuations in economic activity, **understanding business cycles may improve sales forecasts**

Although cycles are systematic fluctuations in time series, they are **not as repetitive in characteristics** as seasonal components

Each cycle, from trough to peak is **highly individualistic with varied amplitude/length**

Numerical generalisation of cycle behaviour is **unlikely to be of great benefit**

Analysis of cycles will be more **subjective**.

Forecasting including Cycle

MACQUARIE University

We typically analyse business cycles and our target time series for the following;

1. Identify the **historical relationship and links** between the business cycle and our target time series

2.Identify the **current level of business activity** and **where we are on the cycle**

3. Project **the course of business activity** in the coming months or periods

4. **Adjust and hopefully improve forecasts** of the target time series.

Future Cycle Behaviour

MACQUARIE University

Unadjusted (for change in cycle) forecasts are likely to be **highly inaccurate**

Given cycles are individual in nature, **generalising the future path** of current cycles from previous cycles via **numerical analysis or extrapolation** will not necessarily be effective

Of major importance in predicting the future path of cycles is understanding **turning points** (expansions turn to contractions and vice versa)

Turning points in economic activity are likely to induce **major increases or decreases in the levels of the target time series**.

Additional Problems

MACQUARIE University

Analysis of cycles using real GDP measures provided by ABS will also be problematic due to the **time lag** of data collection

GDP figures for a given quarter are typically published **around 6 weeks after the end of the quarter**

The data provided **does not measure current economic activity** but **activity in the recent past**

Current cycle activity needed to **adjust forecasts** for **future cycle activity** and **turning points** may not be available to the forecaster

Leading Indicators

MACQUARIE University

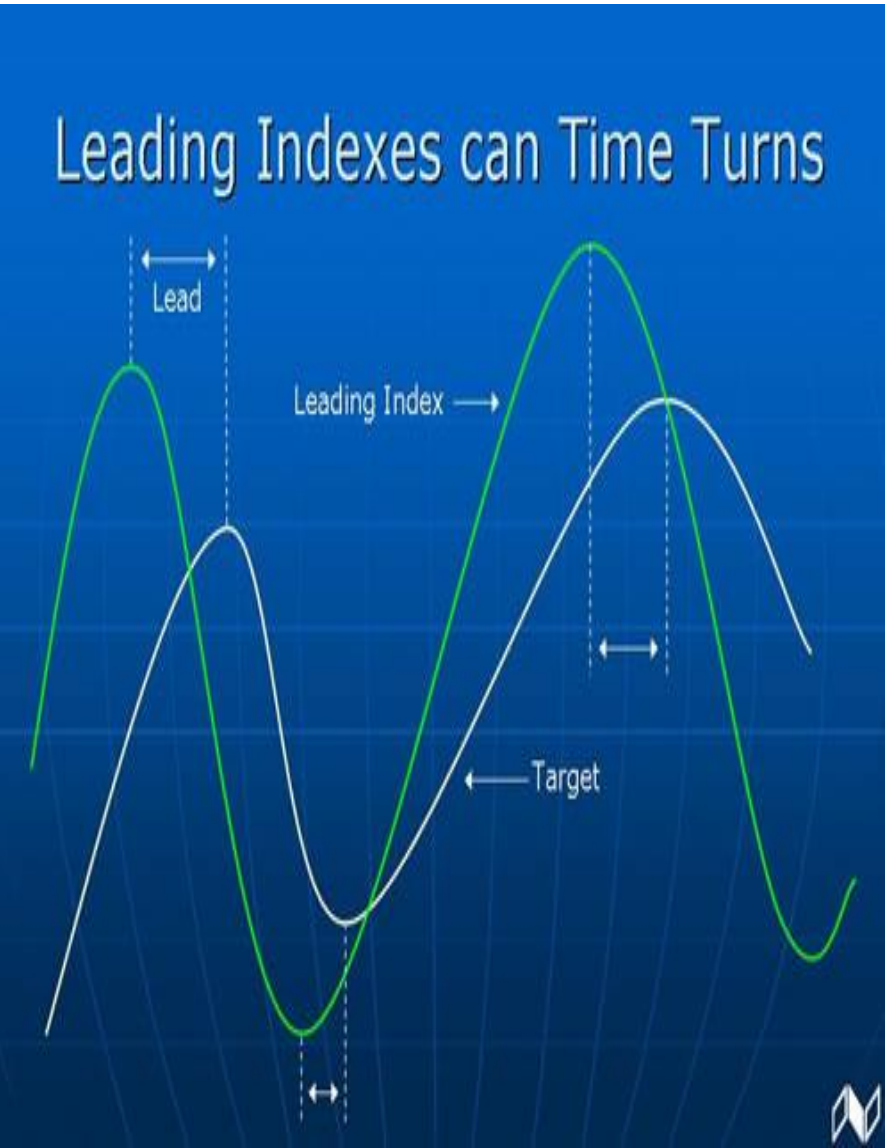
The problems of lack of current measures of economic activity (publication time lag) and non-generalisability of cycles from observation of previous cycles can be partially overcome by using **leading indicators**

Leading indicators are sensitive statistical time series which tend to turn up or down in **advance of other series of interest**

They go through **similar cyclical fluctuations** as the target time series but at **slightly different points in time**

Leading indicators tend to reach turning points **before** the target time series

Leading Index and Target Series



The leading index reaches turning points **before the target time series**

The time lag between the leading index reaching its **turning point** and the target series doing likewise can be used in **adjusting forecasts for the target series**

Reasons for Leading Indicators

MACQUARIE University

Due to time sequences of processes: Many of the processes relevant in business follow logical **time sequencing**. Plans for investment typically precede investment which precedes changes to production capacity

Due to market expectations: Expectations formations and changes typically precede changes in activity

Due to prime movers: Certain time series drive economic activity and will precede changes in economic activity – investment, interest rates, money supply

Leading Indicators- How they help

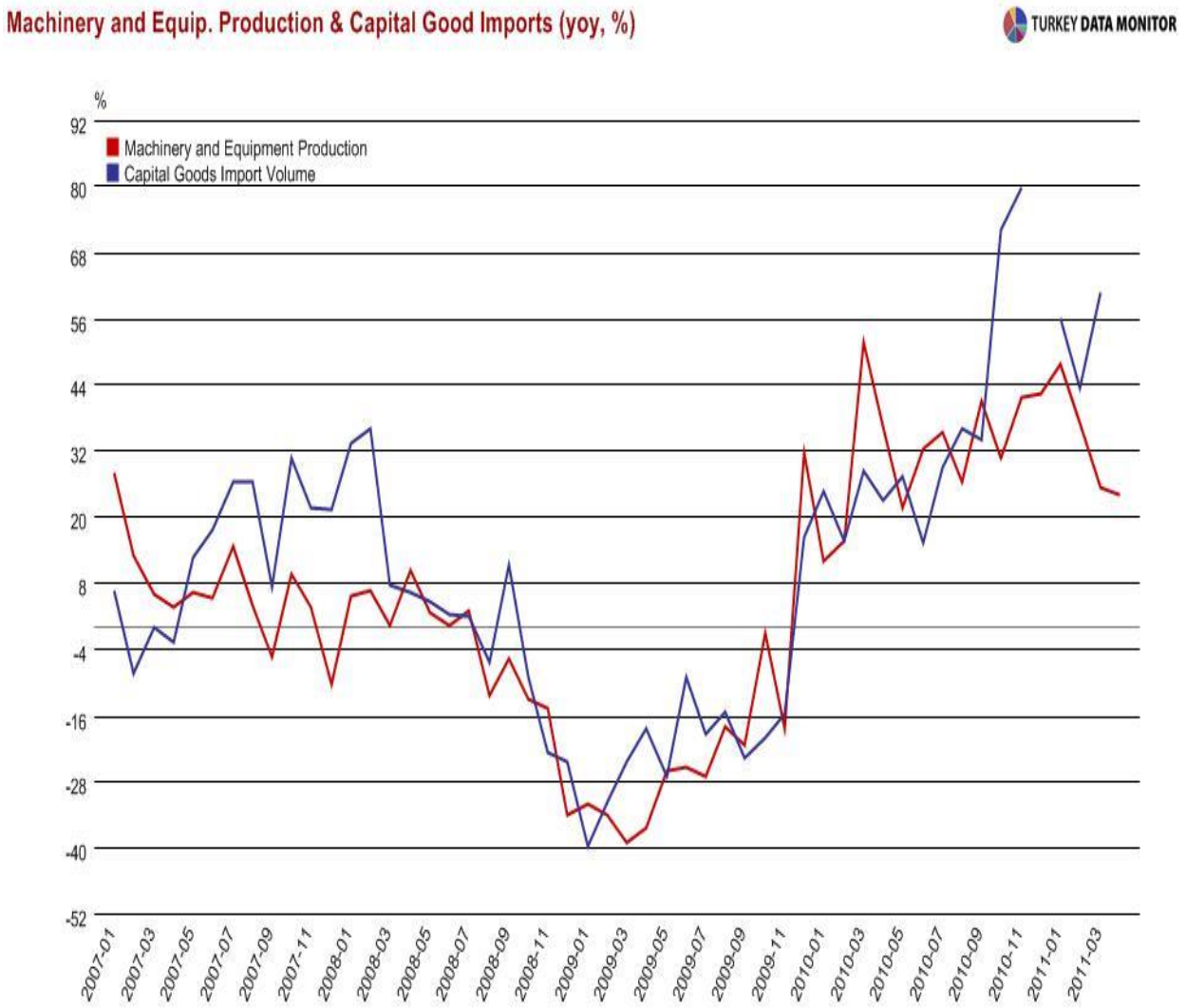
Non-mathematical approach to forecasting

Enormous advantage if it is possible to identify a group of statistical time series which give **correct indications of future cycle activity**

By observing leading indicator cycle activity we may be able to reasonably **accurately predict business cycle activity** and **adjust forecasts** accordingly

Various organisations have developed systems of leading indicator and business cycle analysis to **provide analysis of turning points in economic activity**

Leading Indicator Example

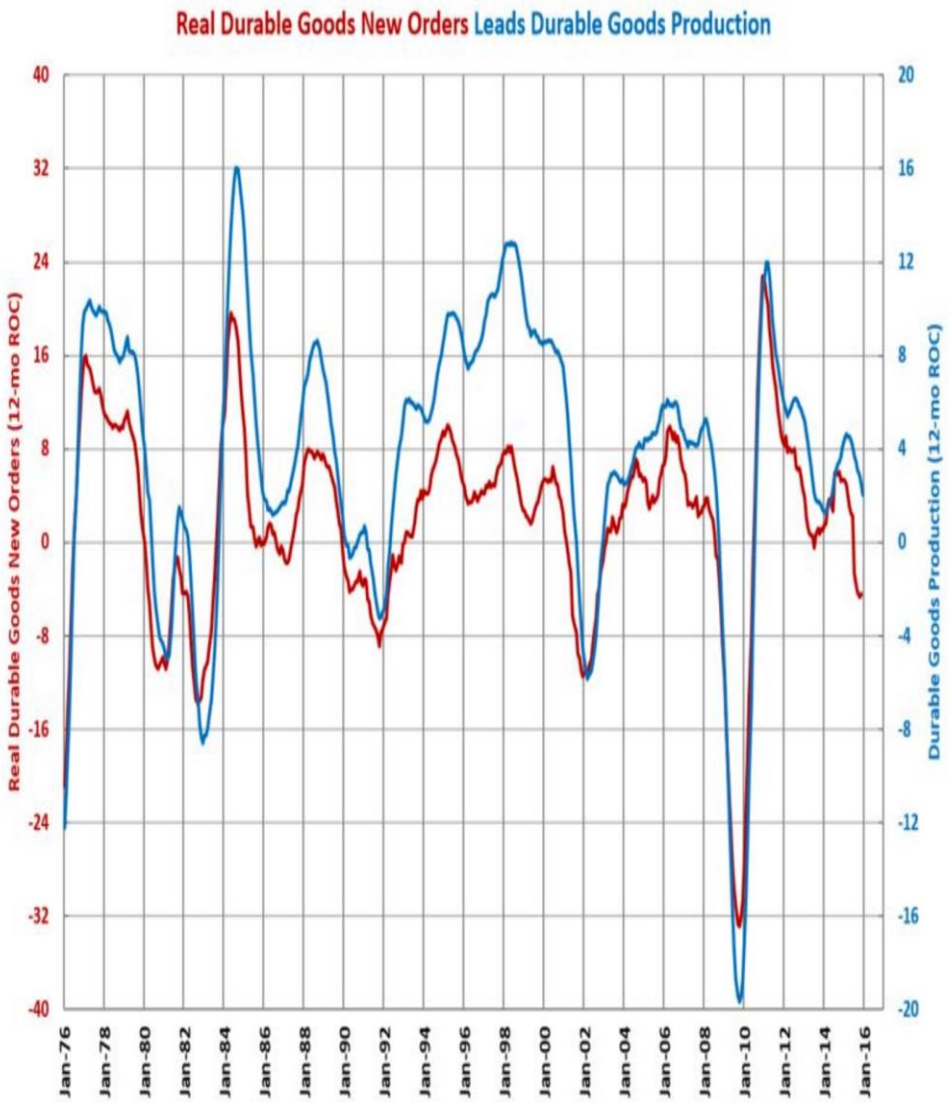


In this example, the volume of **Capital Goods Imported** seems to precede (lead) the **Machinery and Equipment Production** time series

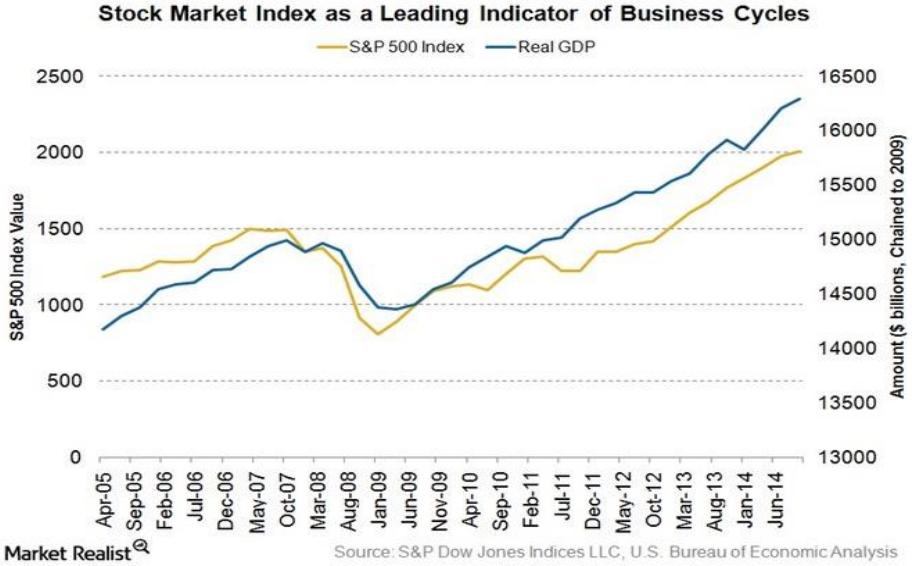
This due to the process of manufacturing equipment

General Activity Leading Indicators

MACQUARIE University



Source: ABS 8731.0, 6416.0



Market Realist

Source: S&P Dow Jones Indices LLC, U.S. Bureau of Economic Analysis

Criteria for Leading Indicators

MACQUARIE University

A suitable leading indicator:

- Is a **significant economic variable**
- Is **statistically adequate**;
- Is **not subject to significant revisions**;
- Reveals a **consistent relationship** (leading, coincident or lagging) over time with **business cycle peaks and troughs**
- Is not dominated by **irregular, erratic and non-cyclical influences**
- Is **promptly and regularly available** preferably **monthly**

Composite Leading Indicators

MACQUARIE University

Is there one single time series that acts as a proxy for business cycles?

Typically, **one time series will not be sufficient** to proxy the broad economic activity cycle

Broad economic activity encompasses diverse sectors such as **real goods, services, financial markets and international markets**

No single measure is likely to be able to adequately measure changes in activity across those diverse sectors. Usually, **several time series are combined in a composite index**

Composite Indicators- More

MACQUARIE University

Composite indexes are **weighted averages of several time series**

Statistically, composite indexes are likely to have **less random fluctuations** than single time series and be more suitable as indicators

In Australia, the three main composite leading indexes used are

1. **Conference Board (CB)**
2. **OECD**

Australian Composite Indexes

MACQUARIE University

The different composite indexes use **different component time series**

Very little agreement between the indexes on what the **relevant component series** should be

Certain time series such as All Ordinaries Index (share market) and dwelling approvals seem to have **consistently led Australian economic activity**

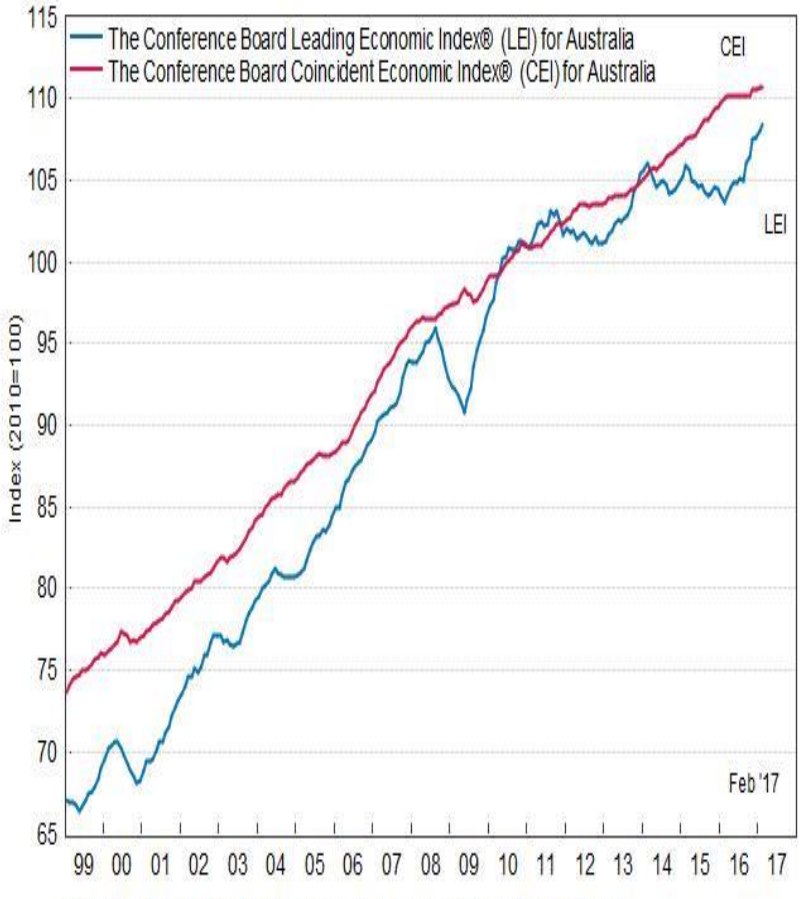
All Ords series is used in **all the composite leading indexes** cited previously while dwelling approvals appears **in WMI and OECD**

CB

MACQUARIE University

CB consists of the following series;

1. Medium term govt bond yield
2. Yield spread (10 year & 90 day)
3. Rural Exports
4. Sales to Inventories ratio
5. All ordinaries share price index
6. Building approvals
7. Real M3 money supply



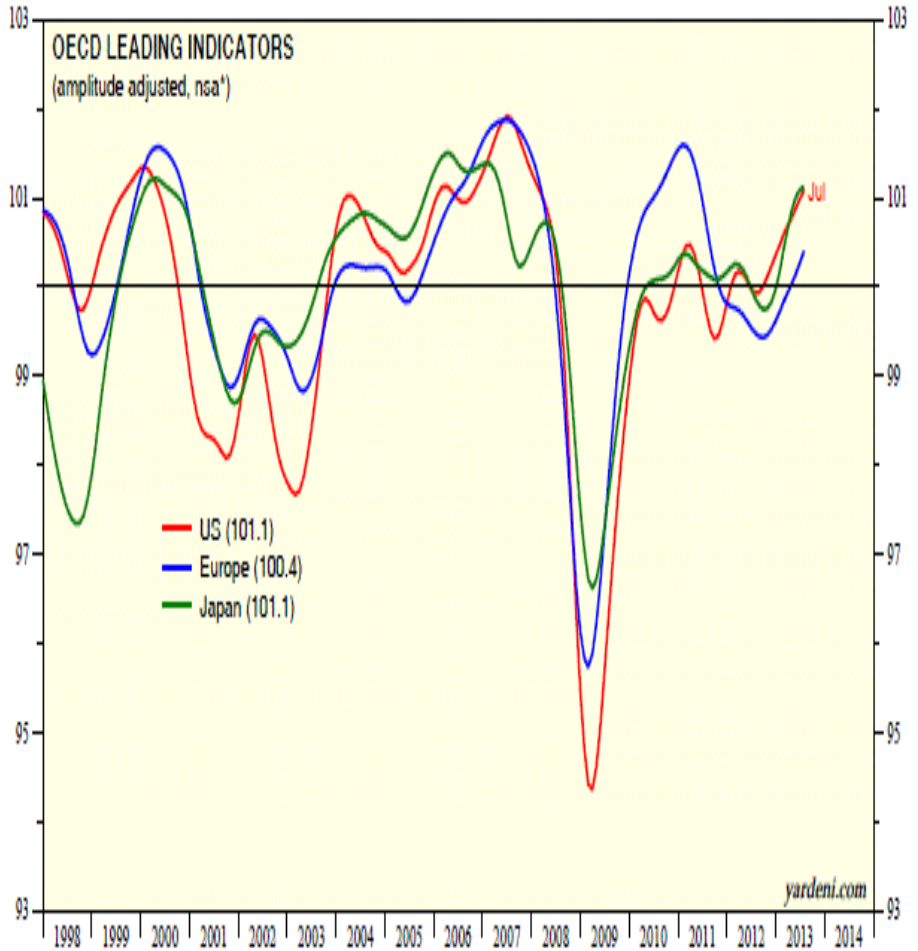
The shaded areas represent business cycle recessions. The peaks and troughs are designated by The Conference Board based on the coincident index and real GDP.
Source: The Conference Board

OECD

MACQUARIE University

OECD consists of the following series;

1. **Dwelling approvals**
2. **Manufacturing production**
3. **All ordinaries share price index**
4. **Terms of trade**
5. **10 year yield on treasury bonds**
6. **Real M3 money supply**



* A reading above 100 that is rising predicts expansion, above 100 and falling a downturn, below 100 and falling a slowdown, and below 100 and rising a recovery.
Source: Haver Analytics.

Coincident and Lagging Indicators

MACQUARIE University

Coincident indicators are indexes that reveal the current state of the business cycle

The turning points of coincident indicators are **approximately at the same time** as the turning points in the business cycle

However, they typically consist of time series that are **published more regularly than economic activity data** and are **thus available more readily**

Lagging indicators turning points **follow** the turning points of the business cycle

CB Coincident Index

MACQUARIE University

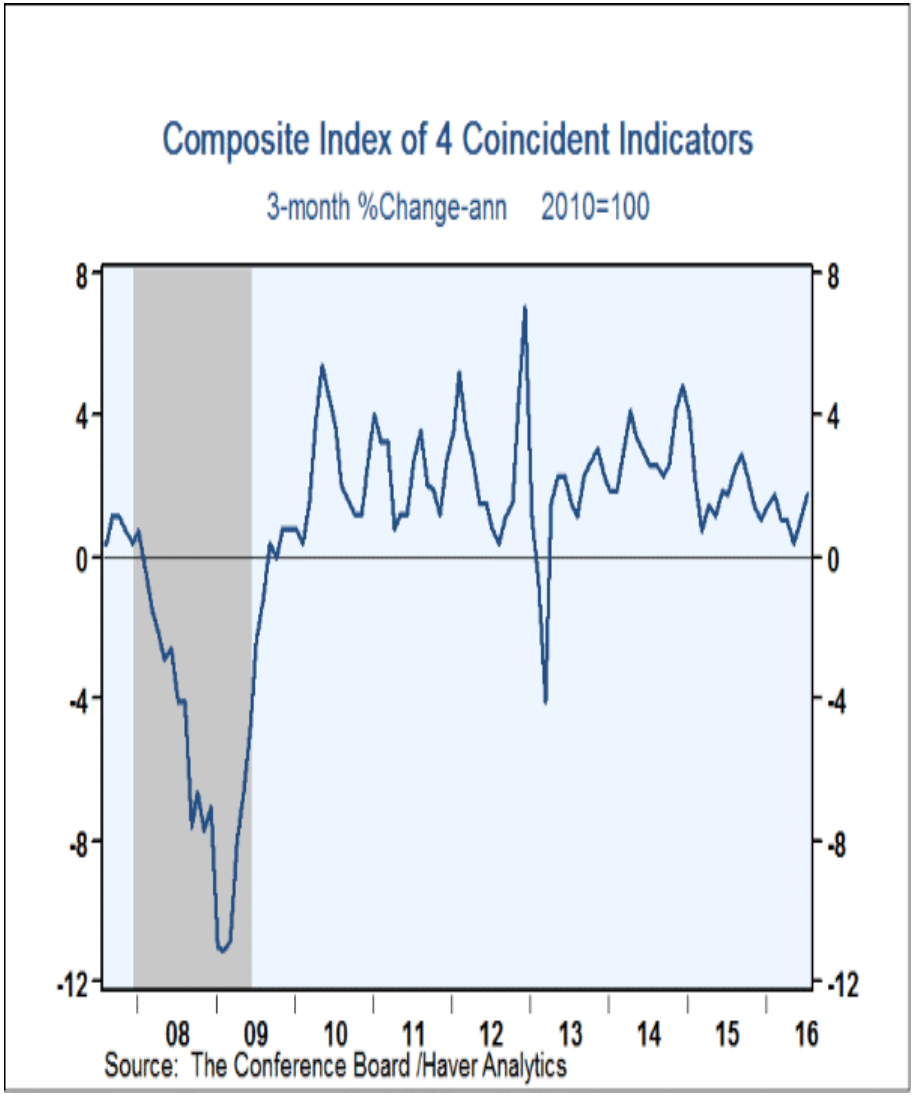
Conference Board also provides a **coincident index** made up of the following series;

1. Retail Trade

2. Industrial Production

3. Employed Persons

4. Household Disposable Income



Micro Level Leading Indicators

There may also be leading indicators that can be applied at an **organisational level**

Enquiries logged may precede orders and demand for an organisation's products or services. **Web or social media** registrations and information search data can precede orders or sales.

Monitoring of related products and services may be useful as leading indicators of the target organisations sales

Components manufacturers can monitor demand for related finished products

Tourism operators can **monitor airline bookings/sales**

Pre-Sales/Orders and Social Media as Leading Indicators

MACQUARIE University

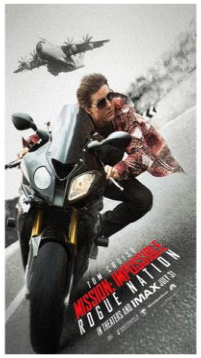
Observing social media metrics before a movies release assists in forecasting revenues/profits

comScore

MOST TALKED ABOUT MOVIES: JANUARY 1st thru JANUARY 7th

Title	Distributor	Days Before Release	New Conversations	Cumulative Conversations
Fifty Shades Freed	UNI	33	185,075	722,241
Black Panther	DIS	40	60,466	1,145,324
Slender Man	SNY	131	36,315	36,555
Maze Runner: The Death Cure	FOX	19	33,164	634,793
Post, The	FOX	5	30,356	131,158
Avengers: Infinity War	DIS	117	19,976	1,473,289
Paddington 2	WB	5	14,344	129,540
Proud Mary	SNY	5	10,475	57,877
Solo: A Star Wars Story	DIS	138	9,199	145,678
Wrinkle In Time, A	DIS	61	6,317	170,806

The "Most Talked About Movies" chart represents the amount of conversation measured through comScore's PreAct – a tracking service utilizing social data to create context of the ever-evolving role of digital communication on feature films.



Mission: Impossible – Rogue Nation

US Theatrical Release July 31st 2015

3.24M	35.5M	103k	135k
Likes	YouTube Views	Tweets	Google Views
3%	0.31%	64.6k	
PTAT	YouTube Buzz	Retweets	

Vacation

US Theatrical Release July 29th 2015

2.65M	17.9M	29.9k	85.5k
Likes	YouTube Views	Tweets	Google Views
5%	0.32%	16.4k	
PTAT	YouTube Buzz	Retweets	

MP MOVIEPILOT

Anticipatory Surveys

MACQUARIE University

Three major types of anticipatory surveys:

1. **Consumer attitudes/buying plans**;
2. **Investment anticipations**;
3. **Inventory and sales anticipations**.

Outcomes of these surveys can be used as **input to prediction of the cycle**

The forecaster must bear in mind the **characteristics and accuracy record of these surveys which isn't great**