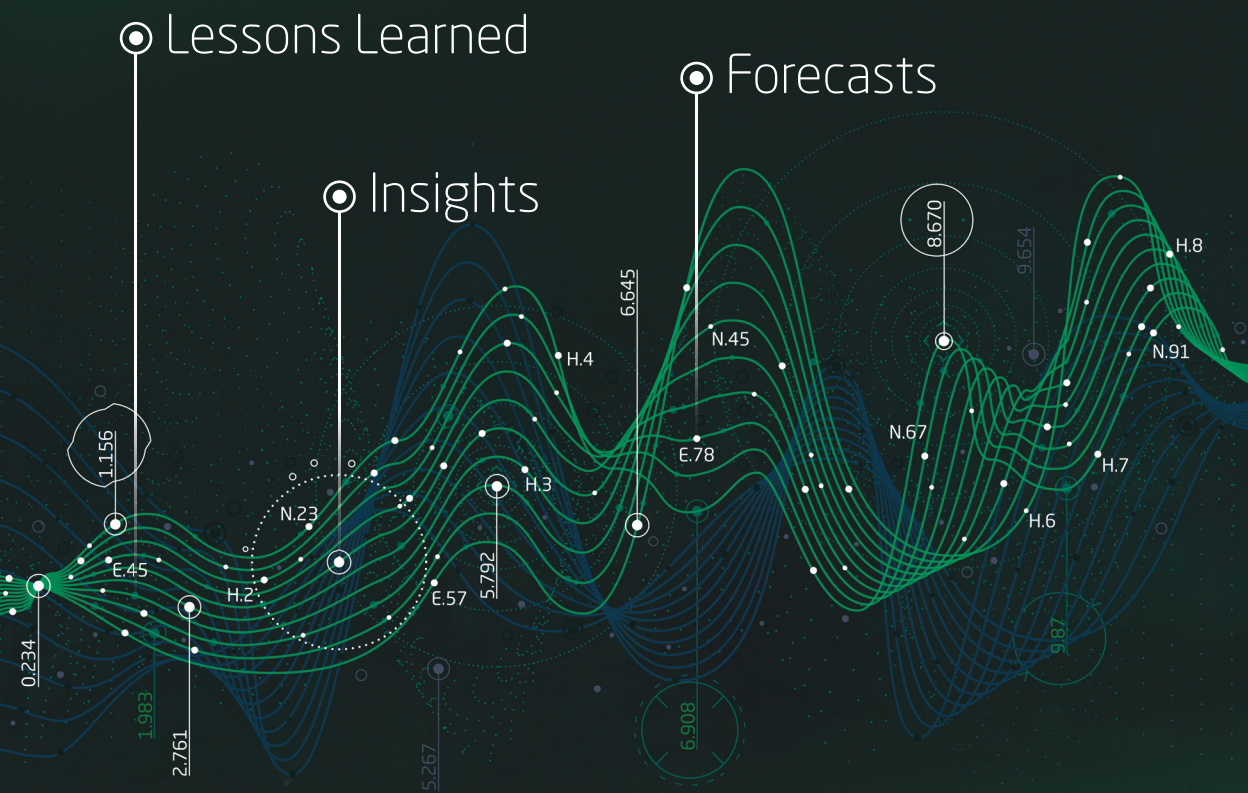


Peter Meier

The **Economy** as an Oscillating System



Meier

The Economy as an Oscillating System

Peter Meier

The Economy as an Oscillating System

Lessons Learned - Insights - Forecasts

With 114 images

HANSER

All the information contained in this book has been compiled to the best of the author's knowledge as well as carefully checked and tested. Nevertheless mistakes cannot be ruled out entirely.

For this reason no liability of any kind is assumed or no guarantee of any kind is provided in conjunction with the information contained in this book. The author(s, editor) and the publishing company consequently do not assume any responsibility and will not assume any consequential or other liability, which arises in any way in connection with the use of this information – or parts thereof.

Nor do the author(s, editor) and the publishing company provide any guarantees that the methods described etc. are not subject to third party intellectual property rights. The use of common names, trade names, product descriptions etc. in this book, even without specific labelling, does not entitle the reader to assume that such names are not covered by brand and trademark protection law and that they therefore may be used by everyone.

Cataloging-in-Publication Data is on file with the Library of Congress.

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or by any information storage and retrieval system, without permission in writing from the publisher.

© 2019 Carl Hanser Verlag GmbH & Co. KG, Munich, Germany

www.hanser-fachbuch.de

Production manager: Anne Kurth

Cover design: Max Kostopoulos

Cover concept: Marc Müller-Bremer, www.rebranding.de, Munich, Germany

Translation: Leinhaeuser Languages Services, Unterhaching, Germany

Typesetting: Kösel Media GmbH, Krugzell, Germany

Printed and bound by Friedrich Pustet GmbH & Co. KG, Regensburg, Germany

Printed in Germany

Print-ISBN 978-1-56990-778-8

E-Book-ISBN 978-1-56990-779-5

Content

Preface	7
Introduction	9
1 Business Cycle Patterns	13
1.1 Gross Fixed Investment	18
1.2 Machine Tool Manufacturing	24
1.2.1 Industry Business Cycle Patterns	24
1.2.2 Corporate Business Cycle Patterns	30
1.3 Textile Machinery Manufacturing	34
1.4 Machinery Manufacturing and Several Sub-Sectors	38
1.5 Business Cycle Indicators	40
1.6 Reading Business Cycle Patterns	48
2 Structure	49
2.1 A digression on the subject of trend identification	50
2.2 The beginnings of industrialisation	56
2.3 From an industrial to a service economy	61
2.3.1 Per capita gross fixed investment	62
2.3.2 Employment in the industrial sector	64
2.3.3 Machine tool consumption	66
2.4 From service to information economy	68
2.5 Structural changes harbour risks and create opportunities	73
2.6 Identifying structural changes in good time	80
3 Process	81
3.1 Business cycle fluctuations escalate and propagate	82

3.1.1	Bullwhip effect	82
3.1.2	Hype cycle	86
3.1.3	Speculation	88
3.1.4	The multiplier and economic policy	90
3.1.5	Accelerator	92
3.1.6	Extended accelerator principle	96
3.1.7	Business cycle fluctuations are unavoidable	100
3.2	Consumption and investment – a non-linear relationship	102
3.2.1	Consumption-Investment Model	102
3.2.2	Trend breaks generate shocks	106
3.2.3	Shocks generate fluctuations	110
3.2.4	Saturation shock	112
3.2.5	Capital goods demand and installed capacity	120
3.2.6	Bubble shock	124
3.2.7	Shocks reduce employment	128
3.2.8	Shocks are reproduced right round the globe	130
3.2.9	What triggers a shock?	132
3.2.10	Shocks and technological changes	136
3.3	Propagation characteristics of business cycle fluctuations	140
4	A Finger on the Economic Pulse	141
4.1	Time Lags	144
4.1.1	Linear time lags	144
4.1.2	Non-linear time lags	150
4.2	Consumption and industry cycles	154
5	Forecasts	165
5.1	Data Pool	166
5.2	Forecasting Model	167
5.2.1	Industry Forecasts	167
5.2.2	Corporate Forecasts	174
5.3	When will the next crisis occur?	178
5.4	Impact on industries or companies	192
5.5	About the accuracy of economic forecasts	194
5.6	The ten premises on which the forecasting model is based	200
	Bibliography	201

Preface

As a sales manager and then CEO of Starrag for twelve years I experienced the impact of the business cycle first hand. This experience showed me that the business cycle is universally prevalent and affects all market players to a similar degree.

At an early point, I had intuitively developed the mathematical forecast model presented in this book, a model that transforms general economic indicators into industry- and company-typical patterns. Over the last twenty years I was able to devote myself almost exclusively to enhancing this model, and in the process I incorporated some of my experience during my time as CEO.

Swissmem took an interest in the forecasts for some of its specialist groups and provided me the opportunity to present my theories to a wider audience at its events. Eventually entrepreneurs approached me wanting to know if I could generate company-specific forecasts.

My research has now focused on how business cycle stimuli were propagated from the macroeconomic level of a national economy to the microeconomic level of a specific company. I gradually came to realise I had intuitively observed the course of economic events in the form of an oscillating system. The fact that some of the propagation mechanisms of business cycle stimuli are of a non-linear nature makes the course of economic events difficult to comprehend. But non-linearities also have the welcome side effect of generating time lags, which can be utilised for forecast purposes.

I am very grateful to the many companies in Germany and Switzerland with which I had such an in-depth and consistently invigorating level of contact. Without them, this book would not have been written.

I should especially like to thank Swissmem's "Machine Tools and Manufacturing Technology" specialist group as representative of the various specialist groups in the associations that regularly invited me to give presentations. During my time as CEO of Starrag I already had developed close links with this particular group. I am particularly delighted that the "Machine Tools and Manufacturing Technology" specialist group has facilitated and actively supported the publication of this book to mark the seventy-fifth year of its founding during its anniversary year.

The company hpo forecasting is now continuing my forecasting activities with verve and innovative ideas. I am very grateful to be able to place my life's work in younger hands.

A special thank-you goes to my dear wife Marguerite. She covered my back and helped me write this book by providing plenty of tips, critical suggestions as well as in many other respects.

Last but not least I should like to thank the staff at Hanser Verlag for the very pleasant collaborative working relationship. The editorial deadline meant that many diagrams reflect the status as at September 2018.

I have attempted to describe a number of economic relationships in terms of an oscillating system in the hope of contributing to a better understanding of economic processes and arousing readers' interest in continued research into this topic.

Peter Meier,

Goldach, March 2019

Introduction

The question of why crises occur has occupied my mind ever since I studied to become an engineer. Back then I wanted to know what triggered the major economic crises of the 1930s. I browsed a number of relevant books, but in the end was none the wiser.

My main occupation for around twenty years now has been observing, analysing and forecasting business cycles. Yet the question about what causes business cycle fluctuations is not an easy one to answer, even after poring over all the material. Economic researchers have been grappling with this topic for generations. The outcome of all their efforts is a large number of to some extent contradictory theories. Some are able to explain why certain economic slumps occurred in the past, while others are not able to do so. Some other theories are so scientifically abstract that barely any practical benefits can be derived from them. Things start getting really tough when evaluating future business cycle trends. There is only a tiny handful of approaches that could have predicted the financial crisis of 2008/09.

The intention of this book is not to provide an overview of all the business cycle theories out there. There are enough specialist books available that attempt to put the large number of theories into some kind of order; see for instance (Tichy, Konjunktur 1994) (Gabisch and Lorenz 1989). What seems to me to make more sense is to look at the commonalities between the various business cycle theories.

1. There is agreement that business cycle fluctuations stem mainly from fluctuations in investment activity.
 - Observing and analysing business cycles in the capital goods sector are most likely to deliver the approaches that explain the phenomenon of business cycle fluctuations. A wealth of experience from my everyday professional life led me to recognise this.
2. Most economists focus on business cycles in specific countries. What is generally involved here are the description and analysis of gross domestic product and its components.
 - From experience, I know that the capital goods industry went global many decades ago. I therefore cannot understand why so many economists stick rigidly to their national perspective. At most this can be explained by the fact that they de-

rive their income from each respective country. From my perspective I can say that business cycles in the capital goods sector need to be considered in a global context, or at least in the context of large regions (e.g. Europe, Asia, America).

3. The economy is viewed as a complex, non-linear system primarily in more recently propounded theories. We know from chaos theory that such systems tend intrinsically to fluctuate. External causes, such as wars or crises, are not required to trigger business cycle fluctuations.

→ The correlation between consumption and investment is already non-linear. What this means will be explained in more detail in Chapter 3. Added to that is the fact that in the course of economic events any one move in a particular direction is generally dependent on the preceding one. The prerequisites for a fluctuation-prone system are therefore met. Such systems exhibit typical behaviour patterns; in our case these are business cycle patterns.

The observations described in this book are based on these three points. The conclusions drawn may help to understand the mechanics of crises better and to identify impending crises in good time. However it is tough getting your bearings in a complex system. That works best by applying intuition. Nearly all the insights described in this book have accrued from my intuition. The prerequisite for that is an intensive examination of the material – plunging into the jungle of economic events, so to speak. I had multiple opportunities to do this during my many years as CEO of a medium-sized mechanical engineering company. Once you have that gut feeling, intuition gives you those insights in a flash.

I am no economist of any kind. Although I touched on these specialist subjects while studying to become a production engineer, I was not at home in them. Perhaps this not being burdened by expert knowledge benefited my sense of intuition. It was really able to run riot on the subject of business cycles, which is sandwiched somewhere between economics and business management. My flair for empiricism also stood me in very good stead.

I am now faced with the problem of committing the insights gained to paper in an intelligible way. That is not easy, by any means. Ultimately all economic events are interrelated. The standard scientific procedure, in which you break the whole thing down into its constituent parts and consider those constituent parts in isolation, is not really a suitable method of describing business cycles. Models, which capture these correlations in mathematical terms and are thus able to simulate economic events, are much more suitable. Although this helps to understand these correlations better, the obstacle to committing such models to paper in a generally intelligible way remains to be overcome.

The basic problem is that a complex system, in which everything is interrelated, can only be described to a limited extent in the one-dimensional form of a text. A description that tackles the problem from different angles, that effectively takes a helical approach, is possibly better suited. However it expects the reader to accept repetitions.

But that has other advantages: The reader can come on board at the point in which they are most interested.

The economy can be regarded as a living system. A living system organises itself and is reliant on an input of energy. This is the only way it can maintain its structure in a more or less stable balance. A living system is therefore in constant interaction with its environment and cannot be considered separately from that environment at all.

As far as any company, which is itself a living system, is concerned, its environment consists of its market, consumers, suppliers, competitors, the state and so forth. Its environment in turn consists of living systems, which are themselves surrounded by other living systems. Ultimately every company is embedded in the global economy and inextricably linked to it. That energy circulates within the global economic system in the form of intellectual or physical manpower, financial resources, raw materials as well as semi-finished and finished products.

However the question of which aspects of a complex system are the easiest to capture needs to be asked. In his work 'Metaphysics', Aristotle already distinguished between matter (structure, substance, quantity) and form (pattern, order, quality). He linked both through a development process. Fritjof Capra (Capra 2000) takes a very similar approach, by naming three fundamental aspects of complex (living) systems: **Pattern, Structure and Process**. Here he draws on works by neurobiologists Humberto Maturana and Francisco Varela, as well as by the Russian-Belgian physicist and Nobel Prize winner Ilya Prigogine. I would like to make use of these organising principles in the rest of this book and apply them to the subject of crises and business cycles.

The analysis encompasses three points:

- The pattern communicates the history of the system: its actions and afflictions. Here the focus is on its afflictions. In terms of economic events, these are crises. What's involved here are the major crises and the question of what impact global crises have on subsystems, i.e. an industry or a company.
- The structure of a living system always depends on its environment as well. It therefore cannot be described in general terms. Yet all living systems have at least one commonality: they put considerable effort into maintaining their structure. In economic event terms this means that once a growth trajectory has been embarked upon, it will be adhered to for as long as possible. The transition to another growth trajectory involves a more or less major crisis.
- Process involves the question of how a stimulus is transferred from one subsystem to another. For example, along the procurement chain or from the market to suppliers.

The conclusions of the analysis are:

- Economic events are subject to a pulse rate. In a way that makes them predictable.
- The majority of crises are foreseeable.

Ultimately this book is presenting a forecasting system that enables demand for capital goods to be forecast pretty reliably up to eighteen months into the future, based on global economic indicators. The approximate timing of an impending global economic crisis can also be gauged by more than a year in advance, based on hypothetical assumptions that can be periodically reassessed.

1

Business Cycle Patterns

The pattern is the quantifiable footprint of part of a system, so to speak. Given that a subsystem is in constant interaction with other parts of a complex system, the pattern is also an expression of the relationships with the overall system – even if only from the perspective of the subsystem.

When plotted as a graph, the business cycle pattern shows more or less regular ups and downs. In this context it does not matter whether an economic area like Western Europe, a specific industry or a company are being looked at. You keep on encountering similar patterns: fluctuations around a long-term trend. This increases to a greater or lesser degree depending on which economic unit is being considered. It can also fall. There are also major differences in terms of fluctuation margin and period length. At any rate upturns and downturns are necessarily part and parcel of the course of economic events.

A business cycle is usually split into several phases:

1. Upturn

This is the period of economic recovery. Capacity utilisation is increasing and unemployment is declining. There is a lot of investment activity, and wages and consumption are rising.

2. Boom

Demand continues to grow in a booming economy, but at slower growth rates.

3. Recession

The economy is hit by a downturn. Given that capacity utilisation is no longer high, unemployment rises. Investment is cut back severely.

4. Depression

If the economic trough persists for a longer period, this is referred to as a depression.

Various methods are used to depict the cycle. You can either plot the original values as a graph, although these are often adjusted for seasonal influences and smoothed out. Or you can compute the divergence from the trend by breaking the original values down into a trend and a cyclical component. In the first case the upturns appear bigger when the trend is on an upward path and smaller when the trend is on a downward one. Nothing but the business cycle pattern is reflected in the second case. The business cycle pattern is very often depicted together with rates of change compared to the previous quarter or previous year. This has the advantage of making the identification of trends unnecessary. What is often not taken into account is the fact that the original values are transformed as a result of computing the rates of change. The cycle is shifted forward in time, as can be seen in Figure 1.1.

At a national economy level, the rate of change of real, i.e. price-adjusted, gross domestic product serves as a measure of economic performance or output. If the rate of change is negative for two quarters in succession, that is what economists refer to as a recession*. Mind you, the economy is then in a downturn phase and the bottom has not yet been reached.

* What constitutes a recession is a subject of debate among economists. The most common definition speaks of a recession when the gross domestic product falls in two consecutive quarters in comparison with previous periods.

Given that patterns can best be described in the form of graphs, the text contains a large number of diagrams. For the sake of better readability, these are depicted whenever possible on the right-hand side and are commented on in a short text. The actual text, which puts the diagrams in a wider context, is located on the left-hand side of the book.

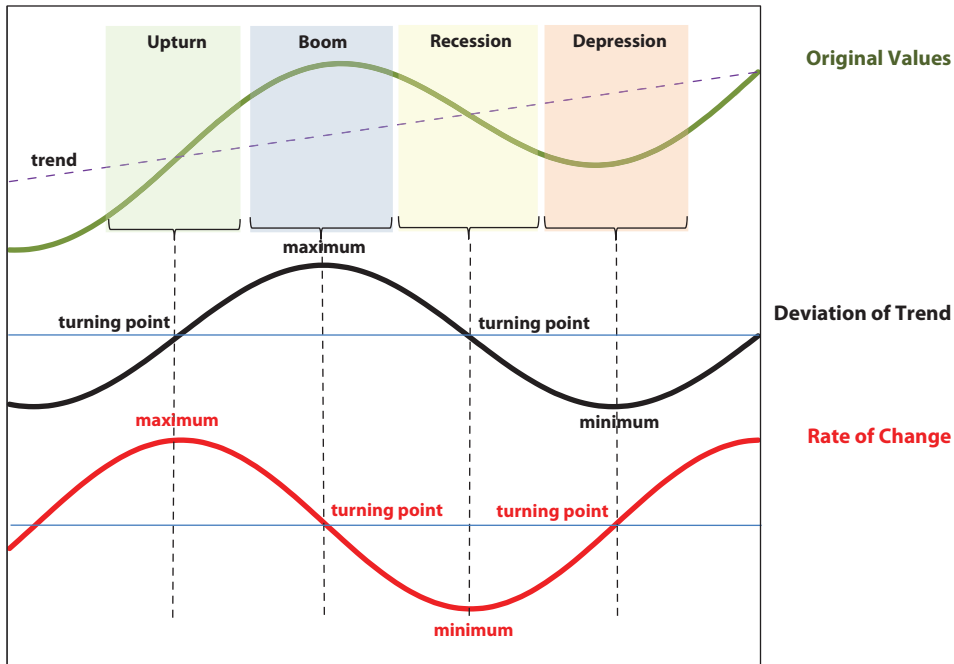


Fig. 1.1 Idealised phases of the business cycle in different representations

The original values (green) fluctuate around a trend (purple dotted line). Where a trend is on an upward path, the upturn is prolonged. An upward trend extenuates any downturn. The reverse applies in the case of a downward trend.

The cyclical component (black) that has been factored out of the trend, in mathematical terms the divergence from the trend, is featured at the same time as the original values.

If the cycle is represented by rates of change compared to the previous period (red), that means there is a phase or time lag with respect to the original values. The maximum or peak now occurs in the upturn phase, while the minimum or trough occurs in the recession.

Tichy (Tichy, Konjunktur 1994) examines various business cycle patterns in the USA, Germany, Austria and Switzerland. When analysing the demand side of gross domestic product*, he observes that investment fluctuates three to four times as much as gross domestic product. This finding, as Figure 1.2 shows, can also be applied to a larger economic area like Western Europe. Consumer spending fluctuates the least. In contrast, gross fixed investment** fluctuates to a much greater extent. However the three curves in Figure 1.2 have very similar paths. It is clear that: the up and down course of economic events is graphically illustrated by gross fixed investment. Thus the demand for capital goods is – like a seismograph – a particularly sensitive barometer of the course of economic events.

In Figure 1.2 the phases in which gross fixed investment exhibited negative growth rates are highlighted in yellow. In 1963 this was only the case in one quarter – too short to be deemed a crisis. Between 1974 and 2015 there were six slumps that lasted longer than one year. Western Europe's gross domestic product also contracted during these phases, except in 2001/02. This also shows that a crisis not only has a more severe impact on the capital goods sector, it generally lasts longer than in other sectors of the economy.

What strikes you when looking at Figure 1.2, is that business cycles bear little resemblance to the ideal type of sine-shaped path. Furthermore, period length is variable. There were minimums or troughs in gross fixed investment in 1975, 1981, 1993, 2001, 2009 and 2012. In the period under consideration period lengths were thus 6, 12, 8, 8 and 3 years. As far as gross fixed investment is concerned, divergences from trend growth came in at $\pm 5 - 7\%$, except for the swings in the 1960s and the 2008/09 crisis.

* The *demand side* of gross domestic product consists of domestic demand and net exports (balance of trade). Domestic demand is split into consumer spending (private and public-sector) as well as gross fixed investment. Added to that are changes in inventories, but these are relatively small. The balance of trade is the difference between exports and imports. It is likely to be more or less evenly balanced in the case of a large economic area. Furthermore, closer inspection shows that exports and imports fluctuate to a similar degree to gross domestic product.

** Gross fixed investment includes all public-sector and private investment and write-downs that a national economy executes during the course of one year. That includes investment in equipment, such as machinery and production facilities, investment in the construction of housing, factories, civil engineering projects and other facilities.

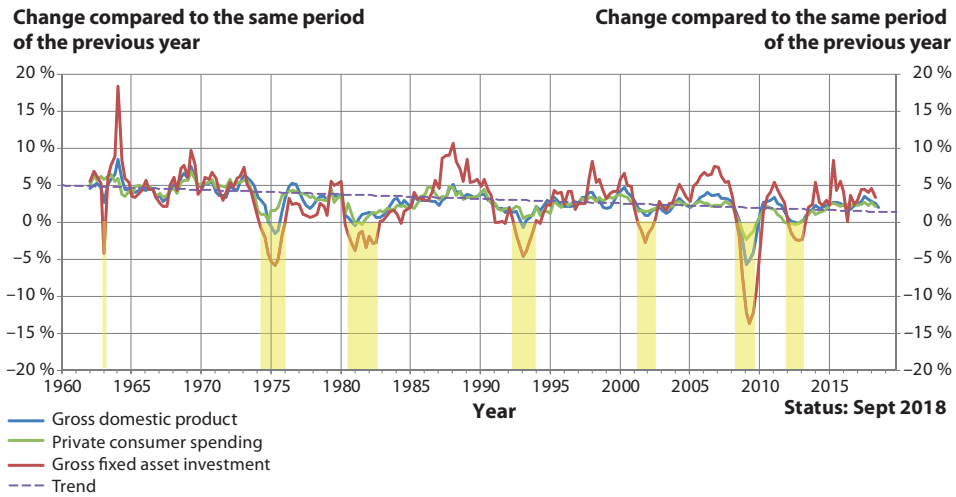


Fig. 1.2 Europe's gross domestic product and its components of domestic demand. Source: OECD; quarterly values

The susceptibility of investment to cyclical changes (red) is very clearly demonstrated. Every time the rate of change compared to the previous year's quarter is negative, that means we are in crisis territory (highlighted in yellow). That was the case in Western Europe on six occasions between 1960 and 2015. The 1963 slump does not count as a crisis, because it was too short.

Gross domestic product (blue) then enters a recession just at the point when gross fixed investment is negative. Consumer spending (green) is the least volatile. Gross fixed investment (red) fluctuates two to three times as much.

In the mid-1960s trend growth (purple dotted) in Western Europe was 5 % per annum. It has now declined to 1 to 2 %.

■ 1.1 Gross Fixed Investment*

The Statistical Offices in most countries publish sets of figures relating to their national accounts on the Internet. There are also sources that convert various countries' figures to a comparable denominator, enabling the data of an economic area to be consolidated. Conversion factors that balance out currency differences on the one hand and effective purchasing power on the other are used for this purpose. This is referred to as purchasing power parity (PPP).

This enables gross fixed investment trends in various economic areas to be compared. Figure 1.3 shows original values in place of the rates of change shown in Figure 1.2. Phases during which investment in plant and equipment declined significantly are highlighted in yellow – a history of the major economic crises of the last 50 years in abridged form. What is striking is that the recessionary phases occur often – but not always – simultaneously in all regions of the world: a manifestation of the globalised economy. With the exception of a minor recession (1969/70) in the USA, the relatively long period from 1960 to 1974 was characterised by steady growth. Major slumps then kept on occurring at irregular intervals.

1. “First Oil Crisis”: The cutbacks in crude oil production in October 1973, during the Yom Kippur War, plunged oil-importing countries into deep crisis. They ended a long period of strong growth, which also included the “German economic miracle”. Western Europe and Japan only recovered slowly from the crisis, while the USA returned to growth relatively quickly, not least as a result of pulling out of the Vietnam War (1973).
2. “Second Oil Crisis”: During the Islamic Revolution in Iran (1979) and the Iran-Iraq War there was a second massive hike in the price of oil. At the same time the Soviet Army invaded Afghanistan. The uncertainty caused by these events brought the tentative recovery in Western Europe and Japan to a halt. In the NAFTA region they led to a significant drop in investment, which was then exacerbated by the savings and loans crisis (1981) and the Latin American debt crisis (1982). It was not until 1983 that the USA returned to growth as a result of the tax breaks introduced by the Reagan Administration and deficit spending by the government.

* Gross fixed investment includes all public-sector and private investment by a national economy, including write-downs. That means structural and civil engineering, machinery and plant of all kinds as well as intellectual property. Germany's Federal Statistical Office publishes a detailed definition of this term, which also applies to the EU (Destatis 2015).

Mil US\$; logarithmic scale

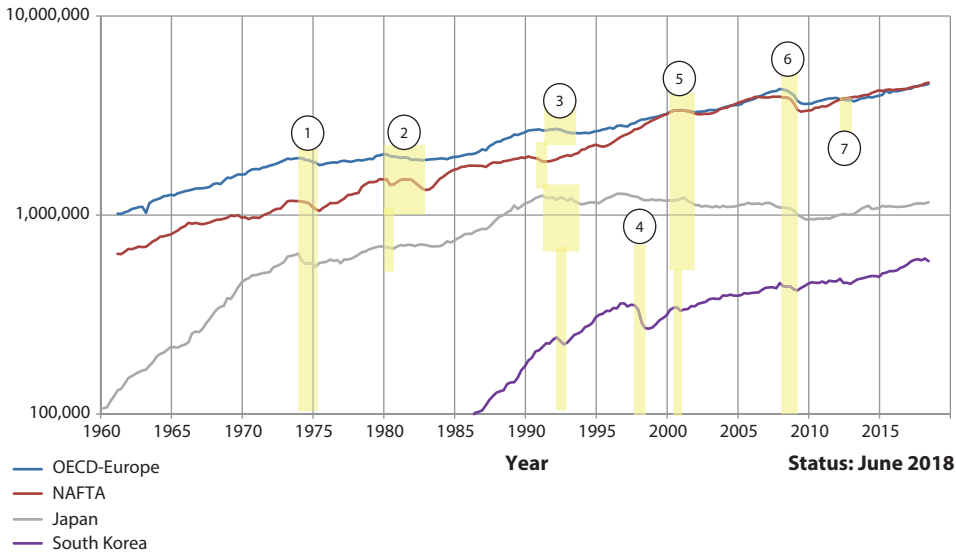


Fig. 1.3 Gross fixed investment in the OECD's economic blocs. Source: OECD; US dollars volume estimates, fixed PPPs, OECD reference year, annual levels, seasonally adjusted

Figure 1.3 shows gross fixed investment trends in various economic blocs. Purchasing power-adjusted quarterly values are shown. The blue curve shows gross fixed investment in Western Europe and the red curve shows gross fixed investment in NAFTA countries* (USA, Canada, Mexico). Both economic blocs are comparable in terms of economic output and population. Unfortunately condensing economic data for the purposes of describing an Asian economic bloc is not an easy task. Economic data for the major emerging economies has been available for several years, however it is very diffuse, depending on what the source is. Gross fixed investment for Japan (grey) and South Korea (purple) are shown in Figure 1.3 as representative of the Asian economic area. Plotting on a logarithmic scale has the advantage of showing the intensity of fluctuations, irrespective of their absolute size. This makes them comparable over time.

The phases in which gross fixed investment contracted are highlighted in yellow. They correspond to the yellow-highlighted phases in Figure 1.2. Because the pattern is shown there featuring rates of change, the crises are to be found where the minimums or troughs are and not where the downturns are as in Figure 1.3.

* NAFTA was established in 1994, the red curve in Figure 1.3 includes gross fixed investment by the USA, Canada and Mexico.

3. The third major crisis is the only one during the period under consideration that did not occur simultaneously in all regions of the world. It began in 1990 in the USA, but only lasted there for 1 – 2 years. To this day, economic researchers are still puzzled by the reasons for this consumer caution back then. Yet it is safe to assume that the fall of the Berlin Wall in 1989 and the subsequent collapse of the Soviet Union triggered a generally major degree of uncertainty. The euphoria surrounding German reunification predominated in Europe to start with. The Cold War had finally ended. Yet the costs of integration were far higher than anticipated and much more time was required to align structures. This led to a lengthy crisis in Western Europe. Investment only reached pre-crisis levels again half a decade later. A property bubble burst in Japan in 1990, which plunged the country into a crisis in 1991, from which Japan has still not recovered. In the spring of 1993 North Korea announced its intention of withdrawing from the nuclear weapons non-proliferation treaty. Fears of a second Korean War that this announcement stoked triggered a short recession in South Korea.
4. “Four Asian Tigers Crisis”: The lengthy period of rapid growth in various South East Asian countries led to a credit boom towards the end of the growth phase. This led to overcapacity. Equities and properties were purchased at inflated prices. The bubble burst in mid-1997 and led to a severe slump in investment, which also hit the already weak Japanese economy.
5. “Dotcom Bubble”: In the 1990s there was a unprecedented spirit of optimism about digital technology emanating from Silicon Valley. This resulted in stock market bubbles all over the world, which burst in the spring of 2000. The uncertainty triggered by this event caused investment to contract in all global markets.
6. “Lehman Shock”: Cheap loans and rising property prices led from the mid-1990s onwards to an excessive increase in consumption in the USA. This led to an export boom in China, which in turn required a high level of investment. Plant and machinery were purchased to a large extent in Europe, and local manufacturers experienced a welcome boom. This increasing euphoria caused stock market bubbles all over the world, which then proceeded to burst in the autumn of 2008. As a result gross fixed investment in industrialised countries collapsed by around 20 %.
7. “Euro Crisis”: European monetary union had provided Southern European countries with low interest rates during the boom period and thus led to excessive borrowing and investment behaviour. The 2008/09 crisis hit these countries particularly hard. Fiscal policy was the only instrument they had to tackle the crisis, but it burdens the national budget more than monetary policy. European monetary union ruled out the option of currency devaluation. The Eurozone was at risk of breaking apart in 2011/12.

You can deduce from the trend in gross fixed investment shown in Figure 1.4 that the global economy has been rocked by five major crises in the last fifty years. Two more crises each only impacted on one economic bloc: Crisis (4) affected the Asian region and Crisis (7) the Eurozone.