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Timing of Investments on the Polish Stock Exchange  
in Accordance with the Economic Cycle

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## INTRODUCTION

Everyone needs to realise one of the most basic investment principles: the stock exchange does not always grow. As many other phenomena occurring in the world, price changes on the stock exchange and the economic growth tend to be cyclical. Many forget (or do not even know) about that, thus they buy on the top, and sell on the bottom. The importance of this matter is significant nowadays, as we are all dependent on the stock exchange. Even if we do not invest our money ourselves, there are institutions which do that for us. This makes the stock exchange one of the main ways in which our money is saved in order to enable us to receive a pension, buy a house, or provide our families with comfort and safety. For this reason, it should be in everyone's interest to become familiar with the characteristic of cycles, and to use them to make money, not to lose it.

Companies quoted on the stock exchange operate in certain economic conditions, so their financial results are subjected to the macro environment. It implies that the economy has to exert some influence on their share price as well. The aim of this paper is to analyse the relation between the value of the main index of the Warsaw Stock Exchange and the Polish economy, measured by the Gross Domestic Product. Since behaviour of both of them appears to be cyclical, their cycles will be examined with a view to defining in which point of the cycle one is, and what decisions concerning the timing of investments on the stock exchange should be taken. In other words, it will be checked if the correlation between these two aggregates can provide investors with the information on a proper 'time window' for their investment decisions.

The influence of the economy on the prices of shares quoted on stock exchange is obviously taken into account in most of the stock analyses. On the one hand, fundamental analysis based on a company valuation requires conducting macro environment analysis. On the other hand, technical analysis, which examines charts, frequently 'explains' historical price levels by relating them to the economy. The analysis in this paper combines both: fundamental and technical approach, as charts of past behaviour of share prices and the economy will be analysed. That approach will enable us to observe their cyclical nature,

which means that some situations that have already happened in the past are going to occur again in the future. And if there is, or was, a certain dependency between the stock exchange and the economy, it may be used while investing. At that point however, I would like to strongly emphasise the fact that I do not claim that any dependencies observed in the historical charts, nor investment decisions based on them, will be still valid in the future. Nevertheless, knowledge of the past may be helpful in the future. And with that approach cycles in the Polish economy and on the Warsaw Stock Exchange will be examined.

The paper starts with the definition of the economic cycle, its morphology, and means of its analysis. It introduces vocabulary and methodology which will be used in the following chapters. What is more, the first chapter presents characteristic features of cycles and their evolution, observed by other authors.

The second chapter aims at finding causes of cyclical nature of the economy. It is crucial to understand why cycles occur, what determines their morphology, and if/how their negative impact can be mitigated. In order to find that out, main economic thoughts explaining the matter are presented. Their approach is very often different, sometimes contradictory, which proves the complexity of the matter.

After having defined what the economic cycles are, and why they occur, the information on what data should be employed in the stock market cycles analysis is given (Chapter 3). Next, the cyclical nature of the stock exchange is presented and its causes explained. Moreover, the concept of the investment circle is introduced, which is a theoretical model of the capital flow in the financial market through the whole economic cycle. It is also one of the most important elements of this research. Finally, the information on how to identify inflection points and phases on the stock cycle is provided.

In the chapter four, the analysis of historical data of the main stock index in Warsaw (WIG) and the Gross Domestic Product of Poland is conducted, according to the methodology described in the first chapter. At the same time, it is examined, whether any of the theoretical statements described in the paper are confirmed.

The fifth chapter combines the stock market and the economic cycles, which (in various forms) are presented in the same chart. The relation between WIG and the GDP is analysed. What is more, the verification of the investment circle is conducted. Finally, the conclusion regarding investments on the Warsaw Stock Exchange according to the economic cycle is made.



Economic and stock market cycles are not identical, thus characteristics of both of them need to be determined. What is more, the investment type that is examined in this paper, is the main index of the Warsaw Stock Exchange only. Investors, who can benefit from this paper, are all investors lacking professional tools and data while investing. The methodology used in the paper involves basic mathematics only, while the theory requires understanding of the main economic phenomena.

My final remark refers to the aim of the investment strategy presented in the paper. That strategy aims at medium/long investment horizon only, as it seeks for investment opportunities which are justified from the economic point of view. I try to find out when investments on the stock exchange are reasonable, instead of speculating what the future will be like. On the other hand, I question the Warren Buffet's assumption stating that some stocks should be bought and kept until eternity<sup>1</sup>. As it will be proved, there are too many fluctuations both in the economy and on the stock market, so that investors could neglect them – cycles and their phases are as important as main trends<sup>2</sup>. For this reason, the conclusion of this paper should be employed as a tool which may help finding a 'time window', i.e. a period of time in which a given investment decision should be made with a relatively low risk level, as according to Buffet, brilliant investment opportunities happen, when because of extraordinary events, very good companies are undervalued<sup>3</sup>. Decisions what to buy (sell), regardless whether it is a parcel of shares, investment fund units, or derivatives based on stock indices, must be carried out independently of what is presented

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<sup>1</sup> R. G. Hagstrom, *Na Sposób Warrena Buffeta*, MT Biznes, Warszawa 2007, p.151

<sup>2</sup> J. Ritchie, *Analiza Fundamentalna*, WIG-Press, Warszawa 1997, p. 64

<sup>3</sup> R. G. Hagstrom, *Na Sposób Warrena Buffeta*, MT Biznes, Warszawa 2007, p.159

in the paper. Such two analyses, conducted simultaneously and combined together, might result in a smart and justified investment decision.

# CHAPTER 1 GENERAL INFORMATION ON ECONOMIC CYCLES

## **1.1. Introduction**

In this chapter the topic of the economic (also known as ‘business’) cycle is introduced. General information on the cycles is presented, in order to establish a common knowledge base for further analysis.

Firstly, it is explained what the economic cycle is, how it is defined, and how to identify it. As it will be shown, there are many fluctuations in the economy, however only one specific group of them is defined as the economic cycle. Secondly, a detailed investigation of its morphology is conducted, to see what its characteristic features are. That part is important as it provides tools for analysis of any cycle (economic and stock cycles included). Finally, it is shown, how cycles change and evolve, and why it happens. The comparison of how cycles looked like in the past, and how they look like nowadays, is presented. Also, the phenomenon of the world/international cycle is discussed, and a term ‘contagion’ is introduced.

## **1.2. Definition and Measurement Methods**

At the very beginning let me state that there are many definitions of the economic cycle. They point out different elements of cycles, and are formed according to different observations. In this chapter I present the most important definitions, how they evolved, and how useful they are for the analysis of empirical data.

Fluctuations of the economy defined as economic (or business) cycles are just one type of fluctuations, when classifying them according to their time span<sup>4</sup>. Based on that criterion, we may define:

- Development trend – direction of changes in the economy (its growth, or decline) in the long-run.

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<sup>4</sup> M. Rekowski, *Koniunktura gospodarcza Polski*, Akademia, Poznań, 1997, p. 18-19

- Periodic fluctuations – short-term fluctuations in the economy caused by seasonal conditions, such as biologic rhythm of the society and its environment, climate changes, people habits, work hours, etc. They can occur in various lengths – days, weeks, months, years.
- Random fluctuations – irregular in terms of their strength and direction, caused by unknown factors, but not related to the economy.
- Economic fluctuations – oscillation of the economic activity about its trend line. They are said to have short and medium duration, result from the internal mechanics of the economy, and are relatively regular. Economic cycles fall into this category.

Clearly, there is no strict division between each type of fluctuations. It is also difficult to define which of the economic fluctuations can be defined as cyclical. Economists argue about what should be the length of the cycle, its phases, and regularity. So far, the unquestioned statement is that, a cycle is a consecutive positive and negative relative change in a process.

For many economists definition of the economic cycle is based on the definition of recession, a term which does not have unified definition either. For instance, the financial press states that recession occurs, when there is decline in real GDP of a country for at least two consecutive quarters. On the other hand, the National Bureau of Economic Research<sup>\*</sup> states recession as “A significant decline in economic activity spread across the economy, lasting more than a few months. (...) A recession begins when the economy reaches a peak of activity and ends when the economy reaches its trough. Between trough and peak, the economy is in an expansion. (...) domestic production and employment are the primary conceptual measures of economic activity”<sup>5</sup>. The term ‘significant’ is obviously imprecise, as well as the time span defined as ‘a few months’. Nevertheless, the research conducted by the Bureau shows, that almost all recessions lasted at least two quarters.

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<sup>\*</sup> The National Bureau of Economic Research is the authority which analyses fluctuations in the US economy, and officially determines its cycles. See: A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 35

<sup>5</sup> Business Cycle Dating Committee, National Bureau of Economic Research, 11.12.2008

The definition presented above evolved from a classic definition of the cycle, which was proposed by A. F. Burns and W.C. Mitchell in 1940's. According to them, "Business cycles are a type of fluctuations found in the aggregate economic activity of nations that organise their work mainly in business enterprises"<sup>6</sup>. What they also claim, is that a cycle consists of expansion phase occurring simultaneously in many economic activities, which is followed by general recession, contraction, and finally revival which lead to expansion phase of the next cycle.

This definition was a starting point for Isle Mintz<sup>7</sup>, who introduced the term 'growth cycle', which defines phases of the cycle depending on the deviation of empirical value of an economic indicator (e.g. GDP) from its estimated trend line. In such a cycle, two phases are distinguished, namely: period of relatively high growth rates, and period of relatively low growth rates. In analysis, often so called deviation cycle is constructed. The trend line from the growth cycle is placed on the X axis, while the Y axis presents the deviation value from the trend line. Naturally, the manner in which the normal rate is estimated matters, as different methods might lead to different identification of cycles<sup>8</sup>. For this reason, the definition of growth and deviation cycle, as well as its measurement method is criticised.

To avoid this problem, a concept introduced by M. Friedman and A. J. Schwarz, called step cycle, is used<sup>9</sup>. In this method the analysis of fluctuations is based on the growth rate of economic indicators in time (e.g. the most popular GDP quarter to quarter). When the growth rate is above its average level, the economy is in its growth phase, when below – in decline phase.

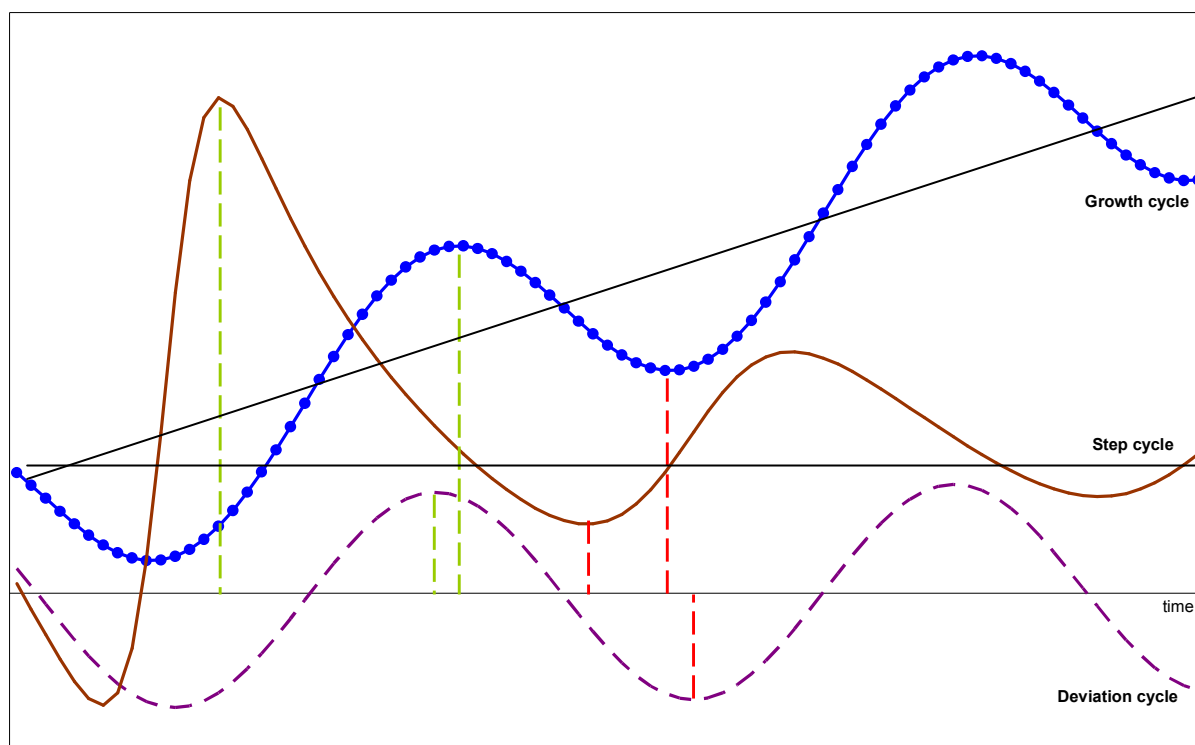
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<sup>6</sup> A. F. Burns, W. C. Mitchell, *Measuring Business Cycle*, NBER, 1946, p. 3

<sup>7</sup> I. Mintz, *The definition of the business cycle revisited in Dating Postwar Business Cycles: Methods and Their Application to Western Germany, 1950-67*, NBER, New York, 1970, p. 1-6; *Dating American Growth Cycle in Business Cycle Today*, NBER, New York, 1972, p. 41

<sup>8</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 133-134

<sup>9</sup> See: M. Friedman, A. J. Schwarz, *Money and Business Cycles*, Review of Economics and Statistics, 1963, vol. 45, No. 1, p. 32-78



**Figure 1 Indication of cycle maxima and minima depending on the definition of economic cycle**

Source: Own, based on definitions of growth cycle, step cycle and deviation cycle, and the analysis by R. Granzer, *Cyclical Indicators for Manufacturing Industries*, OECD Economic Outlook, 1973, p. 24-25

Depending on the methodology applied, i.e. employment of growth cycle, deviation cycle or step cycle in the analysis, we arrive at different identification of phases of the same economic cycle. An example is shown in the Figure 1, where an arbitrary cyclical series is presented as a growth cycle. After having estimated its trend line, we create a deviation cycle. We also measure relative change of the two consecutive values of the growth cycle, which is nothing but a step cycle. Presenting them in the same chart, we can clearly see that local maxima and minima of each cycle occur at a different point in time. Applying proper method, we can identify inflection points, in other words the change of the direction of the economy, earlier. In case of peaks, the fastest indication comes from step cycle, which is followed by deviation cycle, and finally the growth cycle. In case of the trough, the fastest source of information is step cycle again, followed by growth cycle, and deviation cycle. Other differences in the structure and characteristics of cycles, resulting from the type of cycle used in analysis, are described in the next point of this chapter.

To sum up the above considerations, a proper definition of the economic cycle applied in modern economics, is the following:

**Economic cycle** – systematic changes of general economic activity oscillating around a long-term trend<sup>10</sup>. The economic activity is measured by absolute or relative changes in time of main economic indicators, preferably the Gross Domestic Product<sup>11</sup>.

In order to determine a cycle in a chart, I suggest adopting the methodology of Bry-Boschan, which gives the following instructions<sup>12</sup>:

- The peak (trough) of the cycle is attained in the quarter  $t$ , if the value of the cycle in the preceding and the following quarter is lower (higher) than in the quarter  $t$
- Each phase of the cycle must be at least 2 quarters long
- The length of the cycle cannot be shorter than 5 quarters
- When a given cycle ends, another one starts

Finally, note that theoretical explanation of fluctuations is generally excluded from definitions. What was taken into account though, was observation of cycles in the economy, and the plausibility of analysis of it, meaning availability of empirical data, as well as statistical and mathematical tools<sup>13</sup>.

### **1.3. Morphology**

Morphology\* of economic cycle defines its structure and elements of which a cycle is built. It is crucial to have understanding of characteristic features, and apply unified terminology to describe cycles. Only then the analysis of cycles is possible. There are several characteristic features describing the morphology of cycles which will be present here.

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<sup>10</sup> Wydawnictwo Naukowe PWN, Encyklopedia Gazety Wyborczej, vol. 3, p. 509

<sup>11</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 137

<sup>12</sup> M. Massmann, J. Mitchell, M. Weale, *Business Cycle and Turning points: A Survey of Statistical Techniques*, „National Institute Review”, January 2003, No. 183, p. 102-103

<sup>13</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 136-137

\* The term has been transferred to economics from other fields of study like biology or language studies. It comes from the Greek language (morphe = shape; logos = science). Source: Słownik wyrazów obcych, PWN, Warszawa, 1977, p. 492

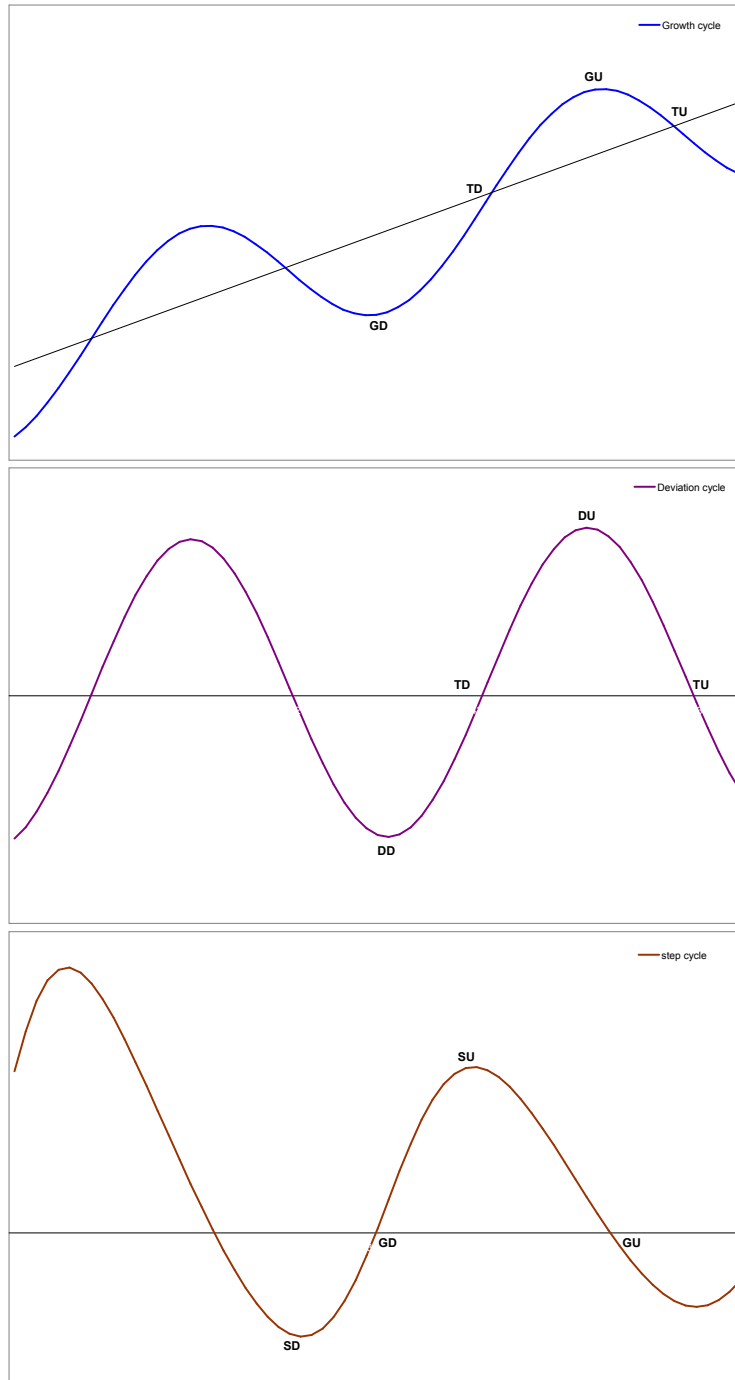
**Turning points** – they determine the boundary between cycle phases, thus are vital to be determined properly. Upper and lower turning points are distinguished. The upper are called “peak” or “downturn”, while the lower are called “trough” or “upturn”. On that basis, it can be stated that a cycle is the time span between two consecutive turning points of the same type.

The identification of turning points is dependent on the type of cycles being analysed. As it was indicated in the second part of the Chapter 1, the analysis can be based on three types of cycles (growth, deviation, step cycle), which lead to different identification of turning points. The main four interpretations include<sup>14</sup>:

1. The identification of turning points in growth cycle, i.e. in series of empirical data, from which random and seasonal fluctuations have been removed. The peak of the cycle is marked by GU, while its trough by GD (see Figure 1.6).
2. The identification of turning points in deviation cycle, i.e. growth cycle with its growth tendency removed. The peak of the cycle is marked by DU, while its trough by DD.
3. The identification based on the intersections of either growth or deviation cycle with the trend line. The upper turning point of the cycle is marked by TU, while its lower turning point by TD.
4. The identification based on the step cycle, i.e. the growth rate of economic indicators in time. The upper turning point of the cycle is the local maximum, marked by SU, while its lower turning point is local minimum, marked by SD.

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<sup>14</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.21



**Figure 2 Identification of turning points in different types of cycles**

Source: Own, based on R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.20

Due to some problems in finding sharp turning points in modern economic cycles, often “turning zones” are determined instead\*. Other rules clarifying determination of cycles include<sup>15</sup>:

1. A peak cannot be followed by another peak, and trough cannot be followed by another trough, which implies that peaks and troughs must occur interchangeably.
2. They cannot be identified at the end of analysed series, unless data from following time periods confirms that it is justified.
3. In case of double-top (double-bottom), turning point is identified at the second peak (trough), after which decline (growth) is observed.
4. If analysed cycle attains its maxima (minima), but it is impossible to precisely indicate the turning point, as similar values occur for several time periods, then the turning point is identified at the end of this period, after which change in values is observed.
5. It might be hard to determine turning points in empirical data of rapidly growing economies. In such a case, deviation or step cycle is constructed and further analysis is conducted. Note however, that there are differences in morphology of these cycles.

**Phases** – based on the identification of turning points, cycle phases can be defined as the time span between two consecutive, but opposite, turning points. As a result phases of the economic growth and the economic decline are obtained. Based on the methodology applied, similarly as in the case of turning points, we arrive at different identification of phases (see Table 1).

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\* Turning zones are said to be the result of more efficient information propagation, and advanced management systems. See: A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 490-491

<sup>15</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.22-23

Turning points	Growth phase	Decline phase
Local maxima (minima) of step cycle	SD-SU	SU-SD
Intersection of the step cycle with the zero line (NBER method)	GD-GU	GU-GD
Local maxima (minima) of deviation cycle	DD-DU	DU-DD
Intersection of cycle with the trend line	TD-TU	TU-TD

**Table 1 Identification of phases of economic cycle based on the identification of turning points**

Source: Own, based on R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.23

The division of cycles into two phases is unquestionable. Some authors however, indicate that there are also some sub-phases (see below). Most of these theories are based on analysis of economic cycles defined as “classic cycles”. They occurred in the economy before World War II. After that, economic cycles evolved, and their morphology has changed. The summary of changes is presented in the Table 3.

So as to phases of classic cycle, as already mentioned, Burns and Mitchell defined four phases – expansion, recession, contraction, and revival. Similar division is proposed by G. Haberler – expansion, prosperity, depression, contraction<sup>16</sup>. What is interesting is that, according to Haberler, also turning points (or zones) can be treated as phases, while A. Spiethoff states that economic crisis is a separate phenomenon, which is not necessarily a part of economic cycle\*.

In modern cycles, often two phases are distinguished only. These are periods of relatively high growth rates, and periods of relatively low growth rates (originally referring to the

<sup>16</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 140

\* To learn more about financial crises see: S. Valdez, *Global Financial Crises*, in *An Introduction to Global Financial Markets*, 4th edition, Palgrave Macmillan, New York, 2003, p. 353-366

growth cycle by I. Mintz). However, due to the influence of the state on the economy, as well as the influence of monetary factors, some additional phases are identified. For instance J. R. Meyer and D. H. Weinburg define four phases – recession, recovery, demand pull inflation, stagflation. A. Szeworski, claiming that the state actions are anti-cyclical, indicates the following phases – recession, recovery, revival, stabilisation at high level.

**Length** – both length of the cycle as well as length of its phases can be determined. Length of a phase is simply its duration in time. Obviously, length of a cycle is its time duration in time, being equal to the sum of durations of all its phases.

**Frequency** – defines how many cycles (or what part of a cycle) occur in a specified time interval. Naturally, it is equal to inversion of the cycle length.

**Amplitude** – it refers either to phase or cycle. Amplitude of phase it is a numerical value equal to the absolute value of the difference between value that the phase attains at its maximum and minimum. In other words it's the absolute value of the difference between values attained at turning points of the phase. Amplitude of cycle, it is defined as the difference between the amplitude of the growth phase and the amplitude of the decline phase. We may also define amplitude as the absolute value of the value that phase (cycle) attains at its turning points, in case of deviation and step cycles.

What is more, three types of oscillations based on their amplitude can be distinguished. Namely:

1. Oscillations with constant amplitude (see Figure 5 b))
2. Explosive oscillations with growing amplitude (see Figure 5 c))
3. Damping oscillations with decreasing amplitude (see Figure 5 a))

**Intensity** – measures the strength of growth or decline in each phase, or the whole cycle. The tool used in this procedure is simply the standard deviation of series of data given. The higher value of the standard deviation is, the more intensive the cycle is.

**Symmetry/asymmetry** – it explains the relation between phases of cycle, with respect to their duration and amplitudes. A cycle is symmetrical if its growth and decline phase have equal amplitudes (thus the amplitude of the cycle is equal to zero), and equal length (duration in time). All in all, four possibilities of relations can occur, which are presented in the Table 2.

		AMPLITUDES OF PHASES	
		EQUAL	DIFFERENT
LENGTH OF PHASES	EQUAL	FULL SYMMETRY	SYMMETRY WRT. LENGTH
	DIFFERENT	SYMMETRY WRT. AMPLITUDE	FULL ASYMMETRY

**Table 2 Symmetry/asymmetry of cycle**  
 Source: Own, based on R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.27

**Structure** – it defines economic cycle according to two factors, and treats the cycle as a structure composed of several economic indicators (e.g. GDP, Industrial production, Consumption, etc.). The first factor is the ‘cause and effect’ relation between several economic indicators. The second one is the lead/delay in occurrence of turning points in different series of economic indicators.

**1.4. Changes in Economic Cycles Resulting from Globalisation**

Economic cycles change in time. They differ in their length, amplitude, intensity, that is in most aspects of their morphology. Moreover, their causes and behaviour are explained in a different manner, as the economic and mathematical models improve, and more factors are

taken into account. Based on observation of cycles, economists distinguish two groups of cycles<sup>17</sup>:

1. Classic cycles which occurred before World War II
2. Modern cycles which appeared after World War II

Differences between these two cycles are presented in the Table 3. It may be stated that modern cycles are much shorter (lasting approximately 3,5 to 5 years), with growing amplitude, two phases identified, and smoother turning points, which in fact become turning zones. They are also more complex in terms of their analysis, as there are many factors which affect their behaviour.

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<sup>17</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.28

<b>Morphology</b>	<b>Classic cycle</b>	<b>Modern Cycle</b>
<b>Number of phases defined</b>	4 phases	2 phases
<b>Turning points</b>	Sharp points	Turning zones
<b>Length:</b> - growth phase - decline phase - cycle	4-6 years 4-6 years 8-12 years	2-3 years 1,5-2 years 3,5-5 years
<b>Frequency</b>	Low	High
<b>Amplitude:</b> - phases  - cycle	- similar amplitudes  - amplitude close to zero	- higher amplitude of growth phase than of the decline phase  - positive, growing amplitude
<b>Intensity</b>	High	Low
<b>Symmetry/asymmetry</b>	Asymmetry	Asymmetry
<b>Structure:</b> <b>Lead/delay time</b>  <b>Cause and effect</b>	Long lead/delay times between turning points of different economic indicators  Simple relations, small number of variables	Short lead/delay times between turning points of different economic indicators  Complex relations, numerous variables

**Table 3 Comparison of classic and modern economic cycles**

Source: Own, based on R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p.29

The changes observed in the matter are the result of overall changes taking place in the world. We can list three main changes in the world, which result in changes of cyclical nature of the economy:

1. Structural changes – e.g. privatisation in former centrally planned economies, growth of companies and monopolisation. Generally speaking, companies operate more efficiently, which results in increased amplitude of cycles.
2. Anticyclical policy of governments – as their aim at mitigating effects of economic crisis and enforce growth, cycles become shorter, turning zones smother and amplitudes higher.
3. Internationalisation of economic activities – thanks to technology advancement (IT being vital element of it), political cooperation between countries and international regulations, world has become a global village in which flow of information, capital, people, goods and services is as easy as never before.

Internationalisation of economic activities leads to another important element of modern cycles, that is to, so called, world or international cycle. Obviously, the number of countries needed to be in the same phase of their cycle at the same time in order to create a common international cycle might be questionable. So might be the world cycle. Nevertheless, it may be assumed that the world cycle is the net cycle composed of cycles occurring in different countries<sup>18</sup>.

Clearly, the biggest impact on the world cycle comes from countries which contribute major part to the world GDP. Today, the role of the USA is the biggest<sup>19</sup>, but also some large Asian and European countries are vital elements of the global economy. The phenomenon that links economies of different countries is called ‘contagion effect’<sup>20</sup>. It is a relatively new term, theory of which is being widely investigated. Its uniqueness and importance is based

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<sup>18</sup> K. Piech, *Międzynarodowa synchronizacja cyklu koniunkturalnego Polski*, In K. Piech, S. Pangsy-Kania, *Diagnozowanie koniunktury gospodarczej w Polsce*, Elipsa, Warszawa 2003, p. 85-95

<sup>19</sup> Lectures on *Alokacja aktywów w ramach cyklu koniunkturalnego*, W. Białek, Gazeta Giełdy Parkiet, Warszawa, 27.09.2008

<sup>20</sup> See: R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p.99-128

on the fact that the transfer of impulses between countries is very rapid, while its magnitude and range substantial. What comes to that, is that the transfer often occurs even between those countries, which have relatively weak economic cooperation established. Channels, through which impulses are transferred, include all economic activities, e.g. international trade of goods and services, capital investments (Mergers and Acquisitions, Foreign Direct Investments), diversification of investments performed by investment banks.

Note that the term contagion implies negative associations coming from epidemiology. The reason for this, is that often more impact is put on analysis of negative impulses, i.e. crises spreading across countries. Hence, the phenomenon of contagion effect is analysed in two categories: non-crisis contagion and crisis contagion. Economic crises are dependent on monetary factors (see 2.5.2. Monetary theories of economic fluctuations). If a country has some economic/financial/political problems, the risk of investing there spreads across other countries of the region or those having similar economy. As a result fragility of the system occurs not only on the national level, but free flow of capital makes it cross national borders easily (see the Minsky's theory in chapter 2.5.3.).

### ***1.5. Summary***

Based on the above considerations, it may be stated that the economic cycles are complicated field of study. There are various definitions and measurement methods. Nevertheless, I have decided to adopt the definition stating that the economic cycles are systematic changes of general economic activity oscillating around a long-term trend. I am going to measure it using the GDP data, based on which different types of cycles will be constructed. Among them the step cycle (relative change of the GDP) seems to be the best choice, as it indicates turning points earlier than other cycles do.

It was also shown how to analyse cycles in terms of their morphology. It will be helpful in comparison of cycles and observation of their evolution. What is more, not only changes of the economic cycles can be observed, but also factors which cause them can be indicated. At that point, globalisation and the contagion effect resulting from it seem to be the most important ones.



## CHAPTER 2 ECONOMIC CYCLES THEORY

### ***2.1. Introduction***

In this chapter main theoretical views on the economic cycles are presented. Since the aim of this paper is to study the cyclical nature of the economy, the reasons for cycle occurrence must be understood first. Unfortunately, there are countless hypotheses on the matter, thus only the most important ones are presented.

It is interesting how the study of cycles evolved. They began as the result of the Sun activity, and ended up as the result of constant instability of financial markets. Interestingly, in some economies cycles were tried to be proved to be absent at all. The question of what the mechanism that creates cycle is, is still open to discussion. Some try to explain it through economic models, some through mathematics or physics, while some through psychology.

Theories on the source of the cyclical nature of the economy, which are presented in this chapter, although containing some mathematics and psychology, try to do that through economics. In general, there are two groups of theories presented here.

The first group of the theories is associated with the Keynesian school. It is defined as a group of endogenous concepts, meaning that reasons for economic fluctuations are strictly internal, i.e. are caused by processes which take place within the economy.

The second group consists of exogenous concepts, which claim that that reasons for economic fluctuations are external, i.e. are caused by the processes which take place independently of the economic system. They are focused on financial aspects of the economic system, and put monetary factors as the most important reason for economic fluctuations.

As I present various theories, I try to highlight some of their details, which correspond to the matter. I do not indicate which of the theories presented is the best one, as the aim is to learn something from all of them, because they all add something up to understanding what the economic cycle can be caused by.

## **2.2. First Scientific Notice of Economic Cycles**

The first scientific observation concerning cyclical behaviour of economy was made by a French economist Clement Juglar<sup>21</sup>. The analysis of the phenomenon started in 1810-1820, and around 1860 existence of cycles was announced. According to Juglar a typical cycle lasted approximately 7-11 years and depended on credit cycle<sup>22</sup>. However, the observation was not widely approved at that time, as the adherents of the classical economics, which dominated by then, claimed that the crisis of 1763-1843 had external reasons, independent of economy. One of the leading classical economists, J.B. Say, stated that economic fluctuations are totally coincidental.

Before serious investigation of economic cycles started, some interesting alternative theories had appeared.

One of them belongs to T.R. Malthus, English economist, who analysed the correlation of the population growth and welfare of the society<sup>23</sup>. The conclusion he arrived at, was that the population grows similarly to geometric series, while its welfare similarly to arithmetic series. This leads to abject poverty and starvation. The solution he proposed, in order to save the world from the upcoming crisis, was sexual abstinence. Other factors helping to solve the problem, by diminishing the population, were wars and natural disasters.

Another interesting theory was developed by St. Jevons, who compared economic fluctuations with sunspot cycles<sup>24</sup>. According to him, an average economic cycle of his era lasted 10,8 years, while the sunspot cycle lasts 11 years. The explanation of this correlation is that higher magnetic activity of the Sun determines amount and quality of crops, which influence the economy.

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<sup>21</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.2-3

<sup>22</sup> See: M. W. Lee, *Economic fluctuations*. Homewood, IL, Richard D. Irwin, 1955

<sup>23</sup> See: T. R. Malthus, *An essay on the principle of population*. Chapter 1 in Oxford World's Classics reprint, p.13, 1798

<sup>24</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.3-4

### **2.3. Economic cycles in Centrally-planned Economies**

The centrally-planned economies are not the point of interest of this paper, so I will not go into deeper analysis of their cycles. It is essential, however, to explain what can be learnt from economists, who actually did analyse that issue. Especially nowadays, that knowledge can be very useful, as there are trends in the world which indicate that the role of governments, central banks and other institutions is increasing, as they control the economy by pumping money into the system, or taking over companies facing financial distress while allowing others to go bankrupt.

An economic crisis can only occur in a free market, and the only way to avoid it, is to transfer all free market economies into a centrally-planned social system. This opinion was expressed by K. Marks, who at the same time admitted that there is a possibility of fluctuations in socialistic economy<sup>25</sup>. In 1920's more attention was paid to this problem, and several reasons for fluctuations were stated. Firstly, the economy transition from one model to another causes tensions in the country, which result in economic fluctuations<sup>26</sup>. Secondly, trade with free market economies can disturb the internal equilibrium. Thirdly, fluctuations can occur as a result of weather conditions, mistakes in production planning, and technology advancement.

These considerations, although quite imprecise, were stopped when J. W. Stalin came to power. Until 1960' the official government statement was that "the development of the socialist economy is free from cycles"<sup>27</sup>. Interestingly, similar opinions were shared among some Western economists<sup>28</sup>. It was claimed that occasional fluctuations in production volume are possible if investment decisions are decentralised and even then, these fluctuations are totally different than those in free market economies. The absolute absence of economic fluctuations in the socialist economies was implied by P. J. D. Wiles in 1962, as well as K. C. Thalheim in 1964.

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<sup>25</sup> See: K. Marks, *Das Kapital, Kritik der politischen Ökonomie*, Band II, Buch II: *Der Zirkulationsprozess des Kapitals*, Berlin 1971, p. 464-465

<sup>26</sup> See: Z. Sabov, *Zyklische wirtschaftliche Aktivitätsschwankungen In sozialistischen Planwirtschaften*, Berlin 1983, p. 14-19

<sup>27</sup> See: I. Kac, *Narodnyj dochod SSSR na nowom etape. Osobennosti sovietskogo tempa rosta narodnogo dochoda*, „*Planovoe chozjajstvo*” no 1, 1931, p. 71

<sup>28</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p. 16

Fluctuations in centrally-planned economies started to be analysed again in 1960'. A Polish economist O. Lange explained that indeed there are fluctuations in such economies, but have very little in common with free market cycles<sup>29</sup>. Fluctuations were caused by, so called, reinvestment policy, and the effort that the socialist economy had to make to fight the poverty, and to industrialise its production plants<sup>30</sup>. As the economy develops, however, the strength of the fluctuations decreases. Economic fluctuations, although rarely called 'cycles', were said to be directly linked to investment cycles. Another Polish economists G. Kołodko and M. Gruszczyński, who analysed growth of Polish GDP in years 1950-1973 claimed that, although a cyclical pattern of the economy can be observed, the only reason for this is historical, meaning caused by building the socialist economy from the scratch<sup>31</sup>. Some economists implied that there was no possibility of finding internal reasons for cycles, as all the reasons come from the outside. For instance J. Goldmann suggested using the term 'quasi-cycle', when referring to cyclical fluctuations.

As it can be observed, the research in the area of economic cycles in centrally-planned economies was determined by political factors. The official government statement made it clear, that there were no cyclical phenomena to be discovered. As a result, it was difficult to announce that there are economic slow-downs in socialists' economy. However, there was awareness of such a phenomenon\*, which is confirmed by theories presented. Unfortunately, the empirical analyses which were conducted are hardly comparable due to differences in the time span and the area they covered<sup>30</sup>. Consequently, there were no consistent theories developed, and there is still no one commonly accepted opinion explaining variations of the economic fluctuations in the centrally-planned economies.

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<sup>29</sup> See: O. Lange, *Teoria reprodukcji i akumulacji*, PWN, Warszawa, 1961

<sup>30</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p. 17

<sup>31</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p. 18

\* It is worth clarifying that although Soviet economists conducted their research behind the iron curtain, they had substantial knowledge and understanding of free market economies and the economic fluctuations. As Alan Greenspan explains it, books on that matter passed through the censorship, as their content (mostly mathematic formulas) was not found hostile to the Soviets. See: A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 124

## 2.4. Endogenous Concepts of Economic Cycle

Endogenous theories of economic cycles imply that reasons for economic fluctuations are strictly internal, i.e. are caused by processes which take place within the economy.

### 2.4.1. Theory of Economic Cycle by J. M. Keynes

One of the most important theories concerning the economic cycles was developed by John Maynard Keynes (1883-1946), an English economist, who is often called, and there truly are reasons for that, the economic genius<sup>32</sup>. His revolutionary theories, although often imperfect and widely criticised, have become fundamentals for economy stabilising methods. Some claim, that if his theories had been understood early enough, the world would have avoided Nazism.<sup>33</sup> What he also did, was the development of the macroeconomics, that is employing aggregates (e.g. GDP) as variables in economic models.

According to Keynes, the key indicator in economics is the national income, which can be presented in the following way:

$$Y = A - A_1 + \Gamma - \Gamma' + B' \quad \text{Equation 2.1}$$

$Y$  – total national income;  $A$  – value of total national production;  $A_1$  – value of all transactions among companies;  $\Gamma$  – value of production assets at the end of examined period;  $\Gamma'$  – hypothetical value of production assets at the end of the period, if the society decided to stop using it and spent the amount  $B'$  on its maintenance and improvement.

The national income can be expressed as the difference between the value of the total national production, and total costs resulting from using production assets. Other costs are equal to income of other members of the society, thus are excluded.

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<sup>32</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 21-47

<sup>33</sup> J. Ostaszewski, *Wstęp do teorii ekonomicznej Johna Maynarda Keynesa*, Szkoła Nauk Politycznych i Społecznych, London, 1961, p. 17-18

Analysing the Equation 2.1, we can arrive at more conclusions. Namely:

Equation 2.2

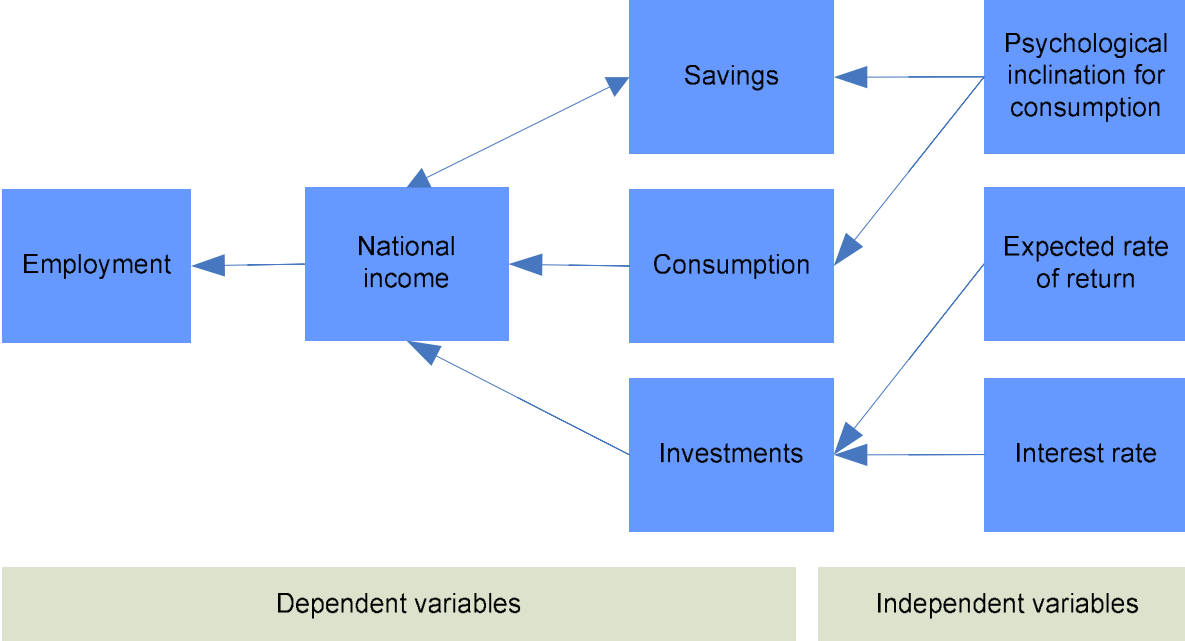
$$C = A - A_1 \tag{Equation 2.3}$$

$$S = Y - C \tag{Equation 2.4}$$

$$I = \Gamma - \Gamma' + B' \tag{Equation 2.4}$$

$$Y = C + I \tag{Equation 2.5}$$

$C$  – total consumption, being equal to the difference between the national production and the value of transactions between companies;  $S$  – savings, the difference between the national income and the total consumption;  $I$  – investments, which is the increase in the value of production assets.



**Figure 3 Dependent and independent variables in the Keynes’s model**  
 Source: J. Górski, W. Sierpiński, *Historia powszechnej myśli ekonomicznej (1870-1950)*, PWN, Warszawa 1979, p. 324

Finally, it can be stated that the national income is the sum of total consumption and total investments. For better understanding, the dependencies of the model variables can be shown in form of a diagram. As you can see in the Figure 3, national income, savings,

consumption and investments are dependent variables (are influenced by others). The independent ones, being a cause for others, are: psychological inclination for consumption, expected rate of return, interest rate.

The inclination for consumption may be expressed as a function of national income and the consumption, that is:

$$C = C(Y) \qquad \text{Equation 2.6}$$

Although the Equation 2.6 implies that consumption level depends on the national income, there are more factors determining it. These include some objective factors like: changes in salaries, difference between gross and net income, current value of assets (if drops, consumption of rich people drops), changes in fiscal policy, and forecasts of future income. The consumption level is also determined by objective factors, including: risk aversion, caution, independence, pride, miserliness, improvement of life condition. Thirdly, it is also important, how the national income is split among the people, as different social groups have different inclination for consumption.

Keynes claims that in the short run the inclination for consumption in a society is constant. Thus, as in the Equation 2.6, it is mainly shaped by the value of national income. It is possible to distinguish average inclination for consumption  $C/Y$ , as well as the extreme  $c = dC/dY$ , which is the first derivative of the function  $C(Y)$ . Using the dependency in Equation 2.3, the extreme  $s = dS/dY$  can be defined.

$$\frac{dC}{dY} = \frac{C}{Y} = c \quad \text{Equation 2.7}$$

$$s = \frac{dS}{dY} = 1 - \frac{dC}{dY} = 1 - c \quad \text{Equation 2.8}$$

$$s = 1 - c \quad \text{Equation 2.9}$$

What is more,  $dC/dY \in (0;1)$ , which states that people always increase their spending on a smaller scale than their income. It implies that increase of income causes increase in savings, not in consumption, provided that the basic human needs are satisfied.

The above considerations lead to an important point of the Keynes's theory, which was developed by his followers later on. It is the concept of the investment multiplier.

$$Y = C + I = C(Y) + I = cY + I \quad \text{Equation 2.10}$$

$$Y = \frac{I}{1-c} = \frac{I}{s} \quad \text{Equation 2.11}$$

In the Equation 2.10 we go step by step through the definitions of consumption. After some transformation we arrive at the dependency in Equation 2.11. The value defined as  $m_i = \frac{1}{1-c} = \frac{1}{s}$  is called the investment multiplier. Further considerations of the problem lead to two cases. First, the consumption function is linear. Second, general case, when inclination for consumption changes with change of income. As a result, Keynes came up with an ultimately important conclusion, that the national income is the multiply of the investment (note, that  $m_i > 1$ ).

As it was indicated before, the dependent variables in the model have their causes in the independent ones (see Figure 3). Let us examine the second one, which is the expected rate

of return, and its divergence from the internal rate of return. The Internal rate of return is the value of the discount rate, for which the net present value of future cash flows is equal to zero<sup>34</sup>. In other words, the amount of capital invested now is equal to the series of future payments, discounted at the rate which is equal to IRR.

$$PV = \sum_{i=1}^n \frac{CF_i}{(1+r)^i} \quad \text{Equation 2.12}$$

Note, that the expected rate of return is not necessarily the actual rate of return from the investment. It is the rate of return, which is expected, estimated, or assumed by investors. The higher expected RR is, the more investments are made. Keynes claims that the expectations of investors/entrepreneurs are, in the short run, determined by irrational thinking, meaning that no mathematical calculations justify their choices. It is called the 'animal spirit', that affects their behaviour in the investment process.

The volume of investment is also dependent on the actual interest rate<sup>35</sup>. Determined by the market or by monetary authorities, it is the premium which investors want for giving up the liquidity for a certain period of time. Thus, the interest rate regulates the amount of money in circulation. When the amount of money in circulation increases, the interest rate is likely to decrease.

So far, we have examined the model, its assumptions, variables, dependencies and some conclusion that were based on the model. Now, let me present how the economic fluctuations that emerge from the Keynes's theory.

Firstly, according to the model, the equilibrium point in the economy is possible only if the total national demand and the total national supply are equal<sup>35</sup>. Combining the Equations 2.3 and 2.5, we obtain:  $S = I$ , which poses an inconsistency in the Keynes's work, as he also claimed that it is a human nature to prefer saving to investing. This part of his theory was

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<sup>34</sup> Lectures on *Introduction to Finance*, P. Pomykalski, International Faculty of Engineering, 2008

<sup>35</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 21-47

improved by the Swedish economists<sup>36</sup>, who introduced considerations of investments and savings *ex post* (actual) and *ex ante* (planned). At that point, it was stated that the economy can be in the equilibrium only by an accident, as it is not possible to adjust total national savings and investments. The only way to maintain investments and savings in equilibrium, is to change the national income, which causes economic fluctuations. Apart from the equilibrium point, there are two cases possible<sup>37</sup>:

$$S^a > S = I = I^a \quad \text{Equation 2.13}$$

1. The deflation state in which the society plans to save more than companies plan to invest. Consequently, total supply is higher than total demand, part of goods is not sold, so companies decrease their production volume, which results in decrease in income. The drop in income causes decrease in inclination for savings, which, together with already visible lack of some goods, results in adjusting the savings to the investments level. After some time, the equilibrium will be obtained again, however it will be at a low level of savings, low level of the national income and employment.

$$S^a < S = I = I^a \quad \text{Equation 2.14}$$

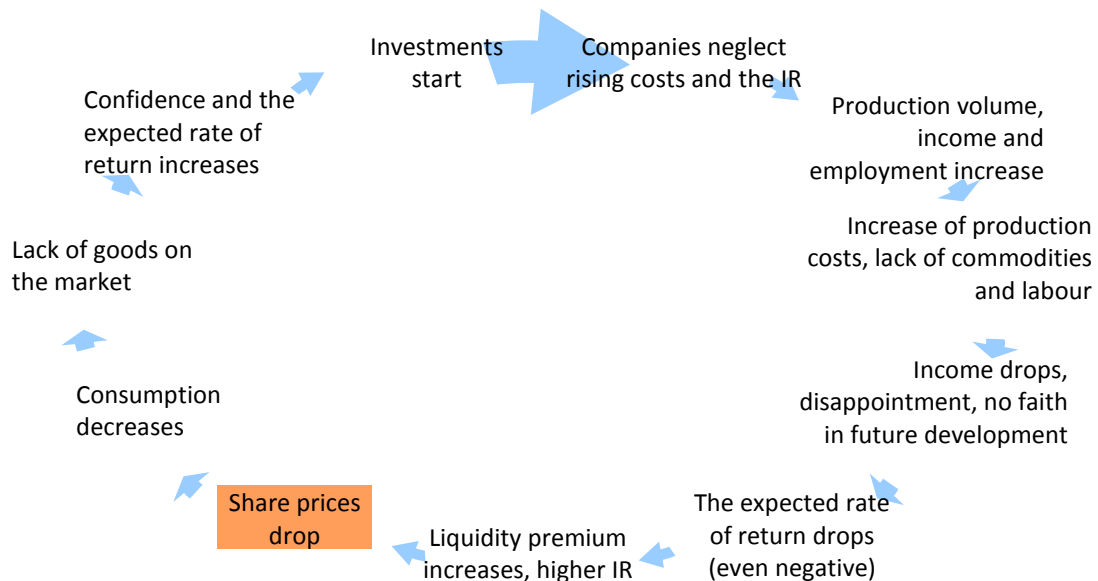
2. The inflation stage in which the society plans to save less than companies plan to invest. Consequently, the total supply is lower than the total demand, so companies increase their production volume. This results in increase in employment of production factors and income. Naturally, increasing income causes growth of the inclination for savings, however before the equilibrium point is obtained, full production capacity can be reached. In this case, increasing prices of goods cause inflation problems. Savings, which grow all the time in the meantime, decrease the

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<sup>36</sup> B. Ohlin, *Some Comments on Keynesianism and the Swedish Theory of Expansion before 1935*; J. Nowicki, *Szkoła szwedzka w ekonomii politycznej*, PWN, Warszawa, 1984, p. 24-33

<sup>37</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 21-47

money circulation in the market causing even bigger inflation tensions, and finally lead to the point at which they equal the investments level.



**Figure 4 Model of the cycle described by J. M. Keynes**

Source: Own, based on A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 42-45

In his work, Keynes describes a full economic cycle. His considerations are presented in the form of diagram in the Figure 4. A very interesting opinion refers to the relation of the economic fluctuation and the share prices. He claims, that the consumption level of some people is dependent not only on their income, but on the situation on the stock exchange<sup>38</sup>. Obviously, if the share prices go up, so is the level of the consumption. The consumption freezes, on the other hand, when share prices slump, especially if the money invested on the stock exchange had been borrowed. In some societies, having “stock mentality”, the growth on the stock exchange is the indispensable factor for the growth in consumption level.

The Keynesian theories have been widely criticised by many economists – the Austrian school, monetarists, neoclassical economists, mainstream economists. Their criticism results from their different view on the economy, which are discussed in another chapter of this paper. Now, let me indicate some imperfections of the Keynes’s model.

The first clear mistake occurs in the assumption made in the Equation 2.1. Note, that the notional income depends on the value of the total national production, no matter whether it

<sup>38</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 21-47

is sold or not. Many economists claim, that in such a case, the ideal way to absorb the savings, increase investments, thus increase the national income is to build pyramids<sup>39</sup>. Another inconsistency in the original work of Keynes was the equilibrium  $S=I$ . Stating that savings are equal to investments collided with his opinion that the humankind has different motives to save and to invest, and it always prefers saving to investing. Further development of the Keynes model in the area of deflation and inflation stages (Equations 2.13 and 2.14) was done by Swedish economists. Finally, the explanation of the business cycle proposed by Keynes was criticised by some economists, who claimed that the model refers to the 1929 crisis only, so it cannot be universal in every case<sup>40</sup>.

As for the summary of the Keynes's theory, we may state that it is the analysis of national income which allows to understand, how the economy works. Provided that the psychological features of a society are stable, the key factor determining the national income is the investment expenditure. This implies, that the entrepreneurship is the core of the economic growth. Moreover, the national income is the result of the consumption, not the other way round. Because of the fact that the consumption level varies within certain limit, variation of the national income is also limited. As a result the economy is, within some limits, stable. And since free markets do not always provide society with optimal amount of goods, it is the government which should intervene in the depression phase<sup>41</sup>.

#### **2.4.2. Further Development of Keynesian Theories**

The theory presented by Keynes and its impact on economics, made it the fundamentals of the new economic thought called Keynesian economics. The idea of the internal instability of an economic system became the area of research for many economists, who developed and improved the original model.

Perhaps one of the most important implementations to the Keynes's model was done by P. A. Samuelson and J. R. Hicks, who developed the theory of multiplier-accelerator model. In fact, it was Samuelson, who first analysed the relation of the multiplier and the

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<sup>39</sup> S. Tsuru, *Szkice o ekonomii politycznej i o gospodarce Japonii*, PWE, Warszawa, 1983, p. 192-193

<sup>40</sup> J. M. Gillman, *Kryzys amerykańskiej prosperity*, Książka i Wiedza, Warszawa 1969, p. 82-84

<sup>41</sup> A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 30

accelerator<sup>42</sup>, but Hicks definitely improved that thought. Hicks's model is composed in the following way<sup>43</sup>:

$$Y_t = I_t + C_t \quad \text{Equation 2.15}$$

$$I_t = I_t^{ind} + I_t^{aut} \quad \text{Equation 2.16}$$

$$C_t = cY_{t-1} \quad 0 < c \leq 1, c = 1 - s \quad \text{Equation 2.17}$$

$$I_t^{ind} = v(Y_{t-1} - Y_{t-2}) \quad v = const, v > 0 \quad \text{Equation 2.18}$$

$$I_t^{aut} = A_0(1+r)^t \quad A_0, r = const, A_0 > 0 \quad \text{Equation 2.19}$$

Y – national income, I – total investments, C – total consumption, I<sup>ind</sup> – inducted investments, I<sup>aut</sup> – autonomous investments, c - extreme inclination for consumption, s – extreme inclination for savings, v – acceleration coefficient, A<sup>0</sup> – initial level of autonomous investments, r – the rate of increase in the autonomous investments, t – time

Inducted investments are those which are response to market demand. They are usually done by companies and are of a strictly endogenous kind. Autonomous investments, on the other hand, are those related to innovations or increase in population. They are usually made by the state. There is no rigid boundary between those two, though. P. A. Samuelson

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<sup>42</sup> See: P. A. Samuelson, *Interactions between the Multiplier Analysis and the Principle of Acceleration*, The Review of Economic Statistics, 1939, t. 21; P. A. Samuelson, *Synthesis of the Principle of Acceleration and the Multiplier*, The Journal of Political Economy, 1939, t. 47

<sup>43</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 62-88

suggests that all investments done based on the past events (demand) are induced, while those trying to satisfy the increasing demand in the future are autonomous<sup>44</sup>.

The similarity to the Keynes's model is clearly visible. Combining equations 2.15-2.19, the national income may be presented in the following form:

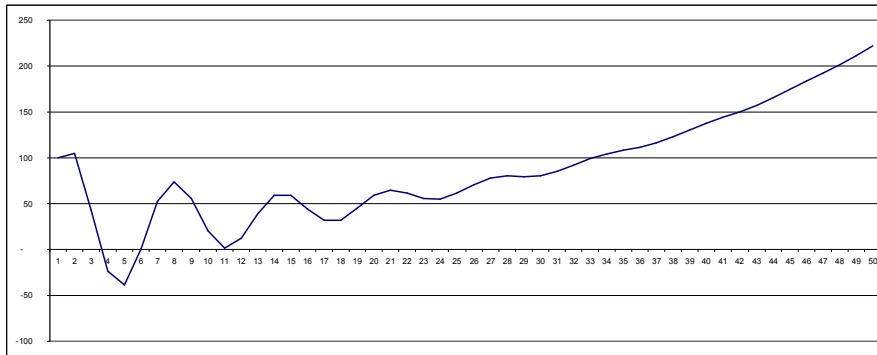
$$Y_t = cY_{t-1} + \nu(Y_{t-1} - Y_{t-2}) + A_0(1+r)^t \quad \text{Equation 2.20}$$

Solving Equation 2.20 we obtain several types of behaviour of the national income, depending on the value of parameters  $c$  and  $\nu$ . The results are as follows:

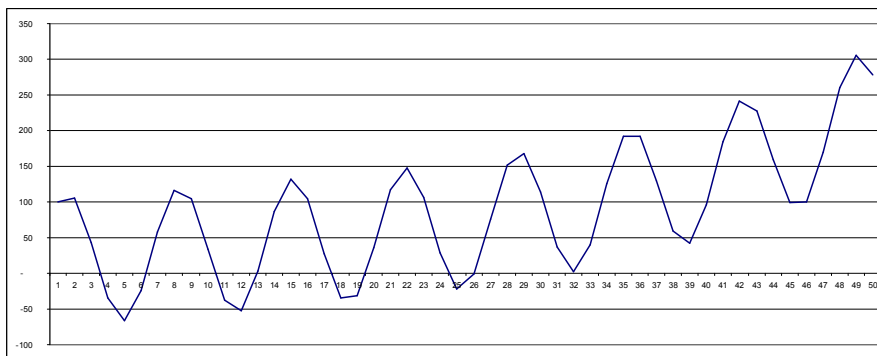
- a)  $\nu < 1$  –there are either no fluctuations of the national income, or their amplitude constantly decreases
- b)  $\nu = 1$  – the national income oscillates with a constant amplitude
- c)  $1 < \nu < (1 + \sqrt{s})^2$  – the national income oscillates with an increasing amplitude
- d)  $\nu \geq (1 + \sqrt{s})^2$  – rapid growth without oscillations.

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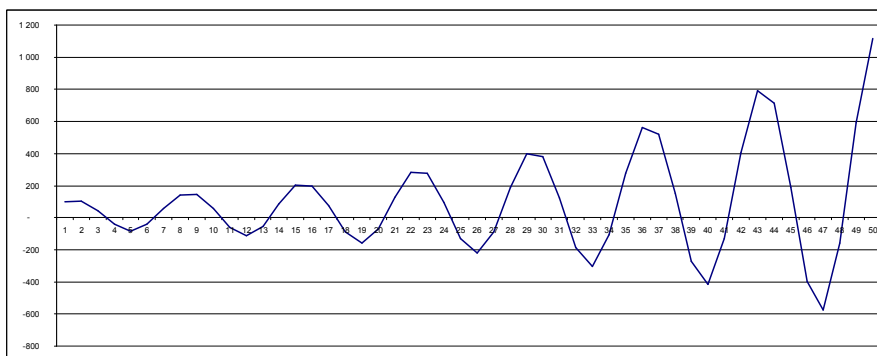
<sup>44</sup> P. A. Samuelson, *Interactions between the Multiplier Analysis and the Principle of Acceleration*, The Review of Economic Statistics, 1939, t. 21, p. 75-78



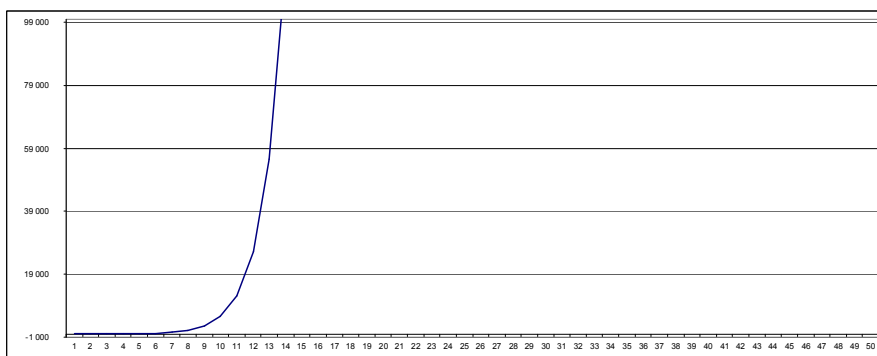
a)  $v < 1$



b)  $v = 1$



c)  $1 < v < (1 + \sqrt{s})^2$



d)  $v \geq (1 + \sqrt{s})^2$

**Figure 5 Graphical representation of national income w.r.t. the value of acceleration coefficient. Other assumptions  $c = 0,2$ ;  $A_0 = 15$  (except d, where  $A_0 = 65$ ),  $r = 5\%$ .**

Source: Own, based on A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 74

What is important is that, even without autonomous investments, high induced investments (and the acceleration coefficient  $\nu \geq (1 + \sqrt{s})^2$ ), can cause growth of the economy. The upper boundary of fluctuations comes from full employment of the production factors<sup>45</sup>. As the national income approaches that level, its pace of growth is lower. This causes decline in induced investments, which stops the influence of the accelerator. It can be proved that the state of full employment can last for maximum two periods<sup>46</sup>. After that time, the acceleration coefficient acts in the opposite direction, pulling the economy into recession. In the recession phase, when the national income approaches the lower boundary (resulting from the fact that the investments are nonnegative, eventually can be equal to the scrap value of production assets), the pace of its decline is lower. Finally, the national income reaches the lower boundary, the accelerator starts working again in the opposite direction, and the cycle is initiated.

The model elaborated by Hicks implies that fluctuations of the national income are caused by the multiplier-accelerator interactions, while growth of the income depends on the level of investments (state interventionism being a part of them).

The assumption concerning the level of boundaries was improved later on thanks to the principle of the capital adjustment, which was developed by H. Chenery and J. Kromphardt<sup>47</sup>. It was claimed that the acceleration coefficient cannot be constant during whole cycle, as capital needed to match current market demand changes. The boundaries established by this adjustment are similar to the original version proposed by Hicks, however fluctuations of the national income tend to be smoother.

Another very interesting theory was presented by A. Smithies, whose model treats economic growth as the consequence of economic fluctuations<sup>48</sup>. The consumption function proposed in the model, depends not only on the current national income, but also on the highest one

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<sup>45</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p. 42

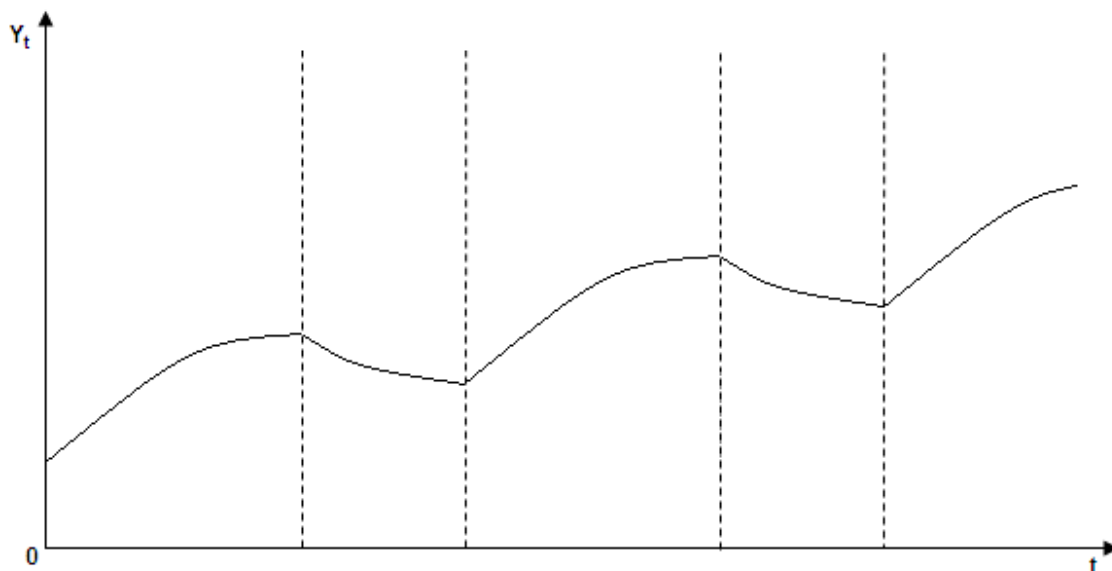
<sup>46</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 79

<sup>47</sup> See: H. Chenery, *Overcapacity and the Acceleration Principle*, *Econometrica* vol. XX, no 1, 1950, p. 1-28;  
J. Kromphardt, *Wachstum und Konjunktur, Grundlagen ihrer theoretischen Analyse und wirtschaftlichen*, Göttingen, p. 180

<sup>48</sup> A. Smithies, *Economic Fluctuations and Growth, Readings in Business Cycle*, London, 1966, p. 39-78

in the past. Moreover, the impact of the past on the present situation is different in growing and declining phases of the national income. It is so called 'ratchet effect'<sup>49</sup>. As a result, decline of the economy is to some extent mitigated, and depression phase can occur at a relatively high level of the national income. This implies, that as fluctuations in the economy take place, the national income reaches (but not every time) higher maxima.

Similar behaviour of the cycle can be observed in the Goodwin's model, which is based on nonlinear accelerator principle and time delay in investments and production<sup>50</sup>. The model is built in such a way, that oscillations are purely endogenous and self-sustaining. The fluctuations diverge to a certain oscillation with constant amplitude, but of non-sinusoidal shape. What is more, usually growth phases are longer than decline phases.



**Figure 6 The national income fluctuations according to Goodwin's model**

Source: R. M. Goodwin, *The Nonlinear Accelerator and the Persistence of Business Cycle*, *Econometrica* vol. XIX, 1951, p. 14

It is vital to notice, that the model developed by Goodwin is directly derived from a model constructed by a Polish economist Michał Kalecki, who had published (in 1933) his theory on economic cycles before Keynes did<sup>51</sup>. The results obtained from the Kalecki's and Keynes's theories are very similar, despite the fact that both of them arrived at them using different

<sup>49</sup> J. S. Duesenberry, *Income, Saving and the Theory of Consumer Behavior*, Harvard University Press, Cambridge, 1952, p. 114-116

<sup>50</sup> R. M. Goodwin, *The Nonlinear Accelerator and the Persistence of Business Cycle*, *Econometrica* vol. XIX, 1951, p. 1-17

<sup>51</sup> A. Szeworski, *Kalecki-Keynes. Sporu o pierwszeństwo ciąg dalszy*, *Nowe Życie Gospodarcze*, 1996, no 16, p. 46-47

methods<sup>52</sup>. The importance of his model, which is fully endogenous, made Kalecki the leader of post-Keynesian school, which is often called post-Kaleckian<sup>53</sup>.

## **2.5. Exogenous Concepts of Economic Cycles**

Exogenous theories of economic cycles imply that reasons for economic fluctuations are external, i.e. are caused by the processes which take place independently of the economic system.

### **2.5.1. New Classical Economics on Economic Cycles**

It can be stated, that the new classical economics grew on two major imperfections of the Keynesian school. First, endogenous concepts fail to include future expectations in their models (apart from extrapolating past data into the future)<sup>54</sup>. Second, was impossibility to fully explain simultaneous occurrence of high inflation and high unemployment in 1970's<sup>55</sup>. Let me stress however, that the new classical economics does not create a single unified stream of comprehensive theories. It is rather a set of various explanations of the economy<sup>33</sup>.

The fundamentals of the neoclassical economics are based on two concepts.

One of them refers to the rational expectations theory by J. F. Muth, which comes in two forms<sup>56</sup>. The first one states, that all decision-making units have access to partially perfect information, based on which expectations concerning the future are done. The second one states, that the expectations are made based on perfect information, which is delayed by one period.

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<sup>52</sup> P. Kreisler, *Keynes i Kalecki o metodzie*, Ekonomista, 1990, no 4-5, p. 629-653

<sup>53</sup> A. Szeworski, *Kaleckian Economics*, Ekonomista, 1995, no 5-6, p. 849-867

<sup>54</sup> M. Kalecki, *Parę uwag o teorii Keynesa, Dzieła: Kapitalizm, Koniunktura i zatrudnienie*, PWE, Warszawa 1979, p. 272

<sup>55</sup> R. Barczyk, Z. Kowalczyk, *Metody badania koniunktury gospodarczej*, PWN, Warszawa-Poznań, 1993, p. 45

<sup>56</sup> J. F. Muth, *Rational Expectations and the Theory of Price Movements*, Econometrica, 1961, p. 315-335

The rational expectations are complemented with the aggregated supply function introduced by R. E. Lucas<sup>57</sup>. The function consists of a normal element, which reflects accumulation of capital and supply of labour, and is responsible for the trend line, as well as a cyclical element, which combines current and expected price level, and causes deviations from the trend line. According to Lucas's "Equilibrium Theory of Business Cycle", the elasticity of prices and wages allows the economy to stabilise itself at the full employment level almost immediately. The reasons for fluctuations are unexpected or coincidental money shocks caused by the state, and delay in information propagation.

The weak point of this theory is that it does not explain how decision-making units form their expectations. It seems unbelievable, that everyone knows all inputs to economic models used in forecasting<sup>58</sup>. What is more it also takes some time and money to process the information flow. Another substantial disadvantage of the theory is, because of its assumption, the lack of morphological analysis of cycle<sup>59</sup>.

### **2.5.2. Monetary Theories of Economic Fluctuations**

For decades economists have argued about the relationship between financial markets and the real economy. Some stated that financial markets adjust to the real economy, and that financial institutions have no impact on it. Nowadays however, most of the theories explaining economic cycles refer to phenomena occurring in financial markets<sup>60</sup>.

One of the first explanations of how monetary factors can cause economic fluctuations was elaborated by D. Ricardo<sup>61</sup>, who claimed that when banks' credit policy transgresses gold reserves, growing inflation affects international trade. National currency exchange rate is high, resulting in increase in import of goods, and decrease in export of goods. This phenomenon causes outflow of gold, thus forces banks to limit their credit policy. As a result, the economy enters into its deflation stage, and the flow of gold changes its direction.

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<sup>57</sup> R. E. Lucas, *An Equilibrium Model of the Business Cycle*, The Journal of Political Economy, 1975, p. 1113-1144

<sup>58</sup> A. Jakimowicz, *Od Keynesa do teorii chaosu*, PWN, Warszawa, 2005, p. 181

<sup>59</sup> R. Barczyk, *Teoretyczne uwarunkowania retrospektywnych analiz współczesnych wahań koniunkturalnych*, Zeszyty Naukowe Akademii Ekonomicznej w Poznaniu, 1990, series I, no 197, p. 66 and 75

<sup>60</sup> R. Cantor, J. Wenninger, *Perspective on the Credit Slowdown*, "Federal Reserve Bank of New York Economic Policy Review", New York, Spring 1993

<sup>61</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p.62-63

Today, the most famous representative of monetarism is Milton Friedman (Nobel laureate), who instead of calling economy cyclical, preferred term 'fluctuations'<sup>62</sup>. What is more, fluctuations are considered a good phenomenon, and result from optimal choices done by companies. For this reason, any attempts aiming at mitigating fluctuations are harmful to the society. However Friedman did claim, that the Federal Reserve Bank has the power of "dropping the money out of a helicopter" in order to fight against deflation. At the same time the role of commodity prices and wages was diminished by him, as "Inflation is always and everywhere a monetary phenomenon"<sup>63</sup>. This implied that the Philips Curve<sup>64</sup> was no longer valid to explain high unemployment and inflation occurring simultaneously, that is stagflation.

According to Friedman, economic fluctuations are caused by increase in prices of goods sold, which encourages companies to produce more, not noticing increasing production costs<sup>65</sup>. Moreover, both employment and nominal wages increase. After some however, everyone starts to notice the real wages and sales (i.e. inflation adjusted values). When these figures turn out to be dissatisfactory, production volume decreases, unemployment increases, which eventually leads to economic slow-down.

A very important element of the mechanism described above is the bank loan. Its importance was stressed by the Austrian school represented by F. A. Hayek (Nobel Prize 1974) and Ludwig von Mises. Their theory, often called overinvestment theory, refers to the fact that monetary supply through bank loans causes disproportions between supply and demand in the market<sup>66</sup>. Amount of money in circulation is defined by the interest rate, which is not only understood as the cost of capital, but the relation of the present value of money to its future value. Nowadays, the interest rate is considered to be composed of four elements<sup>67</sup>:

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<sup>62</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.5-6

<sup>63</sup> See: M Friedman, A. Schwartz, *A Monetary History of the United States 1867-1960*, Chicago 1963

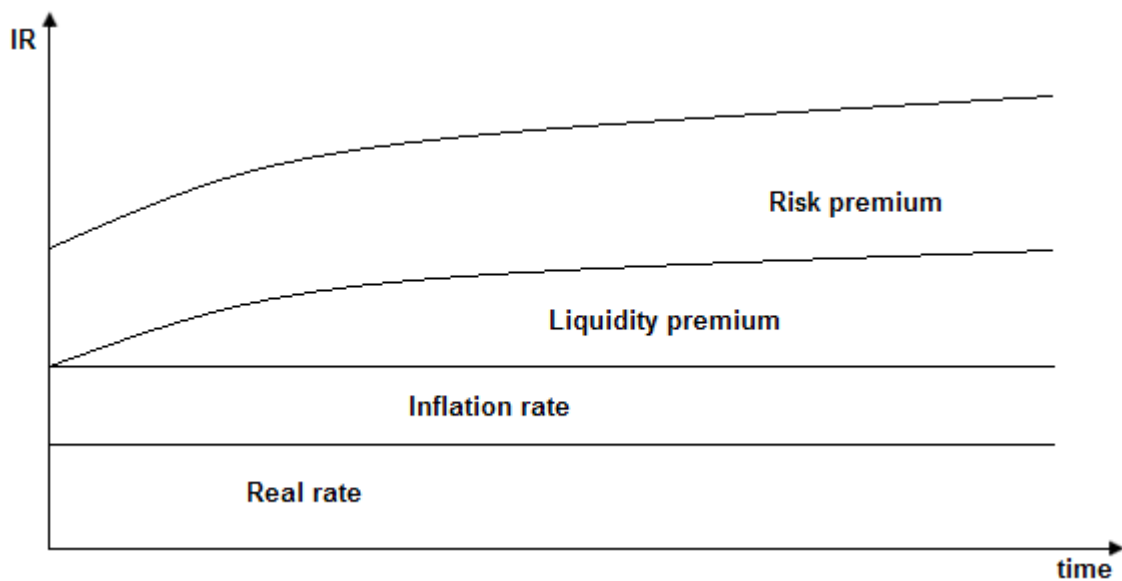
<sup>64</sup> See: A. W. Philips, *The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861-1957*, *Economica* 1958

<sup>65</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.5-6

<sup>66</sup> Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p.65-68

<sup>67</sup> Lectures on *Introduction to Finance*, dr P. Pomykański, International Faculty of Engineering, 2008

- Real rate – how much does an investor need to pay to borrow money
- Inflation rate – drop in money value caused by increased supply of money
- Liquidity premium – the ease of converting assets to cash
- Risk premium – depends on the trust between parties



**Figure 7 Graphical representation of the interest rate**

Source: Lectures on *Introduction to Finance*, P. Pomykalski, International Faculty of Engineering, 2008

The value of the interest rate is determined by the central bank, which often sets up its value on a level different from its natural value, which would be used in transactions between savers and borrowers, if the central bank never existed. This makes markets participants misinformed, and results in capital misallocation. In growth phase of economic cycle, the interest rate encourages companies to incur loans, which are not really needed, thus cause overproduction of goods. When the market saturation level is reached, products need to be sold at a lower price level, in order to provide companies with cash to pay back their loans. Should any disturbances in sales occur, chain reaction starts. Deflation processes are activated, revenues drop, and some market participants cannot pay back their liabilities.

As it can be observed, monetary factors, through bank loans, clearly influence economic fluctuations. What is more, financial market is affected by these fluctuations as well. In case of an economic slow-down, share prices drop, some companies and banks go bankrupt,

credit crunch occurs, less initial public offers are observed<sup>68</sup>. Hayek and Mises also provide some suggestions concerning mitigation of the economic crises<sup>69</sup>. They claim, that the state should not stimulate the consumption in the age of a crisis, while it should try to minimise the impact of the monetary policy on the economy preferably while the economy is still in its growth phase. Moreover, the more rapid and long economic expansion is, the more dramatic slow-down it will be followed by. Finally, the mitigation of a breakdown in one sector of the economy, results in creating a new investment bubble in another one<sup>70</sup>.

### 2.5.3. Financial Instability Theories

The concept of financial instability, which contains some similarities to the overinvestment theory, was first developed by I. Fisher, who pointed out two major factors for economic crisis: high debt ratio of market participants, and the deflationary processes following high debt ratio period<sup>71</sup>. The Fisher's concept was developed by H.P. Minsky in the 1950's. Today, a famous financial crises specialist Ch. P. Kindleberger still employs Minsky's model to explain financial perturbations<sup>72</sup>. According to this theory, economic cycle is caused by endogenous factors. What is more, a financial crisis is inbuilt in the upper boundary of the cycle, being a natural consequence of rapid economic expansion. Because of these features, the theory is often classified as Financial Keynesianism.

Minsky analyses the economy from a company balance sheet point of view<sup>\*</sup>. Similarly to monetary theories by Friedman and von Mises, the economic growth encourages companies to take up more risk, and get financed by increasing their liabilities<sup>73</sup>. It can come in the following ways: issuing bonds, contracting debt, or even applying M. Ponzi's method

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<sup>68</sup> Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p.65-68

<sup>69</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.11

<sup>70</sup> Lectures on *Alokacja aktywów w ramach cyklu koniunkturalnego*, W. Białek, Gazeta Giełdy Parkiet, Warszawa, 27.09.2008

<sup>71</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 69

<sup>72</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.11

<sup>\*</sup> The statement is contradictory to the theory by F. Modigliani and M. Miller, who implied that the capital structure of a company, i.e. the debt/equity ratio, under several conditions, does not have any impact on the economy. See: F. Modigliani, M Miller, *The Cost of Capital, Corporation Finance, and the Theory of Investment*, American Economic Review, June 1958

<sup>73</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 71-77

(contacting debt to pay off interest on other debt)\*\* . As a result financial condition of companies worsens, their capital safety margin decreases, which eventually makes the whole system fragile both to external and internal factors. A vital element is that companies situation is strictly interdependent with banks situation, as demand for loans creates new financial structures in the economy (e.g. financial brokers, advisors), and affects the financial structure of banks themselves. When the economy reaches its full employment level (similarity to the Keynes's model), companies' revenues are insufficient to cover all costs and pay off debt. Since banks are not willing to provide capital to companies facing financial distress, the weakest companies will go bankrupt. Note, that bankruptcy is not a negative phenomenon in this theory. Its main function is to heal the economy by eliminating extensively indebted market participants.

There are two more points in the Minsky's theory, which are worth to be mentioned, as they are very helpful to understand current economic situation in the world<sup>74</sup>.

The first one is the importance of free flow of capital among countries. When the economy of a country (countries, e.g. emerging markets) is in growth phase, foreign capital flows into that economy making it expand faster. Minsky calls such rapid growth "the euphoric economy"<sup>75</sup>, which suggests even greater frailness of the system. When the first fracture of the system is observed, the foreign capital is withdrawn from the economy, causing its collapse.

The second point is the impact of mild monetary policy on the ease of incurring debt, which causes increase of real estate prices. Such a high real estate price level improves balance sheets of companies, and financial position of individuals, which together with low interest rates, allows them to contract more debt. Many of those use this opportunity to speculate, and use real estate properties as collateral. Any attempt to fight against inflation by increasing interest rates may result in piercing the speculative bubble. Stock market and real

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\*\* One of the best examples of application of Ponzi's method is the investment fund which was run by B. Madoff, Or in Poland: WGI Dom Maklerski and Interbrok Investments. See: G. Uraziński, *Madoff I inni naśladowcy Ponziiego*, T. Józwiak, *Oszukał niemal wszystkich*, In Forbes, Polish Edition, No 02/2009, p. 80-85

<sup>74</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 71-77

<sup>75</sup> See: H. Minsky, *Can 'it' happen again? Essays on instability and finance*, M. E. Sharpe, New York 1982

estate price drop. Economic slow-down starts, debtors cannot pay their liabilities, banks are left with toxic financial assets.

What should be stressed, is that the impact of financial sector on the economy is unquestioned. Theories presented effectively explain phenomena that took place in many economic cycles in the real world.

#### **2.5.4. Other Concepts**

There are a few more concepts concerning economic cycles which are widely discussed nowadays. They present an alternative approach to those presented in the paper so far.

First of them is the concept of political cycle proposed by M. Kalecki. Although this author is directly associated with the Keynesian point of view, he was the first one to pay attention to influence of politics on the economy<sup>76</sup>. In a word, the concept states that the monetary policy implemented by the state depends on the political party which is currently in power. Usually its policy differs from its predecessors, and aims at speeding up the economy before the following election, as they hope to be re-elected. The cost of such policy is then transferred to the newly chosen government.

The second theory states that markets are always in equilibrium, and they adjust to circumstances immediately<sup>77</sup>. The theory is called real business cycle theory (RBC), and emerges from the concepts of classical economics by Adam Smith. Today it is mainly associated with works by F. E. Kydland and E. C. Prescott (Nobel Prize 2004). According to them, economic cycles are caused by supply shocks resulting in changes of production output. Such shocks are caused by exogenous factors, e.g. climate changes, wars, state regulations, new technologies. The theory has been widely criticised, as it did not provide sufficient amount of empirical evidence.

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<sup>76</sup> K. Piech, *Polityczny cykl koniunkturalny – wnioski dla Polski, Diagnozowanie koniunktury gospodarczej w Polsce*, Elipsa, Warszawa 2003, p. 59-82

<sup>77</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008, p.6-7

So as to the technology shocks, we need to mention an observation made in 1920's by a soviet economist N. Kondratieff who, based on analysis of prices level in capitalist economies, implied that there is a 50-60 years long cycle. The turning points of each cycle are inventions, for instance: steam engine, railway, electricity, IT<sup>78</sup>.

An alternative approach to the problem, a relatively new one, is proposed by G. Becker<sup>79</sup> (Nobel Prize in economics in 1992), who claims that economic cycles are nothing but a marginal phenomenon. The wealth of a nation is defined by its human capital (knowledge), which is barely elastic to economic fluctuations.

## **2.6. Summary**

In this chapter main theoretical concepts aiming at explanation of the cyclical nature of the economy were presented. As one could notice, they very often present completely different approach to the phenomenon, different assumptions, etc. One of the things they have in common, is that all of them point out some interesting observations which, when combined together, enable us to understand the phenomenon.

Among endogenous concepts, the one presented by Keynes, although imperfect, is the most important. It defines what the national income is, and stresses its dependency on investments, which are the core of the economic growth. Their level depends on the interest rate and 'animal spirit' of entrepreneurs, and is almost never equal to the level of savings, which makes the economy fluctuate. Type of the oscillations may be different, which was shown by Hicks in his multiplier-accelerator model. It was also indicated that every next peak of the GDP is usually attained at a higher level (Smithies).

Exogenous concepts, apart from pointing out imperfections of the endogenous ones, pay attention to the role of state in the economic system. It is the government and the central bank that regulate the monetary supply through the interest rates, issuing bonds, etc. This

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<sup>78</sup> Lectures on *Alokacja aktywów w ramach cyklu koniunkturalnego*, W. Białek, Gazeta Giełdy Parkiet, Warszawa, 27.09.2008

<sup>79</sup> K. Marczak, K. Piech, *Cykle koniunkturalne: ujęcie historyczne i przegląd głównych teorii*, Warszawa 2008. See also G. S. Becker, G. N. Becker, *Ekonomia życia: Od baseballu do akcji afirmatywnej i imigracji, czyli W jaki sposób sprawy realnego świata wpływają na nasze codzienne życie*, One Press, Gliwice, 2006

reminds of centrally-planned economies. What is more, the economy is not independent of politics and wars. However, as the majority authors claim, fluctuations are good, as they are result of choices made by market participants. They help to wipe out those, which are heavily indebted. Artificial stimulating of the economy, on the other hand, always makes it euphoric, results in an investment bubble, and leads to a financial crisis.

To sum up, it may be stated, that none of the hypothesis should be neglected while investigating the economic cycles. It seems however, that models proposed by Minsky and Mises are exact description of economic cycles that occurred in the last decades. For this reason, and because of the impact of the economy on the stock exchange, deep understanding of them and their further research is recommended.

## CHAPTER 3 STOCK MARKET CYCLES

### **3.1. Introduction**

Previous chapters indicated that the financial markets are strongly connected with the economy. Both the Keynesian school and the monetarists agree on that. In this chapter several issues concerning investments on the stock exchange are raised.

Firstly, the idea behind the stock index is explained, and its application in the analysis justified. Main global and national indices are presented, Warsaw Stock Exchange indices included. What is more, three factors which, although independent of condition of companies quoted, affect young stock markets are shown, as they might disturb cyclical phenomena on the stock exchange.

Secondly, the influence of the economy on the capital allocation is discussed. Theoretical model called 'investment circle' is presented. It shows what the flow of capital through the whole cycle should be. Since the stock exchange is the main interest of this paper, the part of the cycle which refers to the stock market will be analysed only. In the following chapters it will be verified whether the model has been valid in Poland.

Thirdly, information on the identification of phases and turning points on the stock exchange is presented. It is of the utmost importance to learn how the market looks like in different circumstances. That knowledge will be helpful in finding peak and trough on the stock exchange with higher certainty.

As it was pointed out in the introduction to this paper, companies quoted on the stock exchange operate in the real world, so their share prices are affected by the economic circumstances, or to be more precise, by investors' beliefs concerning the future. Naturally, stock prices change according to their supply and demand, which are determined by two main psychological factors: fear and greed<sup>80</sup>. This implies that the stock exchange tries to 'predict' the future, so there can be different time shifts between the stock market and the

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<sup>80</sup> Lectures on *Finanse behawioralne*, P. Zielonka, Gazeta Gieldy Parkiet, Warszawa, 10.10.2008

situation in the real economy. Such a shift is commonly believed to be equal to 6 months<sup>81</sup>, and its correctness will be verified in details in the 5<sup>th</sup> chapter.

### **3.2. Stock Indices as Data Series**

In order to determine cycles on the stock exchange, it is essential to examine stock indices, so that one could decide which series of data are appropriate for further analysis.

The analysis of the economic cycles can be conducted by employment of economic aggregates, such as the Gross Domestic Product, Industrial Production, etc. In case of the stock exchange, stock indices are commonly used. A stock index is an indicator which reflects the behaviour of an average share included in the index<sup>82</sup>. In other words, it is a statistical measure indicating direction of price moves and tendencies in the market (growth, decline, stabilisation). Although hardly ever do its components behave exactly as the index itself, its behaviour is an extremely important factor affecting investors' decisions. It is also very often used as a benchmark for other investments, and is employed in forecasts regarding the stock market<sup>83</sup>.

Stock indices differ in terms of the range of markets/sectors/companies they include. There are indices which include companies regardless of their origin, or the stock exchange they are quoted on. What matters is for instance the size (capitalisation) of the company. Such 'world' or 'global' indices are for example: MSCI World (abbreviation of Morgan Stanley Capital International) or S&P Global 100 (Standard & Poor's). The most popular however, are, so called, national indices. They are composed of shares of companies quoted on a given stock exchange. Since the majority of companies quoted on a given stock exchange origins from (and/or operates in this) country, the behaviour of national indices reflects tendencies

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<sup>81</sup> A. Jagielnicki, *Inwestycje giełdowe*, Helion, 2007, p. 79

<sup>82</sup> M. Wojewódka, *Jak się zarabia na giełdzie: pierwsza książka o spekulacji na polskiej giełdzie*, M. Wojewódka Consulting, Kraków 1993

<sup>83</sup> W. Dębski, *Rynek finansowy i jego mechanizmy: podstawy teorii i praktyki*, Wydawnictwo Naukowe PWN, Warszawa 2007, p. 194-195

on that stock exchange and in the economy of the country. The most important national indices are<sup>84</sup>:

- DJIA – Dow Jones Industrial Average, USA, New York Stock Exchange
- S&P 500 – Standard and Poor’s 500, USA, New York Stock Exchange
- Nikkei 225 – Japan, Tokyo Stock Exchange
- FTSE – Financial Times Stock Exchange 100 Index, UK, London Stock Exchange
- CAC 40 - Cotation Assistée en Continu (Continuous Assisted Quotation), France, Euronext Paris
- DAX – Deutscher Aktien Index (German Stock Index), Germany, Frankfurt Stock Exchange

The importance of these indices lies in their capitalisation and size of the companies quoted. Since they are indices of the largest and most influential economies in the world, their behaviour determines the direction of price moves in other countries (contagion effect).

The stock Exchange in Poland has been operating since April 16, 1991. Currently, 372 companies are quoted on the Warsaw Stock Exchange (Giełda Papierów Wartościowych, GPW) and its approximate market capitalisation equals to 216 bln zloty<sup>\*</sup>. Since November of the year 2000 the trade is based on the IT system called WARSET (Warsaw Stock Exchange Trading System), thanks to which all transactions can be executed immediately, while the current price level monitored without any delay<sup>85</sup>. Share price of a company is calculated based on the price according to which, the majority of investors buys and sells given shares.

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<sup>84</sup> W. Dębski, *Rynek finansowy i jego mechanizmy: podstawy teorii i praktyki*, Wydawnictwo Naukowe PWN, Warszawa 2007, p. 199-201

<sup>\*</sup> Data valid on 16.06.2009. Source: *Gazeta Giełdy Parkiet*, p. 14-18, Released on 17.06.2009

<sup>85</sup> Website of Bank Ochrony Środowiska, [www.bossa.pl/edukacja/ustalanie\\_kursu.html](http://www.bossa.pl/edukacja/ustalanie_kursu.html), Accessed on 20.06.2009

Among stock indices on the Warsaw Stock Exchange, there are those which include companies according to their capitalisation (WIG20, mWIG40, sWIG80), or the sector they operate in (e.g. WIG-banks, WIG-media, WIG-fuels)<sup>86</sup>. There is also one index which includes all Polish based companies which are quoted in Warsaw – WIG-PL. The whole stock exchange is measured by the main, and the widest index – WIG (Warszawski Indeks Giełdowy).

If one aims at analysis of the whole stock exchange, then they should employ WIG in the analysis. If one is interested in a particular group of companies, then appropriate narrower index should be chosen. The value of WIG is calculated according to the formula in the equation 3.1.

$$WIG(t) = \frac{M(t)}{M(0) \cdot K(t)} \cdot 1000 \quad \text{Equation 3.1}$$

$M(t)$  – the sum market capitalisation of companies included in WIG in time “t”,  $M(0)$  - the sum market capitalisation of companies included in WIG on the first day of the GPW,  $K(t)$  – correction coefficient in time “t”.

The value of WIG is related to its initial value on the first day of trade on GPW, which is equal to 1000 points. It is calculated in such a way, so that its value reflects real market changes of share prices – the correction coefficient adjusts the value of WIG in case of dividends, new companies entering the stock exchange, or issuing new parcel of shares by those already quoted.

Summing up, it can be stated that in order to analyse the general past behaviour of the Warsaw Stock Exchange, its main index – WIG – should be employed as the data series in the analysis.

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<sup>86</sup> Website of the Warsaw Stock Exchange, [www.gpw.pl](http://www.gpw.pl), Accessed on 20.06.2009

### **3.3. Problems Occurring in Young Markets**

There are three main problems that young markets (for example those which have been transformed from the central planning to free markets, including Poland) and their stock exchanges suffer from. Their importance cannot be neglected, as their impact may affect cyclical phenomena of the stock exchange.

The first problem of a young economy is that it is relatively shallow, meaning its financial markets are of a relatively low capitalisation. What is more, usually its currency is weak. Investments in them are also more risky than investments in developed countries. All these factors allow foreign investors speculate and manipulate such markets. Relatively low amount of capital is sufficient to change value of their stock indices. As a result, it may cause high volatility and instability of such young markets and their currencies, thus affect their (both economic and stock market) cycles. The above phenomenon is one of negative effects of contagion.

The second problem is that investors can only attain long position. It means that, if they want to invest, they must buy shares (if they think that their price is going to increase), and sell them at a higher price to make profits. They cannot attain short position, though. The short sale means, that an investor agrees to sell e.g. a parcel of shares (although he/she does not physically have them), and is obliged to buy them back in the future. If the price at which the investor buys shares (cancels the liability) is lower than the sell price, the price difference is the income. It must be mentioned that there are derivatives on the Polish stock exchange, but they cover 2 indices and 6 companies only<sup>87</sup>. Moreover, many investors do not understand such financial instruments, so they are definitely not as popular as common shares are.

Finally, the third issue which needs to be raised, is analyses and recommendations elaborated by professional financial institutions (banks, brokers, etc.) which have significant influence on investors in Poland<sup>88</sup>. As research shows, only small percentage of such

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<sup>87</sup> Website of the Warsaw Stock Exchange, [www.gpw.pl](http://www.gpw.pl), Accessed on 20.06.2009

<sup>88</sup> D. Zarzecki, T. Matecki, *Rekomendacje biur maklerskich – próba analizy*, In *Zarządzanie Finansami: Inwestycje i wycena przedsiębiorstw*, Szczecin 2006, vol. 1, p. 261

analyses is accurate. So instead of completing their mission, i.e. provide investors with reliable information and analyses, and educate them, they are not only irresponsible, but also misleading. The methodology which is used most frequently in a company valuation is Discounted Cash Flow (DCF) Method. However, since a company exerts very little (or none) influence on its macro environment, the macro analysis should be conducted independently<sup>89</sup>. Nevertheless, the future economic growth, cash flows depending on it, and finally the discount rate used in the model, are highly subjective assumption<sup>90</sup>. A typical error in such analyses, is that they almost never recommend selling shares during the bear market. They rather gradually decrease their recommended price. During the bull market on the other hand, their valuation is based on highly optimistic assumptions, totally neglecting the phenomenon of economic fluctuations and trend changes. It seems that for some reasons, they want the stock exchange to grow. Such analyses result in misinformation of large number of investors, thus highly affect behaviour of stock prices.

To sum up, it can be stated that the Warsaw Stock Exchange is subjected to some factors which are independent of condition of companies quoted there. The factors result from relatively young age of the Polish free economy, and include: susceptibility to speculative capital, no short sale, unprofessional analysts.

### **3.4. Investment Circle**

In previous chapters phases of economic cycles were widely discussed, and their characteristic features discovered. Thanks to that knowledge, one can choose financial instruments, which should be most profitable in different phases of the cycle. Obviously, many financial instruments could be included here, but only four most popular investment options will be examined:

- Cash (bank deposits or saving accounts)

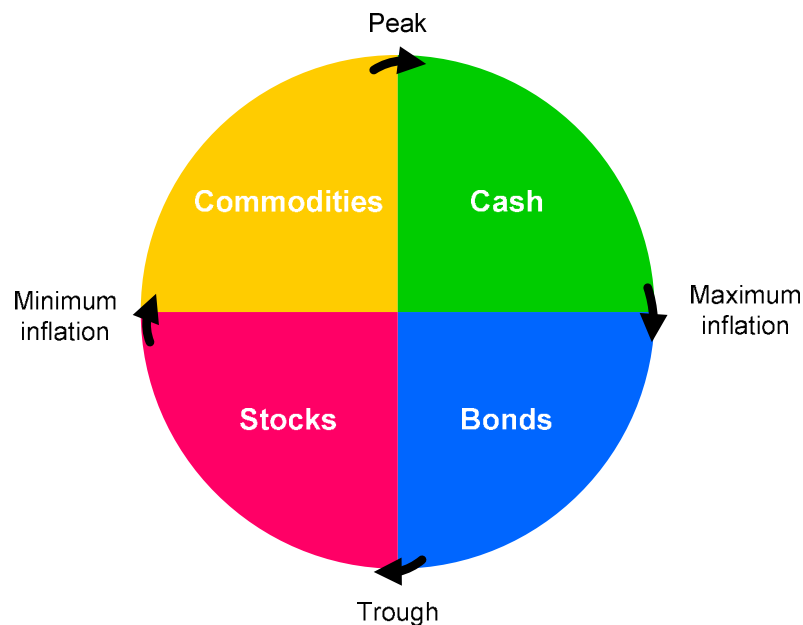
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<sup>89</sup> L. Bednarski, *Analiza ekonomiczna przedsiębiorstwa*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław 1998, p. 355

<sup>90</sup> D. Zarzecki, T. Matecki, *Rekomendacje biur maklerskich – próba analizy*, In *Zarządzanie Finansami: Inwestycje i wycena przedsiębiorstw*, Szczecin 2006, vol. 1, p. 271

- Bonds (governmental bonds or funds investing in them)
- Stocks (stock indices)
- Commodities (derivatives of commodities used in production processes – e.g. copper, aluminium, crude oil, etc.)

Detailed characteristic of investment types listed above is not necessary for the purposes of this paper. They simply present a group of financial instruments, which behave in a certain way in a given phase of the economic cycle. All of them form the investment circle, according to which financial capital should be allocated.



**Figure 8 Theoretical model of financial resources allocation in the financial market according to the economic cycle**

Source: Lectures on *Alokacja aktywów w ramach cyklu koniunkturalnego*, W. Białek, Gazeta Giełdy Parkiet, Warszawa, 27.09.2008

The circle is composed of four pieces representing cash, bonds, stocks and commodities. Arrows indicate the direction of flow of capital between elements, as well as the phases of the economic cycle, whose characteristic points are placed in the circle, namely: peak, maximum inflation point (high interest rates), trough, minimum inflation point (low interest rates).

Let me start explaining the model from the upper turning point of the economic cycle, that is its peak. At this point the highest value of economic indicators such as GDP or industrial production is observed. Manufacturers can easily sell their products, so they increase prices. Consequently, inflation and interest rates increase. In this situation, financial resources should be stored in cash, saving accounts, or deposits. Meanwhile, salaries, fuel, and other production costs increase – the maximum inflation point is reached, production is damped. From that moment, it is advised to invest in bonds, as the interest rates cuts are expected, which makes this financial instrument more profitable. The economic slow down lasts until it reaches its trough (minimal value of economic indicators). At this point, capital should be invested in stocks, as from that moment companies will start to increase its production output and improve its financial condition. After some time, the minimal value of inflation is reached, meaning that also interest rates stop falling. This is caused by the increase in price of commodities, in which the capital should be invested now. The price increases because the demand increases – companies require commodities in their production processes. The situation lasts until the production capacity reaches its maximum value, that is another peak of the economic cycle.

Note that the model is a simple representation of some characteristic morphological elements of the economic cycle and basic types of investments. Obviously we cannot expect that all pieces of the cycle are equal (e.g. in time), and occur exactly at the point indicated in the figure. What is known from the past experience, is that inflation does not always behave as indicated, e.g. there can be no decrease of inflation in the trough zone (see monetary theory by Milton Friedman in the Chapter 2.5.2.).

### ***3.5. How to Identify Turning Points on the Stock Exchange***

The crucial element of investing on the stock exchange is the timing of operations. At this point the most vital issue is the determination of turning points. In order to improve the accuracy of timing, deeper analysis should be conducted. Below I present main factors and some examples from the Polish market which allow investors to estimate whether they are at any of turning points.

Trough	e.g. the 3 <sup>rd</sup> quarter of 2002
Low value of PE ratio* (10-15)	Average PE = 12
Low dynamics of GDP	Q/Q: 0,3% in 2002Q2, 1,1% in 2002Q3
Low PBV ratio** (around 1,5)	Average PBV = 1,1
Companies reorganise their operations but everyone is still sceptical about the future	Yes
Nobody is willing to invest in stocks or stock funds. The issue does not appear in media	Yes
Simple and profitable companies have not been declining for several months	Yes, e.g. a clothing company LPP S.A.
Many people think that the economy will suffer for a long period of time	Yes, although the accession to the EU was expected
Low volatility of prices	Yes
Low volume of transactions	Yes
Small number of IPO***	Only 5 IPOs in 2002 and 2003

**Table 4 Factors determining trough on the stock exchange**

Source: Lectures on *Strategie inwestowania na rynku akcji*, K. Łapiński, Gazeta Giełdy Parkiet, Warszawa, 03.10.2008

\* PE ratio stands for price/earnings ratio. It is equal to the current market price of a given share divided by the sum of the company earnings per share in the 4 preceding quarters.

\*\* PBV ratio stands for price/book value ratio. It is equal to the current market price of a given share divided by the company book value per share; See: B. Pomykałska, P. Pomykałski, *Analiza finansowa przedsiębiorstwa*, Wydawnictwo Naukowe PWN, Warszawa 2007, p. 98-99

\*\*\* The number of Initial Public Offers (IPO) means the number of new companies being quoted on the stock exchange

Peak	e.g. the 3 <sup>rd</sup> quarter of 2007
High value of PE ratio (20-40)	Average PE = 25, Small companies PE > 40
High dynamics of GDP	2,8% Q/Q
High PBV (over 3)	Average PBV = 3,1 Small companies PBV > 4,1
Everybody is willing to invest in stocks or stock funds. The issue is widely discussed outside the financial world	Yes
Simple and profitable companies have not been rising for several months	WIG20 grows less rapidly than the indices of small and medium-size companies
Small and complex businesses are in favour of investors	Yes, e.g. companies like: NFI, Sanwil, Fon, Elektrim
Many people think that the economy will keep on growing for a long period of time, no risk is observed	Yes
High volatility of prices	Yes
High volume of transactions	Yes
Investment and Pension Funds have a lot of stocks in their portfolios	Yes, maximum value since 1999
Large number of IPO	Around 80, and an alternative stock market called NewConnect was brought to life.

**Table 5 Factors determining peak on the stock exchange**

Source: Lectures on *Strategie inwestowania na rynku akcji*, K. Łapiński, Gazeta Giełdy Parkiet, Warszawa, 03.10.2008

As it can be observed in the tables 4 and 5, in order to determine the turning point properly, several pieces of information of a different type must be analysed. Firstly, the real economy and the situation on the stock exchange (GDP, PE, PBV, number of IPOs). Apart from that, the relative change of indices of large and small companies should be monitored (e.g. change of WIG20/sWIG80).

It is also good to know what big players do (i.e. Investment funds). In order to do that, one can find analyses, which present e.g. how many shares (%) pension funds (in Poland called OFE) have in their portfolio<sup>91</sup>. Because of the fact that both pension funds (OFE) and investment funds (TFI) stand for approximately 1/3 of all stock market participants, and because they must behave in the same way to match the benchmark, observation of them might be very helpful in determining trends on the stock exchange.

Finally, one should monitor everyday press and financial/business magazines to see opinions of other investors and analysts.

Let me stress that one can easily fall into troubles while trying to pick tops and bottoms. Many authors agree that the majority of investors fail to predict turning points<sup>92</sup>. Some compare it to catching a falling knife. In most cases, as it will be proved in the 5<sup>th</sup> chapter, it is enough to identify the turning point after it has occurred, which is, without slightest doubt, much easier.

### **3.6. How to Identify Phases on the Stock Exchange**

One of the most important theories describing phases of the stock cycle is the one published by Charles H. Dow in 1884. From that time it is widely employed to help understand behaviour of investors. Although it is usually used as fundamentals for methods classified as technical analysis, because of its explanation of investors' psychology, it is essential to be understood while discussing any cyclical behaviour of the stock market.

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<sup>91</sup> Lectures on *Strategie inwestowania na rynku akcji*, K. Łapiński, Gazeta Giełdy Parkiet, Warszawa, 03.10.2008

<sup>92</sup> P. L. Bernstein, *Capital Ideas Evolving*, John Wiley & Sons, Inc, New Jersey, 2007, p. 41; K. Fisher, *The Wall Street Waltz: 90 Visual Perspectives*, John Wiley & Sons, Inc, New Jersey, 2008, p. 205; R. G. Hagstrom, *Na Sposób Warrena Buffeta*, MT Biznes, Warszawa 2007, p. 222

Dow explains phenomena which take place in the market through the concept of trend<sup>93</sup>. The long-term trend, lasting longer than a dozen of months, is in our interest here. The main long-term trend in the bull market comes in three phases. The first one is the accumulation phase which starts after the trough of the stock cycle. In that phase only the most experienced investors buy stocks, as they estimate all bad information to be already discounted by the market. The second phase attracts substantial number of investors. It also provides improving economic data and rapid increase in stock prices. In the third phase experienced investors sell stocks to newcomers who believe that economic data and forecasts will still last. What is more, many speculative transactions take place in the market. As the number of investors who take profit from the market increases, the third phase of the bull market becomes the first phase (out of three) of the bear market in which stock prices fall more often than they go up. The second phase of the bear market is the panic phase. The supply of stocks is so high that their prices rapidly slump. The third phase is the disappointment phase. Those who bought stocks at the peak or even later, simply give up and sell them. What is more bad economic data comes to that. Many investors find themselves discouraged from the stock exchange for a long time.

There are several comments that need to be made on that theory.

The first is that, between each phase there is a countermove of the stock prices. Obviously its range and strength is smaller than the main one. In fact this makes it very similar to the Elliott waves model, which is purely a technical analysis tool.

The second remark is a very general statement that the higher value of length and amplitude of the bull phase is, the higher value of length and amplitude of the bear phase it will be followed by. Note that the same observation was done on economic cycles by Mises and Hayek (see Chapter 2.5.2.). According to the Dow's theory the bear market destroys approximately 50% of the preceding bull market and lasts about 1/4 to 1/3 of its time.

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<sup>93</sup> Lectures on *Budowanie strategii inwestycyjnej w oparciu o istotne elementy analizy technicznej*, K. Borowski, Gazeta Giełdy Parkiet, Warszawa, 05.10.2008

The third remark on the Dow's theory is the implication, that there are companies which are typically most profitable in certain phases of the bull market. Since that matter is not discussed in details here, let me just mention that in the first phase of the bull market the most profitable are stocks of well-grounded companies (blue chips), and those sensitive to interest rate cuts (e.g. banks). In the second phase stock prices of those companies increase, which are pro-cyclical, i.e. earnings of which are strictly related to the economic cycle. In the third phase all stocks go up, especially those of smaller companies (MidCaps, SmallCaps, or even High Flyers and Penny Stocks).

### **3.7. Summary**

In this chapter the investment circle was presented, a basic model of capital allocation, which allows to invest successfully in all phases of the economic cycle. The main assumption of the model is that financial markets are strongly connected with the economy.

Defining characteristic points of the cycle in the real world is a problematic issue, though. In order to do that, supplementary analysis on points presented in Tables 4 and 5 needs to be conducted. Note that different signals must be taken into account. Some refer to the economy (dynamics of the GDP), some to the stock market (PE, PBV, IPOs, companies in favour), and some to the psychology (opinions of others).

Let me stress two important findings of the Dow's theory one more time. Firstly, investors can move their financial resources from the companies which were profitable to those which are going to be. Secondly, the amplitude of the bear market is twice smaller, and lasts about 30% of the preceding bull market.

Another remark is that in the analysis of cyclical phenomena on the Warsaw Stock Exchange, the main stock index WIG should be used as it covers all companies quoted, so provides information concerning the whole stock market.

Finally, the difficulty of identification of a turning point must be realised. For this reason, seeking for investments based on precise indication of the turning points, may turn out to be very dissatisfactory.

# CHAPTER 4 STOCK MARKET AND ECONOMIC CYCLES IN POLAND

## ***4.1. Introduction***

In this chapter fluctuations of the Polish economy and of the main Warsaw Stock Exchange index (WIG) are examined. Determination of the cycles will be conducted according to the methodology described in the Chapter 1. What is more, detailed analysis of their morphology will be conducted.

The main aim is to identify cycles both in the economy and on the stock exchange. Information obtained will be used in further analysis conducted in the Chapter 5, in which relation between them will be investigated.

The second aim is to analyse morphology of the economic cycles, and check if they match any of the theories described in the second chapter. If they do, hopefully some conclusions concerning the future behaviour of the economy could be made.

The third goal is to study morphology of the stock cycles. Their length and amplitude are the most important, as they need to be determined to find a 'time window' for investments. If there is any regularity visible, perhaps it will occur in the future again.

## ***4.2. Economic Cycles Analysis***

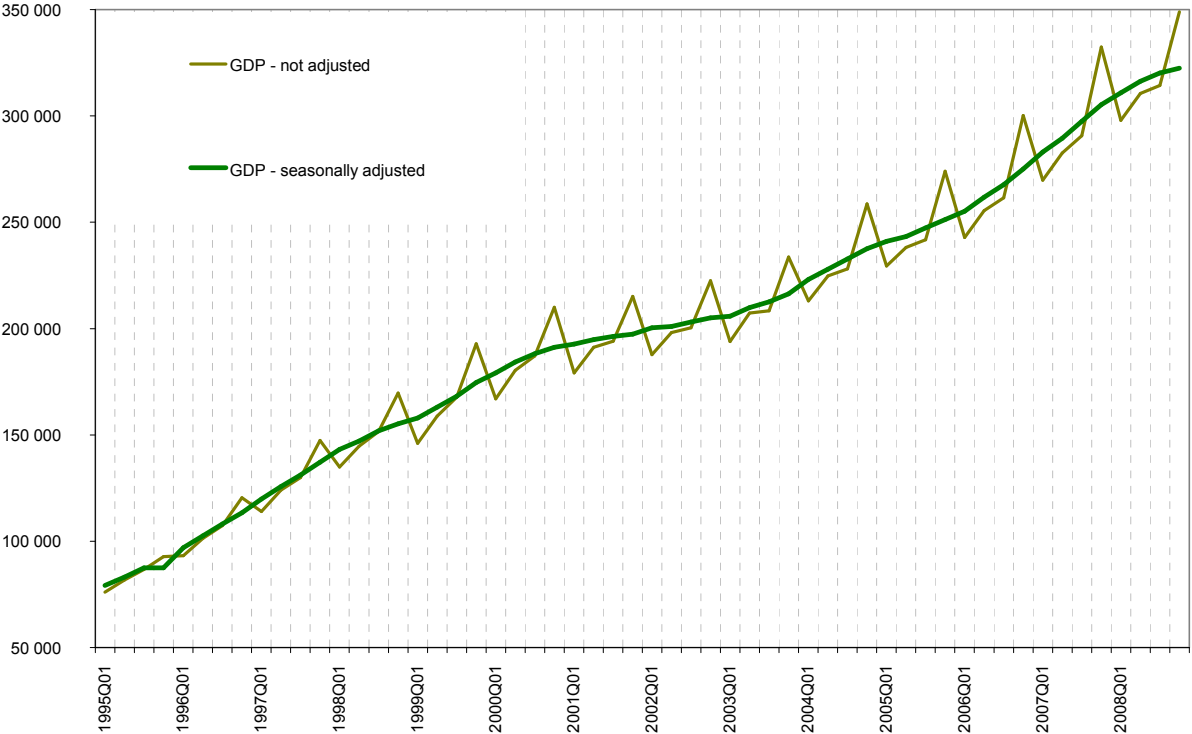
Poland went through radical transformation shortly after the dissolution of the Soviet Union, which caused dramatic changes in the economy<sup>94</sup>. What is more, statistical system was changed as well. For these two reasons it is impossible to precisely determine quarterly data of main economic indicators and create a series of data before 1995<sup>95</sup>.

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<sup>94</sup> See A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 132-133

<sup>95</sup> R. Barczyk, *Nowe oblicza cyklu koniunkturalnego*, PWE, Warszawa, 2006, p. 197

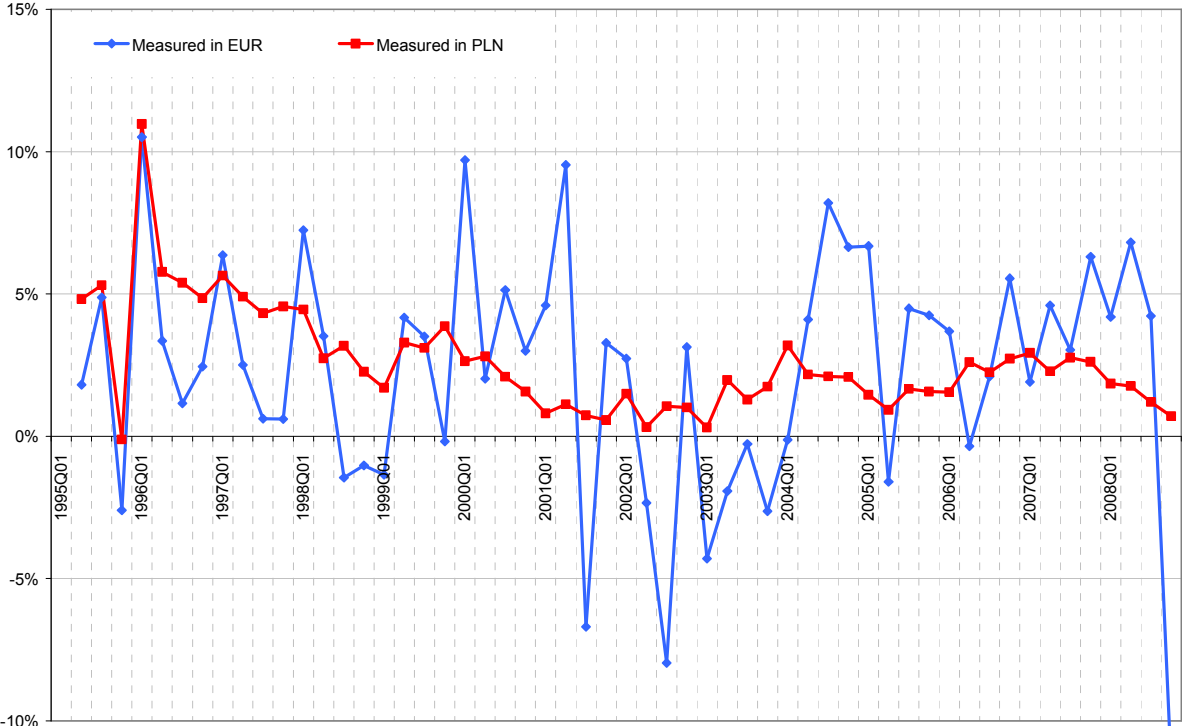
In previous chapters it was implied that the economic activity of a country is measured by absolute or relative economic indicators, the most important of which is the Gross Domestic Product. Figure 9 shows absolute values of the GDP of Poland both seasonally adjusted and not adjusted data. Note that the raw series of data clearly shows that the impact of the season on the economy is significant. The highest economic activity is observed in the 4<sup>th</sup> quarter of each year, while the lowest in the 1<sup>st</sup> quarter. The explanation of this phenomenon might be the Christmas effect (higher sales/spending in that period, no cash in the following period). When all periodical and random fluctuations are removed from the series, we arrive at the seasonally adjusted series of data, which will be used in further analysis. Note, that there is a well established long-run development trend line of the Polish economy. Around that trend there are some oscillations of the GDP, which in fact are invisible in the chart showing absolute values of the GDP.



**Figure 9 Gross Domestic Product of Poland [mln PLN], quarterly data, current prices (period 1995-2008)**  
 Source: Own, based on Eurostat online database. Seasonal adjustments: Eurostat.

Another important issue while analysing the GDP, is the measurement unit. In this research, it is measured in millions of Polish zloty, the national currency of Poland. Currently, there are many analyses published by various international economic agencies, which may present their results based on data expressed in different currencies, thus some attention must be

paid to determining the measurement unit. The difference resulting from data expressed in different currency is evident. Usually, and especially in case of developing countries, the exchange rates tend to be volatile, thus cause disturbances in the GDP measured in a foreign currency. An example is presented in the Figure 10, in which step cycle of the GDP of Poland is presented. One stream of data contains values in New Polish zlotys, another in euros. One can notice, how volatile the latter series is, and how different picture of the economy it shows. For instance, it indicated that Poland has been in recession twice since 1995, which according to values based on the Polish zloty, is obviously not true. Nevertheless, the employment of such data can be used as a supporting indicator of the economy. High value of the GDP expressed in euros may indicate more clearly that the economy is in its prosperity phase – high value of GDP measured in Polish zlotys and strong national currency (a lot of foreign investments in the country). On the other hand, a poor condition of the economy is reflected not only in the low value of the GDP but also in the weak currency, so when these two are combined together, they result in low value of the GDP expressed in euros.



**Figure 10 Step cycle of the GDP of Poland based on data in Euros and Polish Zloty (period 1995-2008)**  
 Source: Own, based on Eurostat online database.

Not only the currency in which we measure the GDP matters, but also the way in which the data is processed later on. The first step, which has been already done, is to eliminate periodical and random fluctuations. The second is to create step and deviation cycles from the series of empirical data.

The step cycle is composed of percentage values calculated as the ratio of the GDP quarter to quarter:

$$step\_cycle\_value_t = \frac{GDPq_t}{GDPq_{t-1}} \times 100\%$$

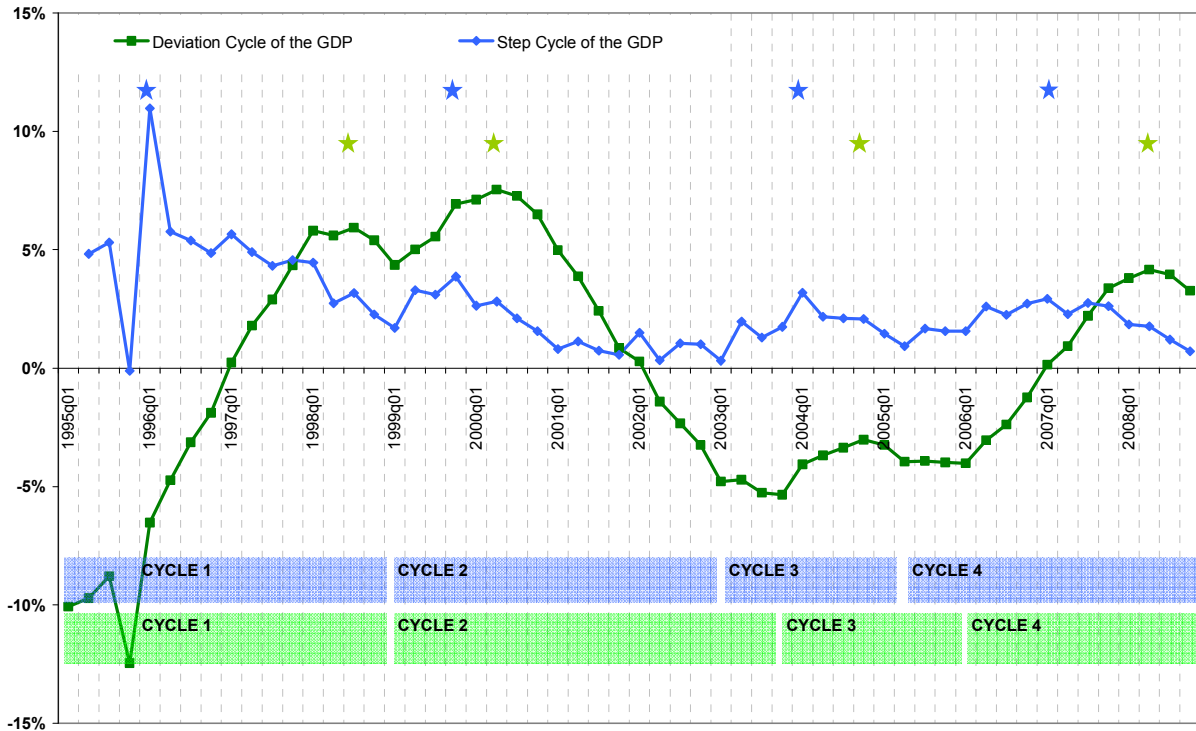
In order to determine values of the deviation cycle, we need to determine the function of the GDP's trend line. In our case it is the quadratic function of the following formula:

$$GDP\_trend = 3,2735x^2 + 3886,9x + 84288$$

The accuracy of the trend line is satisfactory, as its  $R^2$  equals to 0,9837. Having that, we calculate values of the deviation cycle in the following manner:

$$deviation\_cycle\_value_t = \frac{GDP_t - GDPtrend_t}{GDPtrend_t} \times 100\%$$

The result from the above simple mathematical operations is two cycles presented in the Figure 11. The green graph shows the deviation cycle, while the blue graph shows the step cycle. In the upper part of the chart you may notice green and blue stars which indicate the quarter in which the corresponding cycle attained its peak. In the lower part of the cycle green and blue stripes show the length of each cycle.



**Figure 11 Analysis of the economic cycles based on the GDP data presented as step and deviation cycles (period 1995-2008)**

Source: Own, based on Eurostat online database.

In order to determine cycles we assumed the methodology of Bry-Boschan, described in the second part of the Chapter 1. As it can be observed, there have been 4 cycles determined since 1995. A very important observation is that in the analysed period, Poland has never been in a recession, and its q/q GDP dynamics dropped below the zero line (insignificantly) only once. It means that the Polish economy has grown all the time, with a different pace though. In-depth analysis of cycles' morphology is presented in the Table 6.

	CYCLE 1		CYCLE 2		CYCLE 3		CYCLE 4	
	Deviation	Step	Deviation	Step	Deviation	Step	Deviation	Step
<b>Begin</b>	1995Q1	1995Q1	1999Q1	1999Q1	2003Q4	2003Q1	2006Q1	2005Q2
<b>End</b>	1999Q1	1999Q1	2003Q4	2003Q1	2006Q1	2005Q2	?	?
<b>Turning points</b>								
Lower	1995Q1	1995Q2	1999Q1	1999Q1	2003Q4	2003Q1	2006Q1	2005Q2
Upper	1998Q3	1996Q1	2000Q2	1999Q4	2004Q4	2004Q1	2008Q2	2007Q1
<b>Length</b>								
Growth phase	15	5	5	3	4	4	9	7
Decline phase	2	12	14	13	5	5	?	?
<b>Cycle</b>	<b>17</b>	<b>17</b>	<b>19</b>	<b>16</b>	<b>9</b>	<b>9</b>	<b>?</b>	<b>?</b>
<b>Amplitude</b>								
Growth phase	16,0%	11,0%	3,1%	2,2%	2,3%	2,9%	7,2%	2,0%
Decline phase	1,5%	9,3%	12,8%	3,6%	1,0%	2,3%	?	?
<b>Cycle</b>	<b>14,5%</b>	<b>1,7%</b>	<b>9,7%</b>	<b>1,4%</b>	<b>1,3%</b>	<b>0,6%</b>	<b>?</b>	<b>?</b>
<b>Symmetry</b>	Asymmetry	symmetry wrt. amplitude	asymmetry	asymmetry	asymmetry	symmetry wrt. amplitude	?	?
<b>Intensity</b>								
Growth phase	0,064	0,045	0,013	0,004	0,009	0,008	0,030	0,006
Decline phase	0,008	0,014	0,047	0,008	0,004	0,005	?	?
<b>Cycle</b>	<b>0,064</b>	<b>0,024</b>	<b>0,047</b>	<b>0,011</b>	<b>0,006</b>	<b>0,008</b>	<b>?</b>	<b>?</b>

**Table 6 Morphology of the economic cycles of Poland (period 1995-2008)**

Source: Own.

As we have explained already, there is no reliable empirical data of the GDP before 1995. For this reason, I assumed that the Cycle 1 starts in the first quarter of 1995, which might not necessarily be true. However, if I decided to exclude the first cycle from the analysis, the cycle starting in 1999 would be the first one. This would drastically limit the scope of data analysed. What is more, since dependence of the stock exchange on the real economy is going to be investigated, such a long period of time cannot be excluded from the research. What should be realised however, is that the first cycle may not be fully reliable.

Apart from the Cycle 1, three more cycles in the series of data can be determined. Two of them start with exactly 3 quarters delay, when comparing step and deviation cycle, which confirms the point discussed in the Chapter 1, that the step cycle indicates trough earlier than the deviation cycle does. The same situation occurs in case of peaks, where the step cycle is ahead 10, 2, 3 and 5 quarters. This is a very useful piece of information, as it implies that the step cycle is definitely the indicator which allows to observe changes in the economy approximately 3 quarters ahead of the deviation cycle.

A few interesting conclusions resulting from the cycles length can be made. They vary in length, but on average last 14 quarters, which is exactly the length of the cycle said to be normal for developed economies (so called Kitchin cycle<sup>96</sup>). Although so far the divergence from the value 14 is quite high, we may expect it to be reached in the nearest decades. The damping amplitude of the oscillations indicates that the economy stabilises itself around the trend line (just like in the Hicks model, when the acceleration coefficient is smaller than 1, see Figure 5 a). The cycles seem to be less and less dynamic as well, which is confirmed by its intensity, which also suggest that the economy is becoming moderately calm. What diminishes the amplitude of the GDP, is more efficient information propagation among market participants, increasing service output, and just-in-time inventory management<sup>97</sup>. The question which arises, is whether the economic cycles are going to vanish one day. But as it was explained before, the human factor (greed and fear) is not likely to disappear. And for this reason, nor are the economic cycles.

We may also compare growth and decline phases of the cycles. What we may observe, is that growth phases are shorter than the decline phases (oppositely to the Goodwin's model). The asymmetry occurs in terms of the amplitude and the intensity as well. In general, the growth phase is not only shorter (on average 2 quarters), but also of a higher amplitude (on average 0,7%), which confirms Smithies' model, and of higher intensity (on average 0,008).

The comparison of the theoretical features of the modern cycles (see Table 3) to the results obtained implies that the current economic cycles in Poland may be classified within this category. Firstly, the turning points are not always easy to be determined – they become turning zones, a set of points of a similar value. Secondly, the average length of the cycles falls into the 3,5-5 years range. Thirdly, the amplitude of the growth phase is high, which together with the difference in length of the cycles, confirms its asymmetrical structure.

From the above considerations, it can be concluded that Poland, which went through rapid changes in the early 90's, has established its growth trend line around which oscillations

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<sup>96</sup> J. Bernstein, *Cykle Geldowe*, Biblioteka Inwestora, Warszawa 1996, p. 7

<sup>97</sup> A. Greenspan, *The Age of Turbulence: Adventures in a New World*, Penguin Press, New York, 2007, p. 490-491

occur. So far there have been 4 cycles identified, one of which is still lasting. Having analysed their morphology, it can be noticed that dynamics of them is decreasing and the economy is becoming more stable than it used to be after the transformation. Of the utmost importance is the observation that the step cycle indicates turning points on average 3 quarters earlier than the deviation cycle does. Finally, the cycle based on the empirical data expressed in euros can be used as a supplementary tool in the analysis.

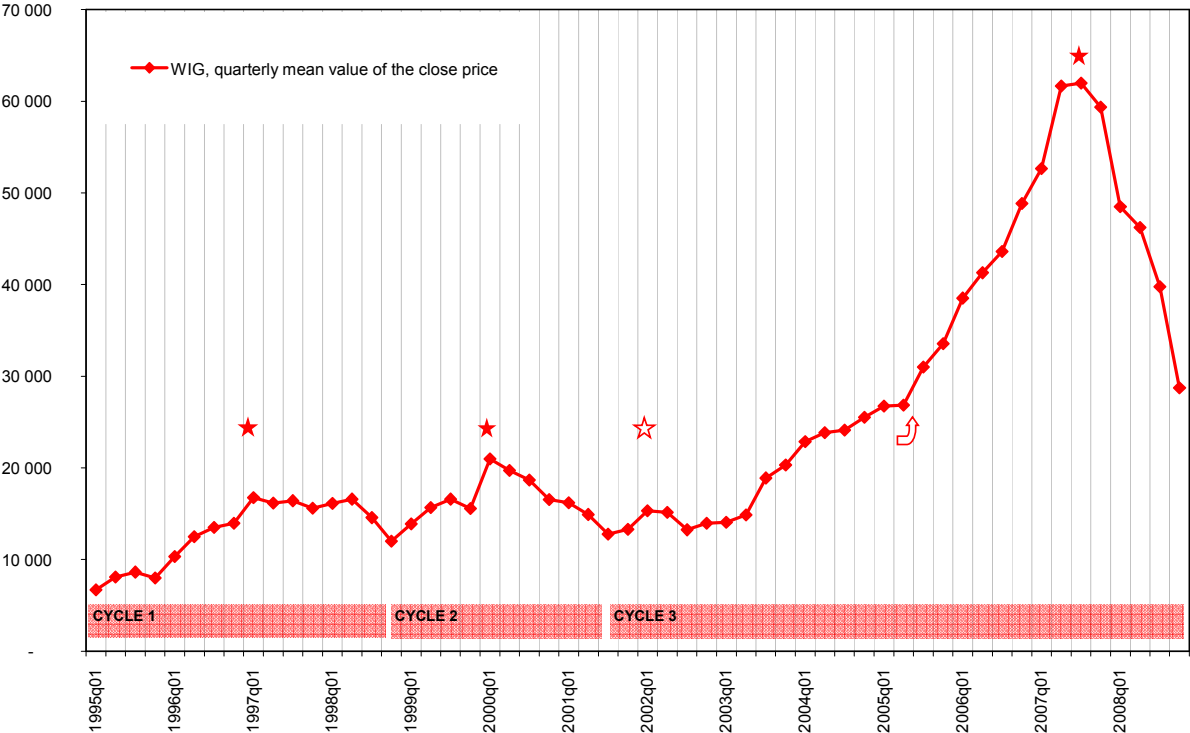
### ***4.3. Cycles on the Polish Stock Exchange***

The stock exchange in Poland has been operating since April 1991. In that time 4 cycles have occurred, one of which has probably not been finished yet. In order to determine the cycles, I calculated the mean value of the close price of the main Warsaw Stock Exchange Index (WIG), and used the same methodology as in case of the economic cycles (Bry-Boschan). However, the morphological features of the stock cycles allow to analyse them without additional data processing (i.e. without step and deviation cycles construction).

The first cycle (let me name it 'Cycle 0') lasted from the first opening bell until the 1<sup>st</sup> quarter of 1995. As the GDP data employed in the analysis cover the time span from the 1<sup>st</sup> quarter of 1995, it is justified to exclude Cycle 0 from further considerations. Let me just mention that it was a very interesting cycle, as it took two years for investors to enter the market. When they finally did, the stock prices went up so high, that from the 1000 points level, they made WIG reach the 20000 points level, which after a rapid slump in the following year, would not be reached again until the year 2000.

In the scope of our interest remain three more cycles, all of which are presented in the Figure 12. The red stripes in the figure represent the duration of each cycle, while the stars – their upper turning points. It can be observed that the main trend line on the Polish stock exchange is positive, and the average quarterly WIG change equals to +3,4%. This however is mainly caused by the last cycle (Cycle 3), which has started in 2001Q3. That cycle is definitively the longest. Its growth phase lasted for 24 quarters and consisted of three sub-phases: a small cycle in years 2001-2002 (see the white star in the Figure 12), moderate

growth till 2005 (white arrow in the Figure 12), and rapid growth till 2007. Prior to that cycle, there were two moderately long cycles of small amplitude (Cycles 1 and 2).



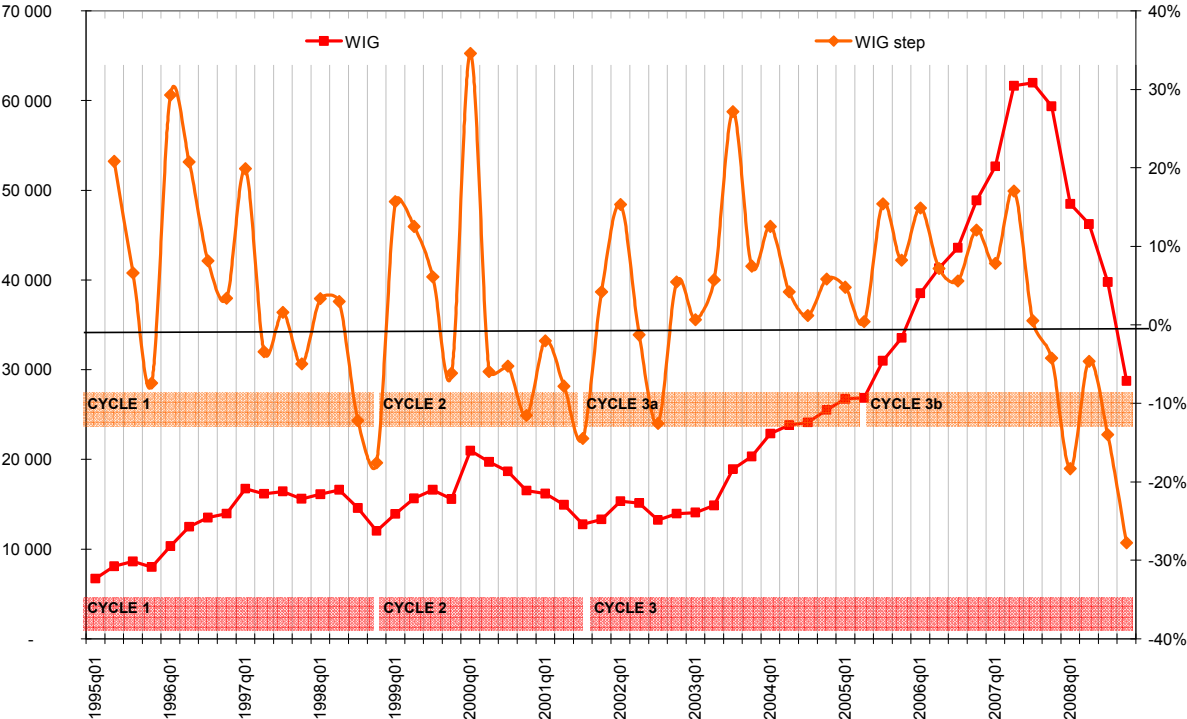
**Figure 12 Growth cycles on the Warsaw Stock Exchange (period 1995-2008)**

Source: Own, based on stock historical data on [www.parkiet.com.pl](http://www.parkiet.com.pl)

The Polish stock market is relatively young, and the Polish economy is in the basket classified as ‘emerging markets’. For this two reasons both foreign direct investment (FDI) and the investment on the Polish stock exchange are considered more risky, than those in the developed countries. Consequently, their growth rate has been much higher (from the first opening bell in Warsaw till the last trading day of the year 2008, WIG increased its initial value by 27 times; at the same time S&P500 increased its value by 2 times). Nevertheless, Poland with its stock exchange is not an isolated island, so all global problems affect it to some extent, and cause its fluctuations – during the Cycle 1 it suffered from the impact of the Asian and the Russian crises, in the Cycle 2 the whole world was affected by the Internet bubble, while the Cycle 3 had its turning point resulting from the subprime crisis. This phenomenon, known as ‘contagion effect’ was explained in the fourth part of the Chapter 1. It obviously implies, that in order to make a successful investment on the Warsaw Stock Exchange, foreign markets must be observed as well. It also confirms the theory by Hayek

and Misses (see in 2.5.3), which states that investments bubbles change their sectors every time.

As it has been already mentioned, the natural features of the stock exchange allow to analyse it without any data processing. The volatility of the index is so high, that we can clearly identify cycles. However, if we decided to construct the step cycle, i.e. a relative change of WIG q/q, we would arrive at cycles presented in the Figure 13.



**Figure 13 Step and growth cycles on the Warsaw Stock Exchange (period 1995-2008)**

Source: Own, based on stock historical data on [www.parkiet.com.pl](http://www.parkiet.com.pl)

As you might learn from the graph, the two first cycles correspond quite well to the original series of data, while the third cycle is split up into two separate ones. Note that step cycles 3a and 3b meet at the point where originally the Cycle 3 accelerated. I will not analyse the morphology of step cycles, as in my opinion original values of WIG are sufficient to conduct analysis of the cycles on the polish stock exchange. The step cycle of WIG might be useful in terms of comparison of it to the step cycle of the GDP, though.

Having analysed the morphology of the stock cycles, summary of which is presented in the Table 7, it may be stated that the stock cycles in Warsaw are different every time (note

however, that only 3 of them are being investigated). They differ in length, shape, amplitude and intensity. Nevertheless, we may draw some conclusions. The first one is that the first two cycles were symmetrical with respect to their length. This means, that it takes similar number of quarters for stocks to grow, and to decline. The second conclusion is that the morphology of the 3<sup>rd</sup> cycle might confirm the statement, which says that the cycle length increases when the stock market capitalisation increases<sup>98</sup>. The third conclusion refers to the cycle's amplitude, which in case of the Cycle 1 washed off approximately half of its growth, while in the Cycle 2 almost all of its growth. The decline of the 3<sup>rd</sup> cycle has destroyed about 50% of its growth so far. Many investors hope that the pattern concerning symmetry with respect to length will not occur in case of the 3<sup>rd</sup> cycle, and that that the amplitude of the decline phase will not increase any more.

	<b>CYCLE 1</b>	<b>CYCLE 2</b>	<b>CYCLE 3</b>
<b>Begin</b>	1995Q1	1998Q4	2001Q3
<b>End</b>	1998Q4	2001Q3	?
<b>Turning points</b>			
Lower	1995Q1	1998Q4	2001Q3
Upper	1997Q1	2000Q1	2007Q3
<b>Length</b>			
Growth phase	8	5	24
Decline phase	7	6	?
<b>Cycle</b>	<b>15</b>	<b>11</b>	<b>?</b>
<b>Amplitude</b>			
Growth phase	10 036	8 955	49 213
Decline phase	4 724	8 293	?
<b>Cycle</b>	<b>5 312</b>	<b>662</b>	<b>?</b>
<b>Symmetry</b>	symmetry wrt. Length	Symmetry	?
<b>Intensity</b>			
Growth phase	3 393	3 012	15 351
Decline phase	1 577	2 858	?
<b>Cycle</b>	<b>3 509</b>	<b>2 670</b>	<b>?</b>

**Table 7 Morphology of the WIG cycles (1995-2008)**

Source: Own.

To sum up, it may be stated, that the morphological features of the stock cycles in Warsaw do not completely confirm the Dow's theory so far, especially at the point in which it claims that the decline phase lasts about 1/4 to 1/3 of the growth phase. What is more, it can destroy more than just 50% of the growth, as it happened in case of the 2<sup>nd</sup> cycle. However,

<sup>98</sup> A. Jagielnicki, *Inwestycje giełdowe*, Helion, 2007, p. 138

the Dow's description of the cycle, and the psychological reasons behind it, seem to find their confirmation on the Warsaw Stock Exchange. It implies, that the value of additional information concerning opinions/predictions/forecasts of other investors (described in the fifth point of the Chapter 3 – How to identify turning points) is crucial for a proper timing of operations.

The final remark regarding the morphology of the stock cycles is that the growth phase lasts quite long (8, 5 and 24 quarters) during which average prices hardly ever fall (Figure 12). This gives plenty of time to make sure that the growth phase has started which, together with the information on 'how to identify a peak' (Chapter 3), might allow to make a relatively reasonable investment.

#### **4.4. Limitations**

The analysis conducted is subjected to some limitations, which may affect the results obtained. It is important to realise that fact, and (if possible) apply other research methodology in future analyses.

The main limitation is the empirical data of the Gross Domestic Product. First of all, the minimal time interval between releases of new data is one quarter. Secondly, it is published with some delay. In case of the Statistical Office of Poland, the first release of data is published within 61 days after the end of reference quarter<sup>99</sup>. Thirdly, as it has been pointed out already, it reflects the past not the present condition of the economy. And what is perhaps the most important, reliable Polish GDP data and the Warsaw Stock Exchange data, cover 14 years time period only, which clearly affects certainty of the results obtained.

Another point which should be considered is the source of data, currency in which it is expressed, and the information whether it has, or has not been seasonally adjusted. One should realise that the same data published by, for instance, the Central Statistical Office of Poland (GUS) and the Eurostat are very often different. No matter what the source of data is,

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<sup>99</sup> Central Statistical Office of Poland, *Final Technical Implementation Report: Drafting Quarterly National Accounts Inventories*, Warsaw 2008, p. 7

provided that it is reliable, the results published by it should be employed in the whole analysis. In other words, one cannot take data from different sources and put them in the same series of data in the analysis.

In order to analyse the stock exchange in the same manner as it is done in case of the economy, the average quarterly values of WIG are calculated. It obviously limits its accuracy, as daily, weekly and even monthly changes are neglected. The justification for such procedure is that it makes the stock cycles comparable to the economic ones. It also helps to understand that in case of the long-run investments, paying attention to every day volatility of the market is nothing else but a bad policy.

Final limitation concerns the methodology used in identification of cycles (Bry-Boschan method). In the GDP series, similar values occur in years 2001-2003, and it is problematic to precisely indicate the trough. In case of WIG, there is a 'small cycle' observed in the beginning of the Cycle 3, however it does not fulfil the conditions assumed in the methodology. For this reason it is suggested to drop the strict rules of the methodology, if it helps conducting further research in the fifth chapter.

The analysis conducted is relatively simple. It requires the GDP and WIG data only. On the one hand, its simplicity is one of the biggest advantages. On the other hand however, more precise results could be obtained and more conclusions could be made, if additional data was employed. Future analysis of the matter could involve other aggregates, namely: national consumption, savings, export, import, etc. Moreover, also more stock indices could be examined, and their cycles determined and analysed. Finally, it would be interesting to compare these two to some leading economic indicators.

#### **4.5. Summary**

In this chapter the economic cycles of Poland and the cycles on the Warsaw Stock Exchange were analysed. The analysis was performed in order to determine their morphological features, and to provide data for investigating the relation between these two aggregates in the following chapter.

Summing the findings up, it can be stated that the Polish economy oscillates around its growth trend line with damping amplitude. It indicates similarities to Hicks' and Smithies' models. Although Poland has never been in a recession (at least not since 1995), four cycles can be identified. As the best tool used for that purpose, the step cycle is recommended.

In case of the stock exchange, depending on the methodology applied, three or four cycles can be found. The general trend line is also positive, however it is mainly the result of the last cycle. What is more, it seems unquestionable that the stock exchange in Warsaw is affected by the contagion effect. As a result, while making investments in Warsaw, attention to foreign markets should be paid.

# CHAPTER 5 RELATION BETWEEN STOCK MARKET AND ECONOMIC CYCLES IN POLAND

## 5.1. Introduction

Up to this moment main necessary information on the economic and stock market cycles was presented, and the analysis of cycles conducted. Having defined them, the ultimate analysis can be conducted – the relation between the Polish economy (measured by the GDP) and the main index of the Warsaw Stock Exchange.

The analysis is conducted in three steps. First, basic relation between the two data series is presented. Cyclical patterns of WIG and GDP are analysed, their correlation is calculated, and simultaneous growth/decline is investigated. Second, supplementary analysis is conducted. Different cycles are constructed, in order to obtain additional information on the cycles' relation. Third, the idea of the investment circle is verified, which is one of the key elements of the paper.

The data employed in the analysis is exactly the same as in the previous chapter. For this reason, it can be assumed that the analysis is subjected to the same limitations.

The crucial issue to be understood before conducting any stock analysis in order to make an investment, is to realise what exactly the relation between the economy and the stock exchange is. One must take cognizance of the fact that stock prices are so hard to predict, because they are themselves predictions of the future<sup>100</sup>. The issue of what exactly they predict, can be still problematic. Nowadays, vast analyses are conducted, which relate the stock exchange not only to the economy, but probably to all phenomena which take place in the world, e.g. sunspots, the hemline indicator, hide and leather prices<sup>101</sup>. This implies that the scope of possible research is in fact unlimited, thus conducting all of them impossible. In the paper, it is assumed and confirmed by theories presented, that it is the economy which

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<sup>100</sup> P. L. Bernstein, *Capital Ideas Evolving*, John Wiley & Sons, Inc, New Jersey, 2007, p. 41

<sup>101</sup> K. Fisher, *The Wall Street Waltz: 90 Visual Perspectives*, John Wiley & Sons, Inc, New Jersey, 2008, p. 192-195, 202-203

is strongly connected with the stock exchange. For this reason, it is justified to carry out the research on the relation between a stock index (WIG) and an economic aggregate (GDP).

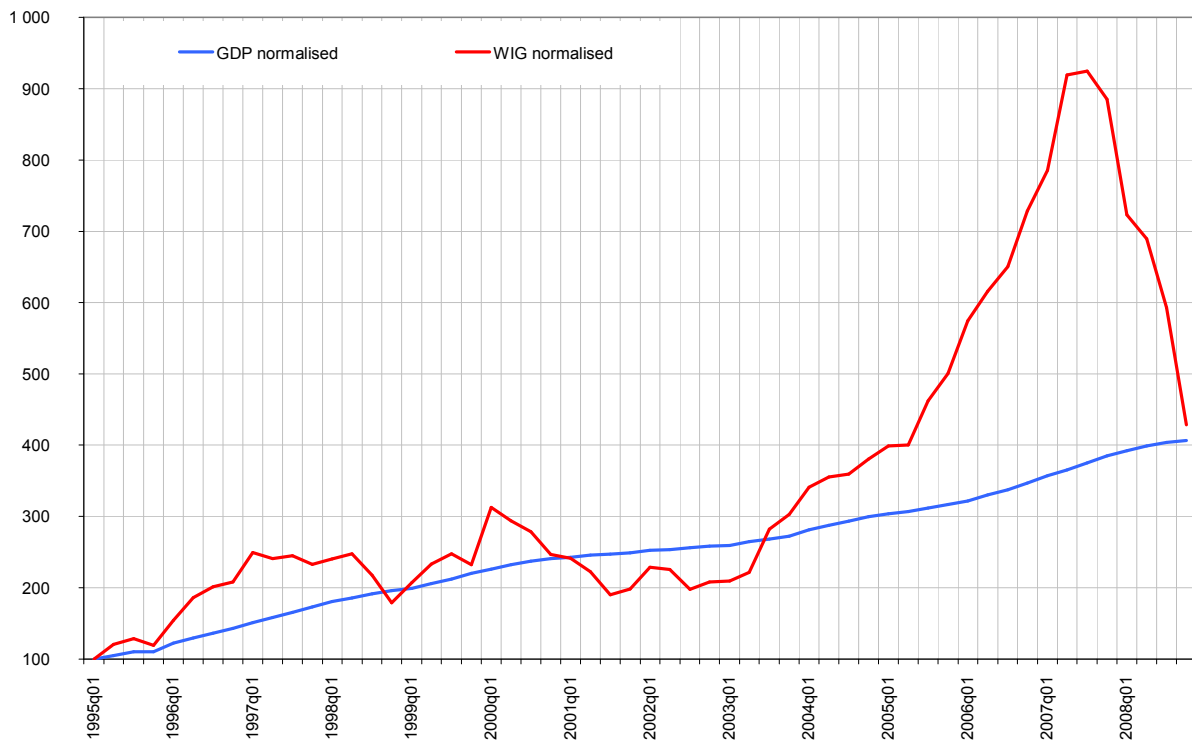
The main objective is to find out, whether the relation between the economy and the stock exchange can provide investors with the information on the 'time window' for their investments. Both the economy and the stock exchange tend to revert toward their mean values in the long run, as any significant divergence becomes recognised, and the market changes its direction<sup>102</sup>. The analysis presented here aims at finding patterns in such divergences. It implies that, to some point, technical analysis tools are to be employed – signals which can be observed in historical charts. On the other hand, the analysis is based on fundamental principles – the impact of the economy on the stock exchange.

## **5.2. Basic Analysis**

The analysis conducted on the common features of stock market and economic cycles in Poland indicates that there are very strong relations between these two aggregates. First of all the correlation coefficient of series of GDP and WIG (average quarterly values) is equal to 0,8292. Both of them have clearly positive trend lines. On average WIG grows 3,4% q/q, while GDP 2,6%. The obvious difference between them is the volatility. In case of WIG, the standard deviations is equal to 12%, while in case of GDP it equals 2%.

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<sup>102</sup> P. L. Bernstein, *Capital Ideas Evolving*, John Wiley & Sons, Inc, New Jersey, 2007, p. 41



**Figure 14 GDP and WIG normalized. Value in 1995Q1 = 100 (period 1995-2008)**

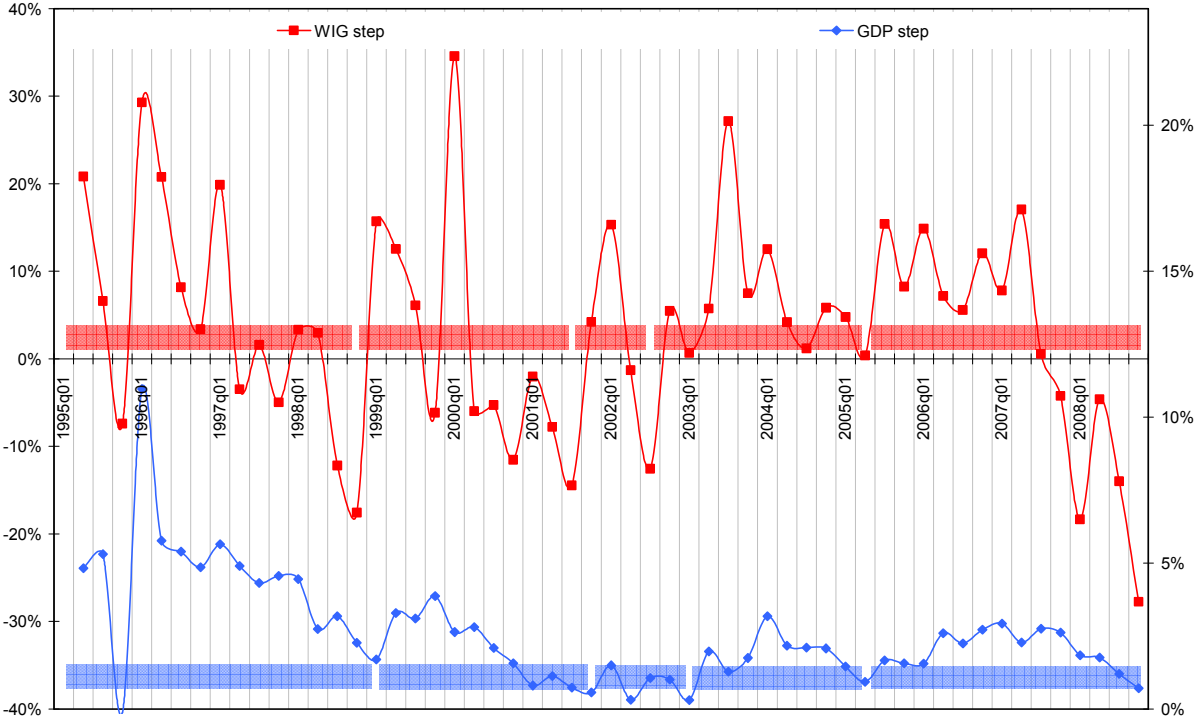
Source: Own.

In order to determine the relation between WIG and the GDP more specifically, let us examine their step cycles. In the Figure 15 they are presented in one chart.

Note however, that the cycles (marked with stripes) differ from those presented in the Chapter 4. The reason for this is because some of the assumptions of the Bry-Boschan methodology are not applied in this part of the analysis, as in case of disturbances lasting from the 2<sup>nd</sup> half of 2001 till the end of 2002, it would make us arrive at misleading conclusions, meaning that Cycle 2 of the 'WIG step' ended in Q3 of 2001, while Cycle 2 of the 'GDP step' lasted till 2003Q1, which makes them incomparable. From the formal point of view, the determination of cycles done before is obviously correct, and the results presented in previous chapters are still valid, as they are based on the actual morphology of these cycles, and the disturbances are their natural feature. Now, the similarity of the two series is analysed, so there is no need to stick to the formal rules applied before.

The analysis of the step cycles of WIG and the GDP confirms that one of the main differences between them is their volatility (note scales on the axes of ordinates corresponding to

them). The similarities can be found in terms of length, despite the fact that economic cycles tend to start one or two quarters later than the stock market cycles.



**Figure 15 Step cycles of WIG and the GDP (period 1995-2008)**

Source: Own.

Having determined some similar patterns between the stock exchange and the economy (Figure 15), let us examine their relation more carefully. It has been already implied that the economic cycle starts one or two quarters later compared to the stock market cycle, which means that the stock exchange reaches its trough earlier (predicts the situation in the economy). In case of peaks the situation is not that clear, however in most cases the peak on the stock exchange occurs either in the same quarter, or it is delayed by one quarter.

The question arises: why the stock market cycle tends to start earlier and reaches its peak later than the economic cycle does? Firstly, long-term trends (both in the economy and the stock exchange) are positive, so this suggests that sooner or later both will grow. The optimism (often enforced by professional analyses and recommendations) about the future results in the increase of the stock prices first, as future companies' profits are expected. Then, when the economic and stock market cycles are clearly visible, investors believe

(hope) that they will last longer than they usually do. That is why stock cycle is longer (but not always). This might be result of the ‘euphoric economy’ explained by Minsky.

An alternative explanation of this phenomenon could be the fact, that there is no short sale on the Warsaw Stock Exchange. It means, that investors in order to earn money must buy shares first. As they believe that the longer they keep them, the higher return they will get, they are willing to buy when the economy is still in its decline phase, and sell when the growth phase is already over. This phenomenon is also enforced by recommendations released by financial institutions, which are often more optimistic than pessimistic (see 3.3).

Apart from peaks and troughs, there are some similarities in other points of the cycles. In order to estimate their value and effectiveness, and to check if the stock market predicts the situation in the real economy, correlation coefficients of the ‘GDP step’ and of the ‘WIG step’ delayed by 1, 2, 3 and 4 quarters are calculated. It is also checked whether the stock and the GDP cycles grow or decline at the same time, or with 1, 2, 3 and 4 quarters delay. The results are presented in the Table 8.

	Stock delayed by number of quarters:				
	0	1	2	3	4
<b>Correlation coefficient</b>	41%	24%	23%	36%	38%
<b>Simultaneous growth/decline</b>	50%	64%	50%	66%	48%

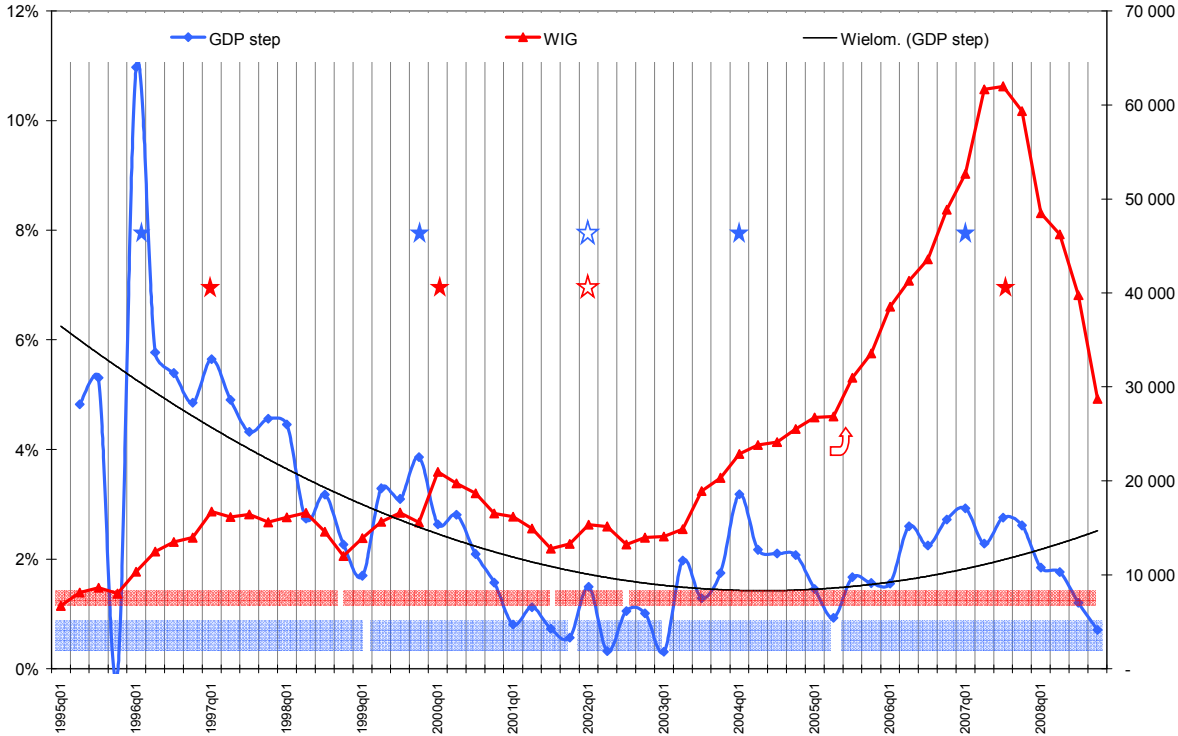
**Table 8 Calculation of correlation between the step cycles of WIG and the GDP**  
Source: Own.

Although the GDP and WIG step cycles seem to be similar when analysed qualitatively, the numbers representing their relation do not really confirm that. The highest correlation coefficient is observed when the ‘WIG step’ data is not delayed, at is equal to 41%, which indicates that there is still a moderately low or medium correlation. The results for delayed WIG are even lower. Interestingly however, the simultaneous growth/decline occurs relatively frequently (66%), when WIG is delayed by 3 quarters. When not, stocks and the economy fall or grow together 50% of the time.

The opposite situation, i.e. when WIG is shifted ahead of the GDP by 1, 2, 3 or 4 quarters, results in correlation coefficient being equal to zero. It means that there is no correlation between them.

**5.3. Supplementary Analysis**

The analysis of cycles can be conducted using different methodology, which includes employing data measured in different currency, or constructing different types of cycles (step, deviation). The supplementary analysis is conducted in order to provide additional piece of information on the relation between the stock exchange and the economy.

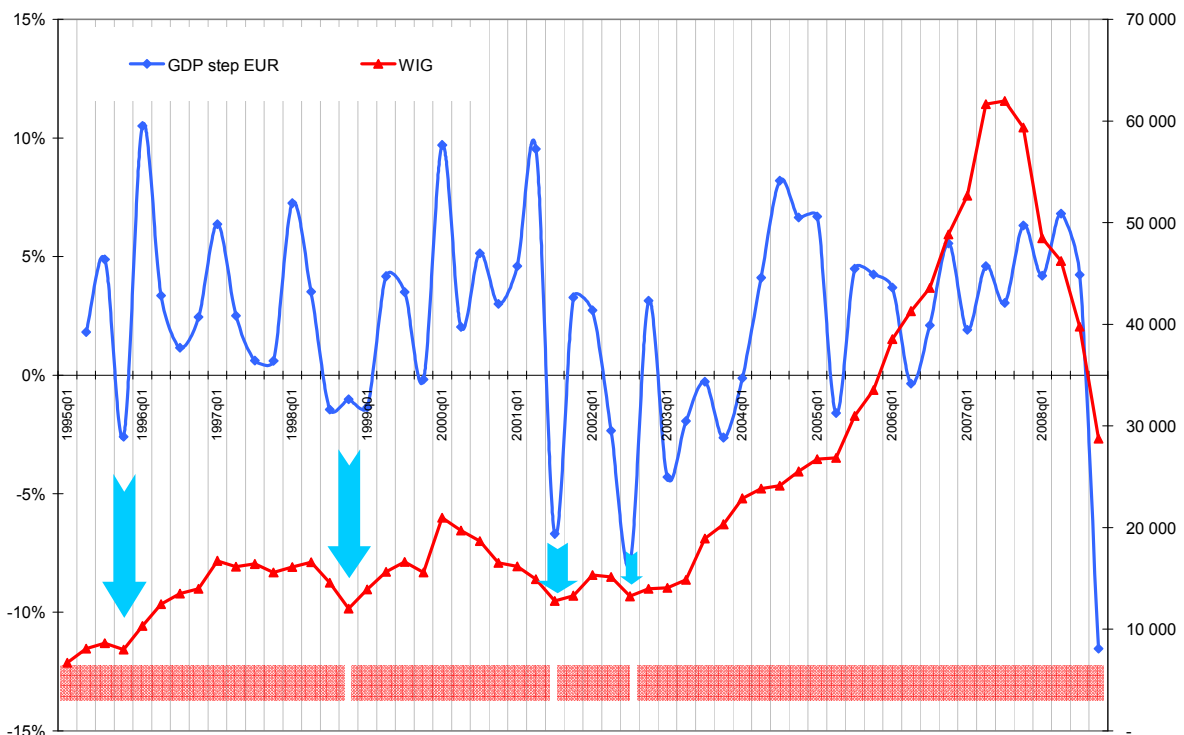


**Figure 16 WIG and the step cycle of the GDP (period 1995-2008)**  
 Source: Own.

In the second point of the Chapter 5 the analysis of the ‘GDP step’ and ‘WIG step’ was conducted (Figure 15). Let us examine the situation in which the empirical values of WIG are presented without further processing of the data. As it can be observed, troughs in the Figure 16 are attained as the Figure 15 (except of the last cycle on the stock exchange, which is not visible on the series of data – we only see the acceleration from 2005Q2). Peaks of cycles, on the other hand, are attained with some delay lasting from 1 to 4 quarters. It

confirms results obtained in the previous analysis – the stock exchange attains troughs earlier than the economy, while peaks later. Because of the fact, that we compare data whose values are completely different, we cannot draw any additional conclusions. The only thing that can be noticed is that whenever ‘GDP step’ pierced its trend line from the bottom, stocks were a good investment for at least 3 quarters. It indicates, that in the era of prosperity and economic growth above its average level, prices on the stock exchange reflect the companies’ development.

So far, all the GDP data employed in the analysis was based on the measurement in Polish zloty. Now, let us examine the step cycle of the GDP of Poland measured in euro. The advantage of this method is explained in the second point of the Chapter 4. Summing it up, the GDP measured in EUR is more sensitive and volatile than the one measured in PLN. As it can be observed in the Figure 17, every time (except of 1999Q4) when the ‘GDP step EUR’ fell below the zero level (meaning that the economy shrinks), the purchase of stocks were a good investment. A rapid slump below that level (-1% and less), indicated the beginning of a new cycle on the stock exchange in Warsaw, or the further growth of the prices. Obviously, the value of the GDP measured in EUR is subjected to the value of EUR itself. For this reason, it must be remembered that currencies are traded in the financial markets as well, so their price levels (due to speculations) can be different from the situation in the economy. When discussing the currency problem, it must be also mentioned, that in a few years time Poland is going to adopt euro as its national currency, which will definitely influence the methodology that will have to be used in the analysis.



**Figure 17 WIG and the step cycle of the GDP (period 1995-2008)**

Source: Own.

The analysis conducted did not employ the deviation cycle. It has been proven that the step cycle is much 'faster' than the deviation cycle is. For this reason, the results of analysis based on the deviation cycle of the GDP (both in PLN and EUR) are not presented in the paper. What is more, in order to determine them, the trend lines must be established, which limits their accuracy from the outset.

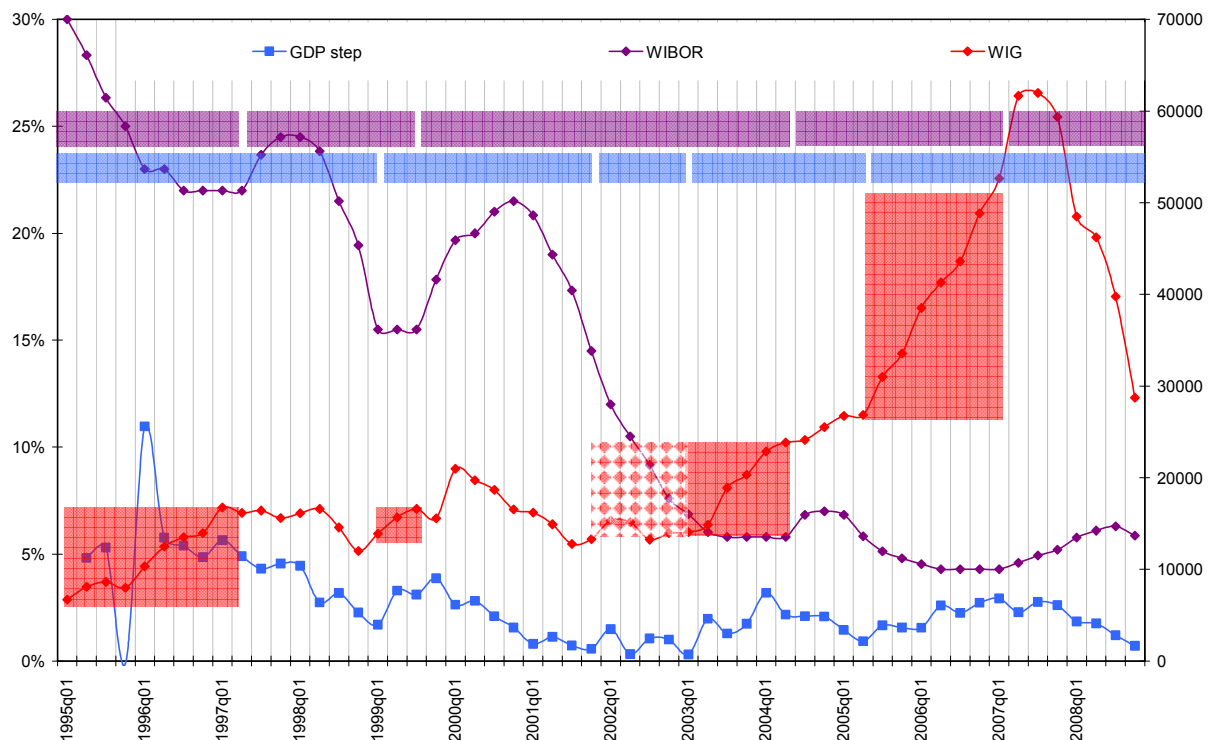
#### **5.4. Verification of the Investment Circle**

The theoretical model explaining situation on the stock exchange and its relation with the economy was described in the Chapter 3. In that chapter the term 'investment circle' was introduced. To cut it shortly, it can be stated that it assigns types of investments to corresponding phases of the economic cycle. The analysis conducted in the second and the third point of the Chapter 5, implies that the best moment of buying stocks on the Warsaw Stock Exchange is usually 1 or 2 quarters before the real economy reaches its lower turning point. Obviously, the methodology trying to forecast the behaviour of the economy is not in the interest of this paper, although some conclusions from the analysis conducted might be useful in the forecasting. Nevertheless, the economic and the stock cycles are in most cases

much longer than 2 quarters, so even a 'late entry' can be profitable. The question of leaving the stock market, or attaining the short position, is a problematic issue for now, as peaks on the stock exchange, although occurring with some delay with respect to the economy, do not follow peaks of the economy in regular time intervals. Thus we need to refer to the investment circle, according to which stocks should be sold when the economy reaches its lowest inflation point, or when the interest rates start increasing (reach their trough).

I strongly recommend using WIBOR data rather than the inflation indices. In the Figure 18 the analysis based on quarterly average values of WIBOR ON (over night) is presented. Any other WIBOR (e.g. 1M, 3M, 6M) could be used as well, as they all change more or less simultaneously. And what matters here, is how they change comparing to their previous values. The WIBOR is a very useful indicator for at least three reasons. Firstly, it measures the risk level and the confidence level in the market. Secondly, its value is established by professionals. And thirdly, it is published on the daily basis.

In the Figure 18, you can observe three series of data combined together, these are: WIG, WIBOR and the step cycle of the GDP. Purple stripes in the upper part of the chart present the duration of the 'WIBOR cycle', the blue one – 'GDP step', while red rectangles show time (from the trough of the economy till the trough of WIBOR) and the corresponding levels of WIG. Since WIBOR and WIG data series are volatile and their changes easily noticeable, we do not construct their step cycles.



**Figure 18 Verification of the investment circle in Poland (period 1995-2008)**

Source: Own.

As it can be observed the investment circle works unquestionably. All investments done according to it would have been profitable. The disturbances lasting from 2001-2002 cause some imperfections (WIBOR did not increase at that time), but even if one invested at that period (e.g. 2001Q4), they would eventually make profits.

Unfortunately, the strategy does not allow to cover the whole growth phase of WIG, because it is recommended to sell shares when WIBOR starts increasing. But one could also wait for about two quarters after the first increase of WIBOR, and then sell the shares. That approach carries more risk, but might result in higher return from the investment.

At that point, each investor should decide whether to enter or to leave the market basing on the additional analysis, namely: employment of different economic data, and conducting research on how to identify turning points (Chapter 3). Moreover, depending on the strategy and the risk-assessment study, one could define the amount of capital that will be invested 'in the area' of a possible turning point, and the amount which will be invested after a certain phase will have started. The optimisation of the investment capital division is another problem requiring additional research.

## **5.5. Summary**

After having dropped formal rules used in determination of cycles (due to disturbances observed in years 2001-2002), 5 cycle-like patterns can be observed both in the economic (GDP) and the stock values (stock index WIG). They have relatively high correlation coefficient (measured in growth cycle) and well established positive trend lines. What differs them, is volatility and timing of turning points. Generally, the stock exchange reaches its trough 1-2 quarters before the economy does, while peaks 0-1 quarters later than the economy (it differs, though). The highest (66%) simultaneous growth/decline is observed, when the stock exchange data is delayed by 3 quarters, meaning that the stock market predicts correctly the direction of movement of the economy three quarters ahead 66% of the time.

The comparison of behaviour of WIG and the GDP, suggests that every time the 'GDP step' is above its average level, stocks are good investment for at least 3 quarters. What is more, every time the 'GDP step' expressed in euro slumps below the zero line, stock investments turn out to be profitable (usually a new cycles starts).

It has been also proved that the investment circle works, i.e. investment decisions based on it can bring profits. Obviously, only the stock part of the circle was analysed in this paper. The outcome of the analysis is that the 'time window' for entering the stock market is approximately 1-2 quarters before the economy reaches its trough, while one should leave it approximately 0-1 quarters after the peak in the economy, or wait up to 3 quarters after WIBOR has started increasing (and sell if WIBOR does not decrease).

Unfortunately, it is difficult to cover the growth phase of WIG entirely. The main reason is that it is problematic to identify the turning points in the economy, as well as the turning points on the stock exchange (the use of the fifth point of the Chapter 3 is of utmost importance). What is more, the GDP data is problematic, since it is released with some delay (see the fourth point of the Chapter 4). What is helpful, is that phases on the stock exchange are quite long, thus an investor has some time to gather all necessary data and make a rational (perhaps only partly rational) decision.



## CONCLUSION

In this paper cyclical nature of the Polish economy, expressed in the Gross Domestic Product, and the main index of the Warsaw Stock Exchange was analysed. The aim was to investigate their relation, and obtain information allowing to find a 'time window' for investments.

In order to do that, general information on the cycles was presented – definition, measurement methods, and morphology. Next, reasons for economic cycles were explained, which allowed us to understand why the economy fluctuates. Finally, the stock market cycles were described, and their main features characterised.

The next step, was the analysis itself. Firstly, the economy and the stock exchange were analysed separately. This allowed to determine their cycles, provide their morphological analysis and confront them with the theoretical models. Having determined the cycles both in the economy and on the stock exchange, their relation was checked. Finally, the concept of the investment circle (the stock part only) was verified.

As for the theories of economic fluctuations, it seems that models presented by Mises and Hayek are the most relevant. They stress the importance of the financial markets in the economic system, explain the role of credit in the economy, and analyse the phenomenon of investment bubbles.

The Polish economy itself, seems to follow the Hicks' and Smithies' model, in which economic oscillations are damped. It is gradually stabilising itself around its growth trend line. What is more, both the Polish economy and the stock market are relatively young, and subjected to the contagion effect (impulses from abroad), but after 1995 Poland has never suffered from a recession.

It has been confirmed that there is a very strong connection between the economy of Poland and the Warsaw Stock Exchange. They have high correlation coefficient, and grow/fall simultaneously 50% of the time. What is more interesting, is the 'predictions made' by the stock market concerning the economy. It turns out that it predicts the

economic trough 1-2 quarters ahead. It also indicates correctly (66% of the time) the growth/decline of the economy 3 quarters ahead.

The similarities between fluctuations in the economy and on the stock exchange allow to make some conclusions regarding investment strategy, especially moments of entering and leaving the stock market. The verification of the investment circle confirms that the time period between the GDP trough and the WIBOR trough is always profitable.

Unfortunately, there are several downsides of such approach. Firstly, there is no guarantee that any of the patterns from the past will occur again in the future. Secondly, it is extremely difficult to identify turning points correctly, especially before they actually occur. Thirdly, there are certain formal limitations resulting from the nature of the data (GDP series) employed in the analysis.

For the reasons listed above, one should treat the outcomes and the methodology of this paper as a supplementary analysis, which indicates when it is relatively safe and reasonable to enter the stock market, and leave it without being exposed to too much risk. Precise identification of the turning points may not be possible. And finally, an independent analysis of the investment itself should be conducted (e.g. valuation of a company, benchmark of investments funds, etc.).



Further research on the matter presented in this paper can include employment of more economic data. Perhaps there is higher relation between the stock exchange cycles and the cycles of national investments, consumption or industrial production. What is more, also more stock indices can be employed, so that it can be checked, what is the sequence of optimal stock investments (BlueChips, MidCaps, etc.) in the cycle. Finally, not only the stock market can be analysed, but all main financial instruments that the investment circle is composed of. The analysis of when cash (bank deposits), bonds, stocks and commodities are most profitable and justified to be included in the portfolio, could result in a strategy bringing profits regardless of what phase of the economic cycle is.

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