Bandura, Oleksandr V.

Article

Economic cycle as a combination of stability and instability in economic development

Reference: Bandura, Oleksandr V. (2019). Economic cycle as a combination of stability and instability in economic development. In: Economy and forecasting (4), S. 5 - 21.
http://econ-forecast.org.ua/?page_id=189&lang=uk&year=2019&issueno=4&begin_page=5&mode=get_art&flang=en.
doi:10.15407/econforecast2019.04.005.

https://doi.org/10.15407/econforecast2019.04.005
JEL: E30, E31, E32, E37

***Oleksandr BANDURA*[1]**

ECONOMIC CYCLE AS A COMBINATION OF STABILITY AND INSTABILITY IN ECONOMIC DEVELOPMENT

It has been empirically proven that the business cycle dating model is inextricably linked with defining the boundaries of periods of stable and instable economic development. The author compares the methods of dating US economic cycles in accordance with the model of the National Bureau of Economic Research (NBER) and the proposed in this article CMI model of cycles. Shown certain competitive advantages of dating CMI cycles based on the CMI model against the NBER model, in which case there may be periods of ambiguity in dating.

The article demonstrates that the use of the author's CMI model for dating business cycles avoids the ambiguities that arise in the official dating of recessions based on the classic US NBER model of cycles. The dating of US business cycles with the CMI model revealed a cumulative effect of reducing unemployment, which explains that even with relatively small economic growth, which, however, lasts for a sufficiently long period of time, a significant overall reduction in the unemployment rate can be achieved.

The equation to determine the cumulative market imperfections first index (ΔP) reflects the current balance between inflation, employment and economic growth for each moment of real (calendar) time and defines fundamental trends, which can be enhanced (weakened) by random events (external shocks, government actions, speculators, etc.). Therefore, despite the single driving force behind economic cycles, which is quantified by magnitude (ΔP), the configuration of each real cycle is unique.

It is shown that the CMI model of economic cycle provides tools to achieve synergies from different types of regulation to maximize economic growth and employment at acceptable inflation by increasing the length of the stability period while reducing the magnitude of cumulative market failure.

Keyword: *business cycle, dating, recession, growth rate, stability, instability, unemployment, inflation, regulation*

The issue of sustainable economic development is a priority for any economy. Different concepts of stability imply a large number of indicators (often even non-economic ones), but key macroeconomic indicators (economic growth, unemployment and inflation) are basic for each concept. In other words, the issues of stability and economic growth can be seen as synonymous, at least in the long run (since without economic growth, it is impossible to meet the ever-increasing standards of living and to withstand technological competition, while ensuring increasingly stringent environmental standards).

[1] **Bandura, Oleksandr Viktorovych –** Doctor of Economics, Assistant Professor, Senior Researcher, State Institution "Institute for Economics and Forecasting, NAS of Ukraine" (26, Panasa Myrnoho St., Kyiv, 01011, Ukraine), ORCID 0000-0002-3543-4461
e-mail: alexban@ukr.net

Statistics show that for any economy, the dynamics of virtually all economic indicators are *oscillatory*, although the amplitude and period of oscillation are different for each indicator. And this is an undeniable empirical fact. However, it is interpreted differently. All economists can be roughly divided into two groups [1]: 1) those who consider fluctuations in economic activity indicators to be natural, that is, they are based on the fact that the root cause of these fluctuations is generated in the economic system itself, so that economic crises (recessions) occurs naturally as well. This approach to the nature of oscillation is called deterministic; 2) those who consider the fluctuations to be accidental (so, in particular, economic crises occur accidentally, and their root cause is rather external (relative to the economic system) negative impulses and shocks, hence supporting the hypothesis of *random fluctuations*. One of the strong arguments in favor of the deterministic views on the nature of economic cycle is the fact that not every negative external shock leads to an economic crisis. The shocks themselves are classified into those related to: 1) supply shocks, 2) demand shocks, 3) external shocks to the economy (including natural disasters, wars, terrorist attacks, etc.), 4) shocks resulting from certain government actions, etc. Thus, the number of possible shocks is much greater than the number of economic crises themselves. And it is unclear why, despite the large number of negative shocks that can occur quite often, crises arise only through the actions of some of them? In practice, after many negative shocks, crises did not occur at all. Moreover, even in the presence of a certain shock effect, one cannot be sure that it is caused by a particular shock. Often, several external negative perturbations occur almost simultaneously (or within a small period), so even after a crisis, it is difficult to determine which accidental shock had caused this crisis.

For example, some economists believe that the economic crisis in the United States and in the world in the early 80's of the twentieth century was caused by the oil price shock (then the absolute record of oil prices was about $42/barrel). In the US, there were also recessions (in 1990 and 2000) when the world price of oil was approaching $40/barrel. And the crisis of 2007-2009 started after the new absolute record of world oil prices at $142/barrel. However, it is unclear why it did not start earlier, for example, in early 2007 (when the oil price repeatedly set absolute records throughout the year) and why the rebound in oil prices to nearly $130/barrel did not lead to a new recession in 2011, as in previous recessions.

Instead, one of the strong arguments in favor of the random fluctuations hypothesis is the fact that there is virtually *no general model* or theory of economic cycles that could explain the root cause of a cycle under any combination of market conditions. Usually a change in conditions causes a change in theory (model) that explains the cycle. Moreover, such a change occurs if the previous theory or model makes errors in predicting or at least timely identifying the beginning of an economic crisis. This state of affairs now only increases the number of adherents to the concept of random economic cycles, creating a myth of fundamental impossibility of developing a common model of economic cycle. However, the absence of a general model of macroeconomic dynamics or economic cycles does not mean a fundamental impossibility of its creation (we will return to this below).

Historically, within the framework of deterministic concepts, the category of "economic cycle" ("business cycle") emerged to characterize the fluctuations of aggregated economic activity. And this is the reason why initially this category was associated with the adherents of the deterministic concept. And representatives of the concept of random oscillations at first generally questioned the very fact of the existence of economic (business) cycles.

For example, the American economist I. Fisher believed that the crises are caused simply by fluctuations around an own mean, and that the content of the idea of cycles goes far beyond the understanding of instability as such [2]. And, for example, T. Sargent believed that most economic statistical series do not reflect the typical patterns that fit within the classic definition of business cycle proposed by the US National Bureau of Economic Research (NBER). However, Sargent noted that the absence of expected spectral samples in the economic data series does not necessarily indicate the absence of business cycles [3]. Fischer was supported by some other economists, such as J. Stock, who believed that before starting to analyze the cycle process, it is important to find out whether there is any evidence that the business cycle is divided into the phases of growth and recession [4].

Statistical tests were conducted to clarify this issue, which confirmed the usefulness of the business cycle concept for *dating* economic data series and refuting Stock's arguments. That is, the results of the statistical tests confirmed the advisability (for convenience and unification) of using the classic NBER business cycle concept to analyze the fluctuations of macroeconomic dynamics, regardless of whether the researcher believes in the regularity of fluctuations or in their accidental character. For example, the mere fact that the ideas of the concept of random economic cycles are embodied in the well-known theory (model) of *real business cycles* (E. Prescott, T. Sargent) may testify to the unification of the concept of economic cycles to describe the fluctuations of aggregated economic activity.

However, the same statistical testing confirmed Stock's idea of the *inexpediency* of further *division of the recession and expansion stages into smaller ones* (recovery, slowdown, depression, speed-up, etc.), since the smaller stages are difficult to identify uniquely in practice [1].

Since macroeconomic dynamics can simultaneously be classified both in terms of periods of stability and instability and in terms of the phases of growth and recession, there must be a correlation between these periods and phases. Obviously, the growth phase may be associated with a period of stability, and the recession phase may be associated with a period of instability. In other words, economic cycle can be seen as a combination of periods of stability and instability in economic development. However, to more accurately determine the relationship between these phases and periods, it is necessary to quantify their boundaries, that is, *to define the calendar dates* of the beginning and end of the phases and periods (that is, to *date* them).

In the absence of universally accepted business cycle theory, which would explain the beginning and the end of phases in any cycle under any market conditions, various rules of empirical processing of statistical series and econometric models or their combinations are used to date business cycles. They include: the NBER rule of classical business cycle and deviation (growth) cycle, the Mayer - Weinberg rule, the rule based on nonparametric algorithm of data series processing, the rule based on the dynamic factor model with Markov switch, etc. [1, 5–7].

The method of classical business cycle, despite its shortcomings [6, 7], was the first to appear and still remains the most common and easy to use. The rest of these methods mostly produce dating results, which are close to the classical NBER business cycle method (although for some years deviations from the classic method may be considerable), which is emphasized, for example, in [1, 7]. One reason for this is that deviations from the classical dating method are both positive (ahead from the classical method's results) and negative (delayed). Moreover, it is not known in advance what sign and amplitude will be in a particular deviation, since these dating methods are not supported by any theory that would explain the reason of the change in cycle phases. Therefore, alternative dating methods predetermine the results of dating that are, on average, close to the classical method, which explains the absence of significant advantages of alternative methods relative to the classical NBED method. Therefore, below we will focus on the business cycle dating methods used by the NBER.

Fig. 1 presents two business cycle dating options suggested by the NBER: 1) the classic business cycle; 2) the cycle with deviations (or growth) proposed subsequently to correct certain shortcomings of the classical cycle (see below).

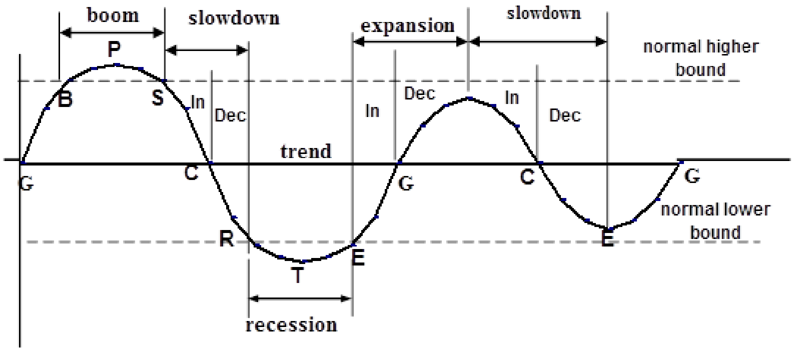

Fig. 1. The diagrams of the classical cycle (according to Burns and Mitchell) and the deviations (growth) cycle proposed by the US NBER

Notes:

B – boom	S – slowdown	C – contraction
P – peak	R – recession	E – expansion
T – trough	G – growth	In – increase
Dec – decline	P, T – the cycle's critical points	

Source: [1].

When the absolute level of business (economic) activity decreases and the recovers over time, this phenomenon is called the "classic business cycle" or simply "business cycle". The foundations of the modern classic business cycle model were laid in 1946 by W. Mitchell and A. Birns, who defined it as a type of fluctuations observed in aggregate economic activity and affecting most companies. Theoretically, the cycle consists of the phases of growth, decline, contraction and recovery. The last phase is followed by the growth phase of the next cycle. Such a sequence of the phase change is recurrent but not periodic. The duration of a business cycle ranges from over one year to twelve years. Within business cycles, no other cycles with a smaller own amplitude are not envisaged.

This relative scale for separating periods of rise and decline of business activities is based on the following two assumptions:

1) the business cycle is a continuous process, that is, growth becomes decline, which in turn becomes growth so that the process repeats itself over and over again;

2) to determine the turning points between rise and decline (recession) only two points (peak and bottom) are needed.

Another definition of business cycle introduced by NBER was called a "deviation cycle" or - more generally - a "growth cycle". The growth cycle is understood as a deviation around the degree of trend change, which reflects periods of acceleration and slowdown in economic activities. The growth cycle has many characteristics in common with the classic business cycle.

Fig. 1 shows the relationship between growth cycles and classic business cycles. The continuous horizontal line characterizes the degree of trend growth for a series of statistical data, and the dashed horizontal line represents a certain standard deviation from this trend. The standard deviation lines in a unique way cover the cyclical amplitude, which distinguishes growth cycles from classic business cycles. Points P and T correspond to the periods of the growth cycles and, at the same time, determine the bottom and the peak for the business cycles, while points S and E determine respectively the highest and the lowest turning points for the growth cycles.

The American economist I. Mintz cites several reasons why growth cycles would be explored as an alternative to the classic business cycle [1]:

1. The dynamics of growth cycles are very close to that of inflation cycles. On average, shifts in economic growth also lead to shifts in inflation during seven months. However, within the mild growth cycles in 1951 and 1962, either such an effect was not observed at all, or the dynamics of these cycles almost coincided.

2. Peak points of the growth cycles follow comparable peaks of classic business cycles. For the US economy, the highest points of growth cycles are reached on average seven months earlier than the peak points of classic business cycles, which is also shown in Fig. 1.

3. Growth cycles are more symmetrical in length and amplitude than classic business cycles. For example, between 1948 and 1982 in the United States, average rising phases in the growth cycles lasted 22 months, while average downturn phases lasted 21 months. The understanding of the average value here is quite variable, while the adjacent phases of growth cycles are quite similar in duration. Thus, the growth phase, which began in March 1975 and ended in December 1978, lasted 45 months, and the subsequent phase of the growth cycle lasted 48 months.

There is a difference in the dating of classic business cycles. The recessions of classic business cycles between 1948 and 1982 lasted on average 11 months, while the duration of the growth phases was more than three times greater (a comparison of the results of dating by different business cycle models is given below in Table 2).

4. The US Department of Commerce's Leading Indicator Composite Index is used to predict growth cycles better than traditional business cycles. The decrease in the composite index of the leading indicators corresponded to the ten phases of the growth cycle decline from 1948 to 1982.

While all these arguments encourage the study of growth cycles together with classic business cycles, doubts remain. True, dating a recession based on growth cycles is more challenging and ambiguous than dating based on a classic business cycle model, because the former is related to measuring the growth rate in relation to its trend, which is difficult to define unless it is constant in time (a constant). Then a question arises: why is a section line needed on the growth cycle diagram? Studies conducted by the US NBES for the recent fifty years have convincingly demonstrated that the dynamics of classic business cycles more clearly explain and describe economic developments in relation to certain critical points. *That is why the official dating of US business cycles is carried out by NBER based on the classic business* *cycle model* and is recognized by any institution both in the US and abroad, introducing a kind of standard in dating cycles [8].

Standardization in dating the turning points of business cycles provides economists with a common point of reference in the analysis of economic activities. The overall sense of introducing such standardization is the same as, for example, that of the introduction of electricity standards. If some economists disagree with the NBER dating results, a situation arises, which is similar to the situation in computer industry: early in the development of microcomputers, there were no generally recognized standards and often the software did not match a particular system, as it was often created for a completely different one.

Since the economy cannot automatically remain in a state of growth, there is a widely recognized need for regulators to keep it in that state. At present, it is difficult to find a market economy where regulation is not implemented to varying degrees. That is, regulatory policy is a prerequisite for maintaining economic growth and expansion. However, criteria, timeliness of the use of tools and the depth of such regulation, due to its ambiguity, are a topic of constant debate.

Inflation, growth rates and employment are key macroeconomic indicators and can therefore be considered as the main quantitative indicators for the periods of stability and instability. Each of them at any given time depends on a large number of factors, whose impact is difficult to define precisely because their parameters and weights are constantly changing. Moreover, the same factors can affect each of the three key metrics differently, creating their unique combinations, which in turn affect each indicator separately.

There have always been attempts to empirically identify and develop a model (equation) that links at least two (and preferably all the three) key macroeconomic indicators, such as the Phillips curve linking inflation and unemployment, or the Taylor rule, which, with the use of empirical coefficients, links growth and inflation, but discussions continue on these issues. *Developing such a model would allow control over several key macroeconomic indicators (linked by one equation) at a time, targeting only one indicator.* However, the main problem here is the local character of this type of model, its inability to become common or adequate under any market conditions and at any point in time, such as Polterovich (1998) - for the Phillips curve [9] and Ofani (2002) - for the Taylor rule [10]. But the relevance of the creation of such a general model (equation) is only increasing over time as the use of *several key macroeconomic indicators (linked by one equation)* as a single target for the regulators'' actions (for example, attempts with the Taylor rule) would open up new opportunities to raise the efficiency of regulatory policies aimed at ensuring the stability of economic development.

However, in the recent decade, the task of developing an equation (stability criterion) that would link the key macroeconomic indicators has become more complicated. The problem is that the contemporary (after the Great Recession) dynamics of economic growth, inflation and employment (unemployment) contradict the classical theories that are to explain it. For example, according to the classical theory of economic cycle, acceleration of economic growth should lead to an increase in commodity prices, an increase in production costs, a decrease in unemployment, a rise in wages, which theoretically should speed up inflation. And the well-known Phillips curve reflects the inverse proportion between unemployment and inflation.

But the main surprise for regulators was the low inflation rate (below the target set by the regulator) practically from 2008 to 2017, because due to the QE policy (October 2008 to November 2014), $ 4 billion was "infused" into the US economy. Moreover, the US unemployment rate dropped to 3.5% in early October 2019, which was the lowest level since at least 50 years before (see Figure 4), which, according to classical economic theories, should also have stimulated inflation.

Actually, the current level of unemployment in the United States should match the "overheating" of the economy, because it is below the average natural level. Under such conditions, according to well-known theories, economic growth rates should be higher than average or even maximum in the current business cycle. For example, some scholars believe that "Achieving full employment and, consequently, potential output means production is on the limit of the economy's producing capacity" [11, p. 425)]. However, it is unclear why, with a maximization of employment above natural level (3.5% for the United States), the rates of economic growth are almost half the average (Fig. 4).

Thus, the modern dynamics of all the three key macroeconomic indicators demonstrate their certain *divergence*, which requires appropriate reflection in the equation (stability criteria) that binds them. And a manifestation of this divergence is the violation of classical laws and regulations (Phillips, Taylor), which explain the relationship between inflation and unemployment and between economic growth and inflation. That is why, in the general case, the stability criterion should not only reflect all the three key macroeconomic indicators but also explain the deviations from classical laws. In particular, explain the relatively low rates of economic growth at record low unemployment.

We will show that this problem can be solved within the CMI model of economic cycles. The main elements of the CMI-model were presented, for example, in [12], where it was proven that the magnitude of the cumulative market imperfection is proportional to that of latent overspending of production resources (in the exergetic dimension) compared to the technologically achievable minimum (ΔE). The magnitude of ΔE is proportional to that of the *difference* (Δ**P**) between the calculated level of natural (equilibrium) prices, $\mathbf{P_0}$ (at GDP deflator for natural prices) and the level of actual market prices, **P** (at GDP deflator for market prices).

Figure 2 presents a theoretical diagram of CMI-model for business (economic) cycles. The cycle consists of two phases: economic growth (recovery) and recession (contraction). These phases are separated with macroeconomic equilibrium points (E1, E2, E3), in which the magnitude of Δ**P** = 0. At these points, the economy moves from the phase of growth to the phase of decline and vice versa.

To understand the relationship between the *classic US NBER business cycle model* (Fig. 1) and the CMI-model (Fig.2), Figure 1 shows the critical points (peak and trough) corresponding to the classic NBER model.

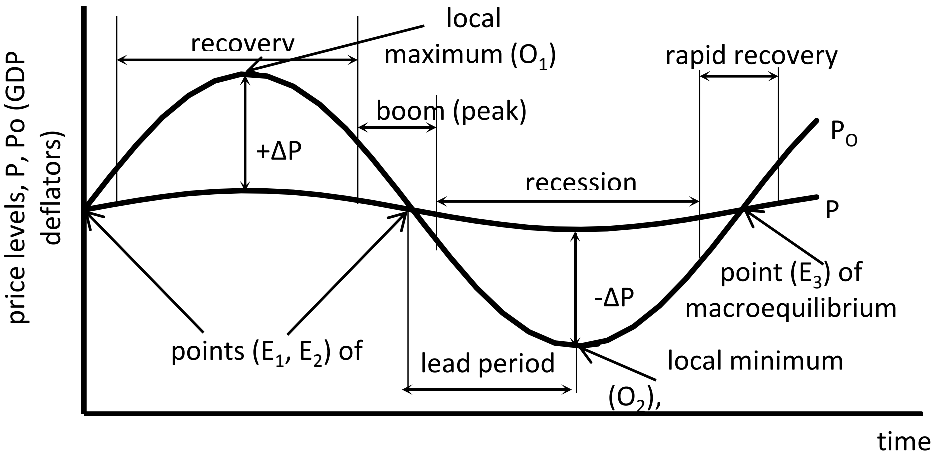

Fig. 2. The author's CMI-model of the economic cycle

Notes: E1, E2, E3 - macroeconomic equilibrium points, cycle turning points;
ΔP – cycle driving force

If ΔP > 0, then there is an economic growth, if ΔP <0, then there is a recession. The points where ΔP = 0 are the turning points of the economic cycle and of the macro equilibrium at the same time. That is, the value of the latent cost over-expenses of production resources (ΔE), which can be estimated based on the magnitude of $\Delta P = P_o - P$, is the initial driving force of the economic cycle.

The initial driving force of macroeconomic dynamics ($\pm\Delta P = P_o$ - P) in the general form can be represented as:

$$\pm\Delta P = \frac{\begin{pmatrix} maximum\ efficiency\ for\ the \\ production\ resources \\ usage\ or\ minimum\ production \\ cost\ for\ GDP \end{pmatrix} * (\text{money supply})}{(\text{sum of natural resources at the economy input})} - (\text{inflation}) \qquad (1)$$

Equation (1) takes into account all the three main macroeconomic indicators: 1) inflation (directly); 2) rate of economic growth (mediated by the value of ±ΔP: at ΔP> 0 natural prices are higher than market ones, which creates an incentive to expand output when market prices rise and vice versa); 3) employment (indirectly, as a component of the total cost of production resources).

In theory, the rate of economic growth is the greater the smaller is the positive value of ΔP (i.e. during the stability period), and the maximization of growth rates is achieved at ± ΔP → 0 (ΔP> 0), since the value of ΔE is minimal. And at ± ΔP → max, one can expect a certain slowdown in the growth rate immediately before the local maximum points and its acceleration immediately after passing these points. This effect of growth rate slowdown with subsequent acceleration is most evident at ΔP > 0 (in the growth phase), since at ΔP <0 this effect only accelerates the overall "economic downturn" ("dissolving" in it).

The maximization of ΔE at ±ΔP → max is the force that changes the direction (sign) of the ΔP trend and causes over time a mutual gravity between natural (Ro) and market (P) prices, that is, the curves of natural and market prices over time are always intersect when ΔP = 0.

Since the NBER business cycle models reflect the final aggregate product (Fig. 1) without explaining the driving force behind its creation, and the business cycle CMI-model (Fig. 2) reflects the incentives to produce the final product (which both represent the driving force of the cycle), then the main difference between CMI-model *is the presence of a* "*lead-in period*" (the period of time between the signal of a macroeconomic trend change and the actual start of this change) for each turning point of the cycle, which opens new opportunities for both forecasting and dating of the business cycle. For *empirical verification* of these theoretical conclusions, in Fig. 3 the schematic CMI-model (Fig. 2) is presented for the US economy in calendar time.

Fig. 4 shows that the time periods when ΔP> 0 can be considered as *stability and growth* phase for the US business cycle, because in this phase growth rates remain positive (despite possible fluctuations) and the unemployment rate is actually steadily decreasing. On the contrary, the period when ΔP < 0 can be considered as a phase of *instability that includes recession*. In this phase, the average annual rate of economic growth begins to steadily decline (until it becomes negative) and unemployment rises. At the same time, the unemployment rate is, by its nature, a lagging indicator [1], i.e. it responds to a change in the macroeconomic trend with a time lag in relation to economic growth. Therefore, the downward trend in the unemployment rate starts a little earlier (by one year, Figs. 3, 4) and ends also later (by one year) relative to the time period when ΔP> 0.

Also Fig. 4 shows that economic growth rate is the greater the smaller is the positive value of ΔP (i.e. during the stability period) and maximization of the rate is achieved at ΔP → 0. To prove this, the average annual GDP growth rates for the US economy for different ranges of ΔP are presented in Table. 1.

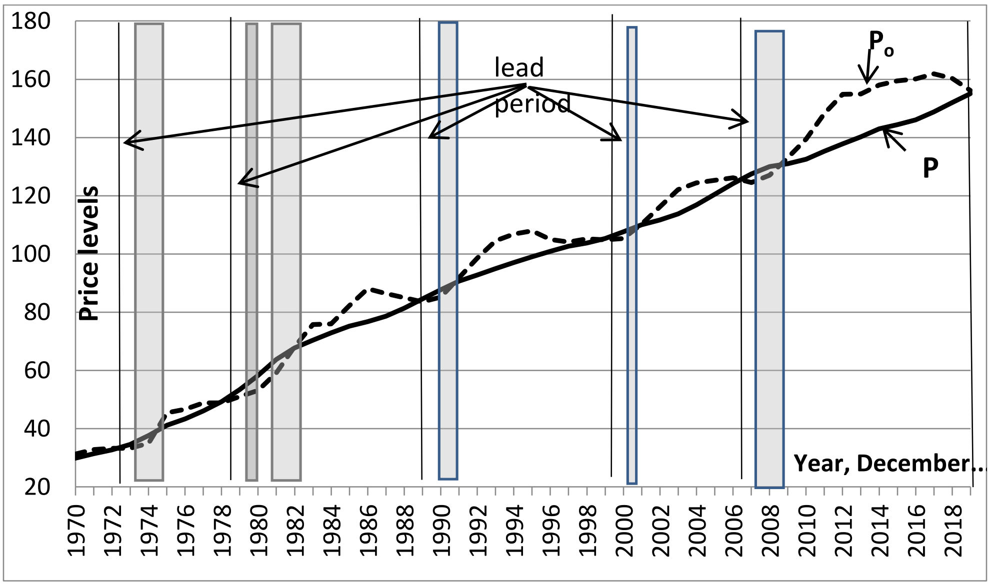

Fig. 3. Dynamics of market and natural prices, as well as recessionary signals of CMI-model for the US economy

Source: Constructed by the author. Gray bars are the official duration of recessions in the US (www.nber.org)

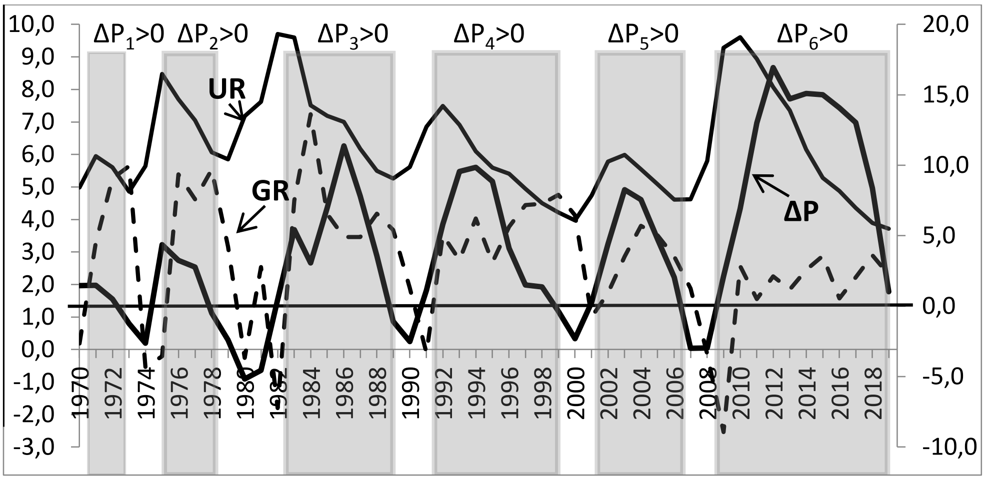

Fig 4. Dynamics of cumulative market imperfection (ΔP) according to CMI-model of economic cycles (left scale), average annual unemployment rates (UR, %) and economic growth rates (GR, %) (right scale) for the US economy

Note: the gray area (where ΔP> 0) corresponds to the growth (stability) phase according to CMI-model.

Source: (ΔP) - author's calculations; average annual unemployment rates [13] – according to: https://www.bls.gov; economic growth rates [14]: https://www.bea.gov

Table 1

Annual growth rates of US GDP for various ΔP ranges, 1970–2018.

Difference between market and natural prices (Δ*P*), *%*	**Annual GDP growth rates**, *%*
from -2.5 to -10.5	1.0
from 3.5 to -2.5	4.1
from 10 to 3.5	3.4
from 20.2 to 10	2.4

Source: author's calculations.

CMI-model combines the benefits of both the NBER approach to dating US business cycles and those provided by the theory to explain the shift in economic trends.

Table 2 presents the results of the dating of US business cycles based on two NBER models (the classic business cycle model and the growth cycle model, Fig. 1) and the proposed CMI business cycle model (Fig. 2).

As can be seen from Table 2, the results of the dating of US business cycle based on the CMI-model can be seen as a synthesis between the two NBER-based datings: the classic business cycle model and the growth cycle (deviation) model. However, based on the CMI-model, the above mentioned anomaly can be explained: *why, with relatively low US economic growth rates during the 2009–2019 growth phase, did the unemployment rate drop to a record low over the past 50 years (3.5%)?*

To explain this anomaly, Table 3 shows duration of the growth (stability) phases, dated with the CMI-model, and the growth phases dated with the classic NBER business cycle model (official dating) from 1970 to 2019. For each phase, average quarterly growth rate (%) and increase (decrease) of unemployment rate (%) are calculated over the same period.

Table 2

Dating critical points of US business cycles in the model of classic business cycles, model of cycles of deviations (growth) (US NBER approach, Fig. 1**) and in the author's model**

Classic business cycle (official dating)	Growth cycle	CMI-model of business cycles
Peak December 1969 Trough November 1970	High March 1969 Low November 1970	n/a ΔP > 0 December 1970
Peak November 1973 Trough March 1975	High March 1973 Low March 1975	ΔP < 0 July 1973 ΔP > 0 May 1975
Peak January 1980 Trough July 1980	High December 1978 Low ----------------	ΔP < 0 March 1979 ΔP > 0 ----------------
Peak July 1981 Trough November 1982	High ---------------- Low December 1982	ΔP < 0 ---------------- ΔP > 0 May 1983
Peak ---------------- Trough ----------------	High July 1984 Low January 1987	ΔP < 0 -------------- ΔP > 0 --------------
Peak July 1990 Trough March 1991	High February 1989 Low -----------------	ΔP < 0 November 1989 ΔP > 0 July 1991
Peak March 2001 Trough November 2001	n/a n/a	ΔP < 0 July 2000 ΔP > 0 September 2001
Peak December 2007 Trough June 2009	n/a n/a	ΔP < 0 December 2006 ΔP > 0 July 2009

Source: Classic cycle: www.nber.org_cycles_cyclesmain.html.pdf; growth cycle: according to [1]; CMI cycle model: the author's calculations.

Table 3

US Quarterly average economic growth rates (%) and gains in unemployment rates that were determined according to classical NBER (Fig.1) and CMI (Fig.2) models for 1970-2019.

(1) Dates of recovery by CMI-model (ΔP > 0), [quantity of quarters]	1971(I) - 1973(I) (ΔP_1) [9]	1975(II) - 1979(I) (ΔP_2) [16]	— —	1982(IV)- 1989(I) (ΔP3) [26]	1992(I)- 2000(I) (ΔP_4) [33]	2001(IV) - 2006(IV) (ΔP_5) [21]	2009 (III) - 2019(III) (ΔP_6) [40]
(2) Dates of recovery by NBER model, [quantity of quarters]	1971(I) - 1973(IV) [12]	1975(II) - 1980(I) [20]	1980(IV)- 1981(III) [3]	1983(I) - 1990(III) [31]	1991(II)- 2001 (I) [40]	2002(I) - 2007(IV) [24]	2009 (III) - 2019(III) [40]
Quarterly average economic growth rates, %, for periods (1) and (2), [quantity of quarters]	6,2[9] 5,2[12]	5,1[16] / 4,3[20]	— / 4,5[3]	4,6[26] / 4,3[31]	3,9[33] / 3,8[40]	3,0[21] / 2,9[24]	2,3[40] / 2,3[40]
Gains in unemployment rate, %, for periods (1) and (2), [quantity of quarters]	-1,1 [9] / -1,2 [12]	-3,2[16]/ -2,7[20]	— / -0,1 [3]	-5,6[26]/ -4,9[31]	-3,4 [33]/ - 2,7[40]	-1,3[21] / -1,0[24]	-6,5 [40]/ -6,5[40]

Source: author's calculations based on data from: US Bureau of Economic Analysis (www.bea.gov), US National Bureau of Economic Research (www.nber.org) and US Bureau of Labor Statistics (www.bls.gov).

As can be seen from Table 3 and Figs 3, 4, each growth phase in CMI-model is shorter than the growth phase in NBER model by the amount of the lead-up period (and the recession phase is larger by the duration of that period). During this period, the ΔP value has already become negative, but is still an insignificant magnitude. This means that although the recession process has already begun, only a small number of the least competitive firms and economic sectors are "experiencing" a recession. During this period, statistics generate mixed signals (positive and negative) for the economy, which characterizes the instability of its development. While overall positive figures are still outweighed, economic growth is steadily declining and the overall increase in economic growth over the lead-up period is negligible. For example, for the period 1991–2001, it is (42.6–39.4) = 3.2%, which is only 8% = (3.2 / 42.6) of the total for the official growth phase (Table 3). Instead, the unemployment rate continues to fall significantly (3.4-2.7) = 0.7%, which is 26% = (0.7 / 2.7) of the official growth phase.

As can be seen from Table 3 and Fig. 4, only for dating business cycles with CMI-model, reduction of unemployment has a cumulative effect, which explains the above anomaly. In other words, even at relatively low rates of economic growth, which, however, continue for a sufficiently long period, it is possible to achieve a significant overall reduction in the unemployment rate. However, economic growth also affects unemployment rate. For example, despite the fact that the period of growth (stability) of ΔP4 was slightly larger (33 quarters) than in the period of ΔP3 (26 quarters), unemployment decreased significantly greater during the period of ΔP4 (by 5.6%) than during ΔP3 period (by 3.4%) because the growth rates with ΔP4 were higher (4.6%) than with ΔP3 (3.9%).

Besides, the use of CMI-model for dating business cycles also avoids certain ambiguity (error) that occurs when official dating is based on the classic NBER model. One of the reasons for the significant time lag (12 to 24 months) [15] in the official dating of business cycles is the NBER's efforts to avoid reviewing official dating results over time. The smaller the decline in GDP during a recession, the greater the ambiguity and the likelihood of error as a result of planned revisions that are performed until full data are available to calculate GDP. Thus, the beginning of one of the shortest and mildest recessions in recent 50 years (Fig. 4) was officially dated by the NBER as March 2001, while actual GDP growth first declined in the first quarter. (Usually, in order to acknowledge the beginning of a recession, this increase should be negative for two quarters in a row). However, the final revision of GDP data (which took place almost two years after the first release of GDP data for the III quarter in April 2000) changed GDP growth from + 0.6% to -0.5%, i.e. this revision showed that the recession began already in the third quarter of 2000. [15] For the first time in the history of its datings, the NBER considered reviewing the official dating of this recession not as March 2001, but as November 2000, as stated by the then chairperson of the NBER business cycles commission, Stanford University professor R. Hall [16].

However, the situation was saved thanks to the planned revision of the base year of GDP calculation, which usually takes place every five years. That is, the recalculation of GDP at the prices of another year again made the GDP positive in the 3rd quarter 2000, so the official date of the beginning of this recession was not revised.

However, if the dating of the US business cycle is based on CMI-model, then such an ambiguity would not arise (Table 2), which also testifies to a more adequate principle of dating of business cycles based on this model, compared to the official dating based on NBER, which is an empirical model of classic business cycle. Theoretically, CMI-model is fair in any market environment and in any country. It has also been shown empirically that this model is valid for Ukrainian economy as well [17].

Thus, if we use the classic NBER model for business cycle dating, then periods of stability and instability do not coincide with periods of growth and recessions. Usually, before entering a recession, the economy already shows signs of instability when statistics "give out" mixed signals (that is, some indicators indicate the beginning of a recession and some indicate continued growth). Therefore, the period of instability will be longer than the recession by the magnitude of the anticipation period (Figs. 2, 3), and the period of stability is correspondingly shorter than the growth phase in the same period.

If we use the media model to date business cycles, the phases of growth and recession coincide with periods of stability and instability. That is, the ratio of cycle phases to periods of stability and instability depends on the principle of dating economic cycles, and on the principle of determining the start and end times of growth and recession. And the principle of dating cycles, in turn, is determined by the accepted model of economic cycle.

Maximizing economic growth at $\Delta P \rightarrow 0$ (Table 1) and inversely proportional interdependence between the unemployment rate and the duration of the phase of economic growth (sustainable development), which is determined by the time period when $\Delta P > 0$ (Table 3, Figure 4), empirically confirm that equation (1) indeed takes into account the dynamics of economic growth and employment (unemployment). In this case, the inflation dynamics are directly taken into account in the value of the ΔP.

Equation (1) for ΔP also establishes relationship between macroeconomic and microeconomic indicators for each of the i^{th} sectors of the economy. This opens up opportunities for sector-specific regulation to influence the key macroeconomic indicators. Moreover, effectiveness of the regulators can be controlled through the magnitude of ΔP.

For example, according to equation (1), the application of the monetary policy of quantitative easing in the USA from 2008 to 2014 significantly increased money supply (M), which led to a sharp increase in (ΔP) (Figs. 3, 4), and therefore almost halved the average rate of economic growth. At the same time, in some quarters the growth rates even became negative (for example, 2011 (I) = -1.0%; 2011 (III) = -0.1%; and 2014 (I) = -1.0%) [14], which raised concerns about the possibility of a new recession (using the classic NBER dating scheme). This concern can even be described as a temporary zone of instability in the growth phase, given GDP data.

However, if, during this period, other US regulators were able, for example, to encourage innovation in certain sectors (macro-levels) and reduce the minimum cost of GDP generation in equations (1), it would contribute to a reduction in ΔP and, as a consequence, acceleration of economic growth and further employment growth (macro-levels) over the period 2009–2019.

Conclusions and recommendations

1. Based on the identification of relationship between the phases of economic cycle and the periods of stability and instability of economic development, the author

proposes a quantitative method for more adequate identification of the calendar limits of these periods.

2. Compared the methods of dating of economic cycles based on the model of the National Bureau of Economic Research of the USA and the proposed in the article CMI cycles model. The author shows the benefits of the CMI-based business cycle dating compared to the NBER model, which may give rise to ambiguous dating periods.

3. Relationship between the growth and recession phases of economic cycle and the periods of stability and instability depends on the principles of dating cycles and determining the start and end times of the growth and recession phases. While the principle of cycles dating, in turn, is determined by the accepted model of economic cycle. If you use the classic NBER business cycle model to date them, then periods of stability and instability do not coincide with periods of growth and recessions. The period of instability will be greater than the recession by the magnitude of the anticipation period, and the period of stability, correspondingly, will be smaller than the phase of growth for the same period. If you use the CMI-model to date business cycles, the phases of growth and recession do coincide with the periods of stability and instability.

4. An equation is proposed to define the cumulative market failure indicator, which relates three key macroeconomic indicators (employment, inflation and economic growth) and can be applied in the practice of regulating economic dynamics as a quantitative criterion for the level of stability.

5. Based on the CMI-model of economic cycle, it has been empirically discovered that a decrease in unemployment has a cumulative effect, which explains the possibility of achieving a record low unemployment rate at relatively low rates of economic growth due to the increase in the duration of the stability period.

6. The author shows that the CMI-model of economic cycle provides the tools to achieve synergy effect from different types of regulation to maximize economic growth and employment at acceptable inflation by increasing the length of the stability period with a simultaneous decrease in the magnitude of cumulative market failure.

References

1. Niemira, M., Klein, P. (1995). Forecasting financial and economic cycles. NY: John Wiley&Sons, Inc.
2. Temin, P. (1998, June). The Causes of American Business Cycles: An Essay in Economic Historiography. *Federal Reserve Bank of Boston. Conference Series*, 42, 37-59. https://doi.org/10.3386/w6692
3. Sargent, T.J. (1979). Macroeconomic theory. New York: Academic Press.
4. Stock, J.S. (1987). Measuring business cycle time. *Journal of Political Economy*, 95: 6, 1240-1261. https://doi.org/10.1086/261513
5. Chauvet, M., Hamilton, J. (2005). Dating business cycles turning points. *NBER Working paper*, 11422, 72. https://doi.org/10.3386/w11422
6. Chauvet, M., Piger, J. (2005). A Comparison of the Real-Time Performance of Business Cycle Dating Methods. *Federal Reserve Bank of St. Louis Working Paper*, 021A, 32. https://doi.org/10.20955/ wp.2005.021

7. Stock, J., Watson, M. (2010). Indicators for Dating Business Cycles: Cross-History Selection and Comparisons. *American Economic Review: Papers & Proceedings*, 100: 2, 16-19. https://doi.org/10.20955/wp.2005.021
8. US National Bureau of Economic Research. Retrieved from www.nber.org_cycles
9. Polterovich, V. (1997, January). The crisis of economic theory. Report at the seminar "Unknown Economy" at the Central Economics and Economics Institute of the Russian Academy of Sciences. Retrieved from http://mathecon.cemi.rssi.ru/vm_polterovich/files/Crisis_Economic_Theory.pdf [in Russian].
10. Orphanides, A. (2002). Monetary policy rules and the Great Inflation. Board of Governors of the Federal Reserve System, materials for the January 2002 Meeting of the American Economic Association. Atlanta, GA. https://doi.org/10.17016/FEDS.2002.08
11. Fisher, S., Donbush, R., Shmalenzi, R.(1993). Economy. Moscow: " Delo LTD" [in Russian].
12. Bandura, O.V. (2016). The overall model of economic cycles is a model of cumulative market failure. *Ekon. teor. – Economic theory*, 1, 86-100. https://doi.org/10.15407/etet2016.01.086 [in Ukrainian].
13. US Bureau of Labor Statistics. Retrieved from https://www.bls.gov
14. US Bureau of Economic Analysis. Retrieved from https://www.bea.gov
15. Benchmark GDP Revision Offers up some Surprises (2003, December 10). *The Wall Street Journal*.
16. Boon the Bush? Recession Might Predate President (2004, January 21). *The Wall Street Journal*.
17. Bandura, O.V. (2017). Monetary policy efficiency and sustainable growth. *Ekon. teor. – Economic theory*, 1, 38-53. https://doi.org/10.15407/etet2017.01.077 [in Ukrainian].

Received 28.10.19
Reviewed 30.11.19
Signed for print 15.02.20

Бандура, Олександр Вікторович
д-р екон. наук, доцент
провідний науковий співробітник
ДУ "Інститут економіки та прогнозування НАН України"
вул. Панаса Мирного, 26, Київ, 01011
ORCID 0000-0002-3543-4461
e-mail: alexban@ukr.net

ЦИКЛІЧНІСТЬ ЯК ФОРМА ПОЄДНАННЯ СТАБІЛЬНОСТІ ТА НЕСТАБІЛЬНОСТІ В ЕКОНОМІЧНОМУ РОЗВИТКУ

Емпірично доведено, що модель датування бізнес-циклів нерозривно пов'язана з визначенням меж періодів стабільності та нестабільності економічного розвитку. Здійснено порівняння методів датування економічних циклів США за моделлю Національного бюро економічних досліджень США (NBER) та за запро-

понованою у статті СМІ-моделлю циклів. Показано певні конкурентні переваги датування бізнес-циклів на базі СМІ-моделі порівняно з моделлю NBER, у випадку вибору якої можливе виникнення періодів неоднозначності в датуванні. Продемонстровано, що використання авторської СМІ-моделі для датування бізнесциклів дозволяє уникнути неоднозначностей, що виникають при офіційному датуванні рецесій на базі класичної моделі циклів NBER США. При датуванні бізнес-циклів США за СМІ-моделлю виявлено кумулятивний ефект зниження рівня безробіття, який пояснює, що навіть за порівняно незначних темпів економічного зростання, що, проте, триває достатньо довгий період часу, можна досягти суттєвого сумарного зниження рівня безробіття. Рівняння для (ΔР) відображає поточний баланс між інфляцією, зайнятістю та темпами економічного зростання для кожного моменту реального (календарного) часу та визначає фундаментальні тенденції, що можуть бути посилені (послаблені) випадковими подіями (зовнішні шоки, дії уряду, спекулянтів тощо). Тому, незважаючи на єдину рушійну силу економічних циклів, яка кількісно визначається величиною (ΔР), конфігурація кожного реального циклу є унікальною. Показано, що СМІ-модель економічного циклу надає інструментарій для досягнення синергетичного ефекту від різних видів регулювання з метою максимізації темпів економічного зростання та зайнятості за прийнятної інфляції шляхом збільшення тривалості періоду стабільності за одночасного зменшення величини кумулятивної недосконалості ринків.

Ключові слова: бізнес-цикл, датування, рецесія, темпи зростання, стабільність, нестабільність, безробіття, інфляція, регулювання

Бандура, Александр Викторович
д-р экон. наук, доцент
ведущий научный сотрудник
ГУ "Институт экономики и прогнозирования НАН Украины"
ул. Панаса Мирного, 26, Киев, 01011
ORCID 0000-0002-3543-4461
e-mail: alexban@ukr.net

ЦИКЛИЧНОСТЬ КАК ФОРМА ЕДИНСТВА СТАБИЛЬНОСТИ И НЕСТАБИЛЬНОСТИ В ЭКОНОМИЧЕСКОМ РАЗВИТИИ

Эмпирически доказано, что модель датирования бизнес-циклов неразрывно связана с определением границ периодов стабильности и нестабильности экономического развития. Проведено сравнение методов датирования экономических циклов США согласно модели Национального бюро экономических исследований США (NBER) и согласно предложенной в статье СМИ-модели циклов. Показано определенные конкурентные преимущества датировки бизнес-циклов на базе СМИ-модели по сравнению с моделью NBER, в случае которой возможно возникновение периодов неоднозначности в датировании. Продемонстрировано, что использование авторской СМИ-модели для датирования бизнес-циклов позволяет избежать неоднозначностей, возникающих при официальном датировании рецессий на базе классической модели циклов NBER США. При датировании бизнес-циклов США согласно СМИ-модели выявлен кумулятивный эффект снижения уровня безработицы, который объясняет, что даже при сравнительно незначительных темпах экономического роста, что, однако, продолжается достаточно долгий период времени, можно достичь существенного суммарного снижения уровня безработицы. Уравнение для определения показателя кумулятивного несовершенства рынков (ΔP) отражает текущий баланс между инфляцией, занятостью и темпами экономического роста для каждого момента реального (календарного) времени и определяет фундаментальные тенденции, которые могут усилить (ослабить) случайные события (внешние шоки, действия правительства, спекулянтов и т.д.). Поэтому, несмотря на единую движущую силу экономических циклов, которая количественно определяется величиной (ΔP), конфигурация каждого реального цикла является уникальной. Показано, что СМИ-модель экономического цикла предоставляет инструментарий для достижения синергетического эффекта от различных видов регулирования с целью максимизации темпов экономического роста и занятости при приемлемой инфляции путем увеличения продолжительности периода стабильности при одновременном уменьшении величины кумулятивного несовершенства рынков.

Ключевые слова: бизнес-цикл, датирование, рецессия, темпы роста, стабильность, нестабильность, безработица, инфляция, регулирование