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THE TIME FACTOR AND THE SPECIFICS OF ITS CONSIDERATION IN ECONOMIC DEVELOPMENT FORECASTING

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Abstract: The article presents a retrospective review of the evolution of the views of key economic schools on the time factor. It examines the approaches of Austrian, neoclassical, Keynesian and institutional theories. The author summarizes the key concepts of time as a factor of market equilibrium, psychological choice, uncertainty and transaction costs. Methodological approaches to the integration of the time factor into predictive models are investigated and specific risks associated with time delays and dynamic uncertainty are identified.

Keywords: time factor, economic schools, time preference, shortrun and long-run, future uncertainty, transaction costs, economic dynamics.

Introduction

Relevance of the Topic. Under the conditions of rapid digitalization, globalization, and high volatility of world markets, the ability of economic systems to adapt flexibly to change becomes the main factor for their survival and competitiveness. The dynamism of modern economic processes forces a fresh look at the fundamental categories of economic science, among which the time factor holds a central position. Time is no longer viewed by economic theory as a passive external coordinate or a simple chronological scale. Today, it is recognized as a scarce economic resource, a catalyst for market risks, and a key parameter determining the trajectories of institutional and innovative development.

The scientific problem lies in the objective contradiction between the static nature of many basic models within the classical mainstream (which assume perfect instantaneous equilibrium under complete information) and real economic dynamics that unfold under conditions of time irreversibility, high uncertainty, and persistent transaction costs. Overcoming these limitations requires a profound conceptual understanding of how the interpretation of the time factor changed throughout the evolution of economic thought.

The Object of the study is the time factor as an interdisciplinary category within the context of the functioning of economic systems.

The Subject of the study is the evolution of theoretical and methodological approaches of leading economic schools toward defining the role, functions, and mechanisms for accounting for the time factor in economics.

The objective of this research is to systematize, comparatively analyze, and comprehensively synthesize the theoretical perspectives of economists from various schools of thought on the economic nature and significance of the time factor. It also provides a comprehensive analysis of the specifics of accounting for the time factor in economic development forecasting, investigates methodological approaches to its integration into predictive models, and identifies specific risks associated with time lags and dynamic uncertainty.

To achieve this purpose, the following tasks must be addressed:

1. To examine the subjective-psychological interpretation of time and the concept of intertemporal choice within the framework of the Austrian School.

2. To analyze the Neoclassical approach to the mathematization of time and the differentiation of market periods.

3. To investigate the impact of time irreversibility on the formation of uncertainty and risk within the Keynesian macroeconomic model.

4. To evaluate the interpretation of time as a scarce resource generating transaction costs in New Institutional Economics.

5. To explore the role of time in the processes of innovation-driven development and J. Schumpeter's "creative destruction."

The research methodology is based on the principles of historicism and the systems approach, utilizing methods of comparative, retrospective, and logical-theoretical analysis of scientific publications.

Discussion. In economic science, the time factor is one of the fundamental categories that determine the nature of market processes, the value of goods, and investor behavior. However, perspectives on its nature, role, and methods of measurement have changed dramatically throughout the evolution of economic thought.

1. The Austrian School: Time as a Psychological Factor and the Foundation of Capital

The representatives of the Austrian school were the first to elevate the time factor to the core of economic theory, linking it to human psychology and the structure of production. Eugen von Böhm-Bawerk formulated the theory of "time preference." He argued that individuals naturally value present goods more highly than identical goods in the future. The difference between them is a premium ("agio"), which transforms into the interest rate within a market economy [Böhm-Bawerk, 2009]. Carl Menger viewed time through the prism of roundabout methods of production. The production of consumer goods requires time and the creation of intermediate goods (capital). The longer the production process takes in terms of time, the more productive it generally becomes, though it demands the postponement of immediate consumption [Menger, 2005].

2. The Neoclassical School: Time as a Coordinate Axis and Equilibrium Factor

Neoclassical economists mathematized the time factor, dividing economic processes into distinct periods to facilitate static and dynamic analysis. Alfred Marshall introduced a revolutionary division of economic periods into the short-run and the long-run. He demonstrated that the time factor determines whether the market price balances through changes in demand (in the short-run) or through the adaptation of supply and production costs (in the long-run) [Marshall, 1993]. In turn, John Bates Clark proposed a methodological separation of the economic system into a "static" state, where the time factor is conventionally excluded to analyze ideal equilibrium, and a "dynamic" state, where time introduces changes in technology, population, and capital [Clark, 1992].

Summary Table 1: Evolution of Views on the Time Factor

School / Scholar	Role of the Time Factor in Economics	Key Concept
Austrian School (Böhm-Bawerk, Menger)	Psychological valuation of goods over time; lengthening of production chains.	Time preference, roundabout methods.
Neoclassical School (A. Marshall, J. B. Clark)	Criterion for supply adaptation to demand and cost adjustments.	Shortrun and long-run periods.
Keynesianism (J. M. Keynes)	Source of market uncertainty	Fundamental uncertainty,

	and the basis for forming expectations.	liquidity.
Institutionalism (R. Coase, O. Williamson)	A resource constraining market transactions (opportunity cost of time).	Temporal transaction costs.

3. Keynesianism: Time as a Source of Uncertainty and Risk

For the macroeconomic approach, the critical understanding became that the passage of time is irreversible and unpredictable. John Maynard Keynes shifted the emphasis to the irreversibility of time, which generates fundamental uncertainty about the future. Because economic agents are forced to make decisions today while obtaining results in the future (under conditions of incomplete information), they tend to hoard liquidity out of fear of the unknown. In Keynes's view, time gives rise to long-term expectations, panic, and investment cycles [Keynes, 2012].

4. New Institutional Economics: Time as Transaction Costs

Contemporary economists view time not merely as an abstract period, but as a valuable resource expended during decision-making. Ronald Coase demonstrated that searching for information, negotiating, and concluding contracts require significant temporal expenditures, which constitute the transaction costs of market operations [Coase, 2007]. Oliver Williamson expanded this approach, noting that the time factor is critically important when evaluating the frequency of transactions, asset specificity, and the risks of opportunistic partner behavior over time [Williamson, 1996].

5. Theory of Innovation-Driven Development

Joseph Schumpeter viewed time as a continuous historical flow within which the process of "creative destruction" unfolds. Time is the medium for innovation processes initiated by innovative entrepreneurs, moving the economy away from static equilibrium and into the realm of dynamic efficiency [Schumpeter, 2007].

Results. Consequently, accounting for the time factor is essential to overcome the limitations of classical models. Modern economic analysis is impossible without integrating the time component, which is reflected in discounting mechanisms, investment project evaluations, and macroeconomic cycle forecasting.

1. Properties of Economic Time

Unlike the natural sciences, where time is often viewed as a linear, homogeneous, and reversible quantity, time in economics possesses fundamentally different properties. Economic time is characterized by:

- Irreversibility: Managerial and economic decisions made in past periods create rigid frameworks for future trajectories (the path dependence effect).
- Heterogeneity: The intensity of economic processes varies depending on the phase of the business cycle, institutional shifts, and technological breakthroughs.
- Subjectivity of perception: The expectations of economic agents (consumers, investors, the state) regarding the future directly influence their current behavior, creating the phenomenon of "self-fulfilling prophecies".

In forecasting, the time factor serves as a bridge linking the past (historical data), the present (the decision-making point), and the future (the target state). Ignoring the non-linear nature of economic time inevitably leads to systemic errors in long-term models.

2. Time Lags and Their Classification in Predictive Models

One of the primary challenges in accounting for the time factor is the presence of time lags—delays between a change in one economic indicator (the cause) and the reaction of another (the effect). In economic forecasting, the following types of lags are distinguished:

Recognition Lag (Internal Lag): The time required for analysts and regulatory authorities to realize a change in the economic environment (e.g., the onset of a recession or market overheating).

Decision Lag: The period between recognizing a problem and formulating a specific regulatory policy or strategy.

Effect Lag (External Lag): The time that elapses from the implementation of a policy impulse (e.g., a change in the central bank's key interest rate) to the appearance of real shifts in macroeconomic indicators (inflation, GDP).

Integrating lags into predictive equations requires using distributed lags (Almon and Koyck models), which allow the influence of an explanatory variable to be distributed over time.

3. Forecasting Horizons and Dynamic Shifts

Accounting for the time factor directly determines the choice of the forecasting horizon. The scale of time alters the very structure of economic relationships:

- In the short term, many factors remain fixed (production capacities, institutions, technologies). The forecast relies on the inertia of processes and current market conditions, focusing primarily on smoothing random fluctuations.

- In the medium term, investment cycles (Juglar cycles) become active. The time factor manifests through capital accumulation processes and the renewal of fixed assets. Models must account for cyclical dynamics and trend turning points.

Table 2. The Impact of Time Lags on Forecast Accuracy Across Planning Horizons.

Forecast Horizon	Primary Lag Type	Level of Uncertainty	Recommended Methods of Consideration
Short-term (up to 1 year)	Recognition lag, operational lags	Low / Medium	Econometrics, ARMA/ARIMA, trend analysis
Medium-term (1–5 years)	Investment effect lag, cyclical component	Medium / High	Dynamic Stochastic General Equilibrium (DSGE) models, structural analysis
Long-term (over 5 years)	Institutional and technological lags	Critically high	Scenario forecasting, Delphi method, Foresight

- In the long and ultra-long term (Kondratiev waves), the rules of the game themselves change. Shifts in technological paradigms, demographic transitions, and transformations of the institutional environment occur. Here, the time factor requires a transition from quantitative extrapolations to qualitative scenario analysis.

The main methodological trap of long-term forecasting is the "absolutization of the current trend". The further out the forecast horizon, the higher the probability of tectonic shifts that render past statistics irrelevant.

4. Discounting and the Concept of the Opportunity Cost of Time

- In economic forecasting for industries and major investment projects, the time factor is accounted for through the mathematical framework of discounting. Money (and resources) available today is objectively more valuable than money to be received in the future for three key reasons:

1. Inflationary processes that devalue nominal income.
2. The risk of not receiving future income (the time uncertainty factor).
3. The opportunity for alternative capital allocation to earn a guaranteed interest rate.

The choice of the discount rate when forecasting public programs or environmental projects is a subject of intense debate. An overstated discount rate "cuts off" long-term projects with delayed returns (such as investments in fundamental science or green energy), prioritizing short-term speculative gains. Conversely, an understated rate can lead to an inefficient allocation of resources in the long run.

5. Modern Toolkits and Methods for Integrating the Time Factor

To adequately reflect temporal processes, modern economic science applies a wide range of mathematical and econometric methods:

- Dynamic Stochastic General Equilibrium (DSGE) models: Actively used by central banks worldwide, they model the economy's response to shocks while accounting for the rational expectations of agents over time.
- Neural Networks and Machine Learning Algorithms (LSTM): Long Short-Term Memory (LSTM) networks have proven effective in forecasting time series with non-linear dependencies and complex seasonality, outperforming classical statistical methods over short and medium horizons.
- Evolutionary Economics and Synergetics: Treat the economy as an open system that evolves through time via bifurcation points. These methods are indispensable for forecasting innovative leaps.

CONCLUSION AND KEY FINDINGS

A retrospective analysis of the perspectives of leading economists leads to the conclusion that the time factor is a cross-cutting and evolving category that determines the depth and realism of economic models. Throughout the development of economic thought, the interpretation of time has transformed from a purely technical parameter into a fundamental property of market reality:

1. From Statics to Dynamics: While representatives of the neoclassical school used time primarily as a tool to differentiate market periods to find static equilibrium, the Austrian school and innovation theory demonstrated that the economy is in constant motion, driven by human psychological intertemporal choices and technological shifts.
2. Transformation into a Risk and Cost Factor: The foundational contributions of Keynesianism and New Institutional Economics made it possible to view time not just as duration, but as a source of irreversibility, uncertainty, and specific transaction costs. Time in the modern economy is a scarce resource and the primary generator of risks.

Accounting for the time factor in economic development forecasting is a complex, multi-level methodological task. Time is not a static coordinate; it is dynamic, filled with lags, institutional shifts, and the subjective expectations of market participants.

Successful forecasting in modern realities requires abandoning rigid deterministic models in favor of flexible, adaptive systems capable of:

1. Recognizing and digitizing time Lags in a timely manner.
2. Correctly selecting planning horizons for specific goals.
3. Combining rigorous econometric methods with qualitative scenario analysis.

Only a deep understanding of the nature of economic time allows for the creation of forecasts that serve as a reliable foundation for strategic decision-making capable of ensuring the sustainable development of the economic system in the long term.

The retrospective analysis of the perspectives of leading economists allows us to conclude that the time factor is a cross-cutting and evolving category that determines the depth and realism of economic models. Throughout the development of economic thought, the interpretation of time transformed from a purely technical parameter into a fundamental attribute of market reality:

1. From Statics to Dynamics: While neoclassical economists utilized time primarily as a tool to differentiate market periods in search of static equilibrium, the Austrian school and the theory of innovation proved that the economy is in constant motion, driven by human psychological intertemporal choice and technological shifts.

2. Transformation into a Factor of Risk and Cost: The foundational contributions of Keynesianism and New Institutional Economics allowed us to view time not just as duration, but as a source of irreversibility, uncertainty, and specific transaction costs. In modern economics, time is a scarce resource and the primary generator of risk.

Consequently, accounting for the time factor is essential to overcome the limitations of classical models. Modern economic analysis is impossible without integrating the temporal component, which is reflected in discounting mechanisms, investment project evaluation, and macroeconomic cycle forecasting.

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