ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ
КЫРГЫЗСКО-РОССИЙСКИЙ СЛАВЯНСКИЙ УНИВЕРСИТЕТ

Кафедра иностранных языков

АНГЛИЙСКИЙ ЯЗЫК

Методическая разработка
для студентов-магистрантов
экономического факультета
специальности ЭПЭАМ

Бишкек 2019

УДК 811.111(072)
А 64

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А 64 АНГЛИЙСКИЙ ЯЗЫК: Методическая разработка для студентов-магистрантов экономического факультета специальности ЭПЭАМ / сост. Н. А. Любимова. Бишкек: КРСУ, 2019. 68 с.

Методическая разработка по английскому языку составлена для студентов-магистрантов экономического факультета.

Целью данной методической разработки является формирование компетенций и навыков в сфере профессиональной деятельности. Комплект заданий составлен с учетом профессиональной ориентации студентов.

INTRODUCTION

This guidance book is meant for teachers of English working with the Master's Degree students of the Faculty of Economics, who are currently pursuing master's degrees in applied mathematical analysis.

This guidance book is aimed at the formation of professional competencies and skills in the professional sphere.

The book includes:

- lexico-grammatical test
- texts for translating from English into Russian
- the vocabulary to special and supplementary texts
- the themes for reports and presentations

It should be noted that tasks take into account professional orientation of the students.

There is hope that this guidance book will help teachers to develop the students' professional competencies and skills in the field of professional English.

UNIT 1

I. Read the text

The economic environment

The economy comprises millions of people and thousands of firms as well as the government and local authorities, all taking decisions about prices and wages, what to buy, sell, produce, export, import and many other matters. All these organizations and the decisions they take play a prominent part in shaping the business environment in which firms exist and operate.

The economy is complicated and difficult to control and predict, but it is certainly important to all businesses. You should be aware that there are times when businesses and individuals have plenty of funds to spend and there are times when they have to cut back on their spending. This can have enormous implications for business as a whole.

When the economy is enjoying a boom, firms experience high sales and general prosperity. At such times, unemployment is low and many firms will be investing funds to enable them to produce more. They do this because consumers have plenty of money to spend and firms expect high sales. It naturally follows that the state of the economy is a major factor in the success of firms.

However, during periods when people have less to spend many firms face hard times as their sales fall. Thus, the economic environment alters as the economy moves into a recession. At that time, total spending declines as income falls and unemployment rises. Consumers will purchase cheaper items and cut expenditure on luxury items such as televisions and cars.

Changes in the state of the economy affect all types of business, though the extent to which they are affected varies. In the recession of the early 1990s the high street banks suffered badly. Profits declined and, in some cases, losses were incurred. This was because fewer people borrowed money from banks, thus denying them the opportunity to earn interest on loans, and a rising proportion of those who did borrow defaulted on repayment. These so-called "bad debts" cut profit margins substantially. Various forecasters reckoned that the National Westminster Bank's losses in the case of Robert Maxwell's collapsing

business empire amounted to over £100 million.

No individual firm has the ability to control this aspect of its environment. Rather, it is the outcome of the actions of all the groups who make up society as well as being influenced by the actions of foreigners with whom the nation has dealings.

(from https://studfile.net/preview/3535557/)

II. Study vocabulary notes

to comprise – включать в себя, составлять
local authorities – местные органы власти
to take *(syn.* to make) decisions – принимать решения
to play a prominent part – играть заметную (значительную) роль
to shape the environment – формировать обстановку, среду, окружение
to predict *(syn. to* forecast) – предсказывать
to be aware – осознавать, знать
to cut back on spending – сокращать расходы
enormous implications – большое значение, смысл, влияние
general prosperity – всеобщее процветание
to enable smb to do smth – делать возможным для кого-то, позволять кому-либо что-либо делать
consumers – потребители
to alter – изменяться
a recession – упадок
total spending – общие, суммарные расходы
to decline – снижаться
income – доход
unemployment – безработица
to purchase *(syn. to* buy) – покупать
to cut expenditure – сокращать расходы
luxury items – предметы роскоши
to affect *(syn. to* influence smb. smth) – влиять
the extent – степень
to some extent – в некоторой степени
the high street banks – центральные банки
to suffer badly – сильно пострадать
profits – прибыль

to incur *(syn.* to bear, to suffer) losses – нести убытки, потери
to borrow from – занимать, брать взаймы
to deny the opportunity – лишать возможности
to deny – отрицать
to earn interest – получать процентный доход
loans – ссуды, займы
to default on repayment – не выполнять обязательств по выплате (долгов, процентов и т. п.)
a debt – долг
profit margins – размеры прибыли
the outcome of the actions – результат действий
to make up society – составлять общество
to have dealings – иметь торговые (деловые) связи

III. Translate into English

1. Состояние экономики (экономической среды) имеет большое значение для успешной деятельности фирм.

2. Когда экономика находится на подъеме, то фирмы продают больше товаров, что ведет к получению больших прибылей и процветанию.

3. Упадок экономики характеризуется сокращением объема производства и сбыта продукции. Отсюда, естественно, следует, что доходы предприятий снижаются и они несут убытки.

4. Результатом деятельности всех субъектов производства (групп общества) является формирование той или иной экономической среды в которой развивается бизнес.

5. У фирмы не было возможности увеличить расходы на рекламу в результате чего она потеряла часть рынка сбыта.

IV. Make short summary of the text

UNIT 2

I. Read the text

Microeconomics and macroeconomics

Many economists specialize in a particular branch of the subject. For ex-ample, there are labor economists, energy economists, monetary economists, and international economists. What distinguishes these economists is the segment of economic life in which they are interested. Labor economics deals with problems of the labor market as viewed by firms, workers, and society as a whole. Urban economics deals with city problems: land use, transport, congestion, and housing. However, we need not classify branches of economics according to the area of economic life in which we ask the standard questions what, how and for whom. We can also classify branches of economics according to the approach or methodology that is used. The very broad division of approaches into microeconomic and macroeconomic cuts across the large number of subject groupings cited above.

Microeconomic analysis offers a detailed treatment of individual decisions about particular commodities.

For example, we might study why individual households prefer cars to bi-cycles and how producers decide whether to produce cars or bicycles. We can then aggregate the behaviour of all households and all firms to discuss total car purchases and total car production. Within a market economy we can dis-cuss the market for cars. Comparing this with the market for bicycles, we may be able to explain the relative output of these two goods. The sophisticated branch of microeconomics known as general equilibrium theory extends this approach to its logical conclusion. It studies simultaneously every market for every commodity. From this it is hoped that we can understand the complete pattern of consumption, production, and exchange in the whole economy at a point in time.

If you think this sounds very complicated, you are correct. It is. For many purposes, the analysis becomes so complicated that we tend to lose track of the phenomena in which we were interested. The interesting task for economics, a task that retains an element of art in economic science, is to devise judicious simplifications, which keep the analysis manageable

without distorting reality too much. It is here that microeconomists and macroeconomists proceed down different avenues.

Microeconomists tend to offer a detailed treatment of one aspect of economic behavior, but ignore interactions with the rest of the economy in order to preserve the simplicity of the analysis. A microeconomic analysis of miners' wages would emphasize the characteristics of miners and the ability of mine owners to pay. It would largely neglect the chain of indirect effects to which a rise in miners' wages might give rise. For example, car workers might use the precedent of the miners' pay increase to secure higher wages in the car industry, thus being able to afford larger houses, which burned more coal in heating systems. When microeconomic analysis ignores such indirectly induced effects it is said to be partial analysis.

In some instances, indirect effects may not be too important and it will make sense for economists to devote their effort to very detailed analyses of particular industries or activities. In other circumstances, the indirect effects are too important to be swept under the carpet and an alternative simplification must be found.

Macroeconomics emphasizes the interactions in the economy as a whole. It deliberately simplifies the individual building blocks of the analysis in order to retain a manageable analysis of the complete interaction of the economy.

For example, macroeconomists typically do not worry about the breakdown of consumer goods into cars, bicycles, televisions, and calculators. They prefer to treat them all as a single bundle called "consumer goods" because they are more interested in studying the interaction between households' purchases of consumer goods and firms' decisions about purchases of machinery and buildings.

(from https://blog.udemy.com/difference-between-micro-and-macro-economics/)

II. Study vocabulary notes

a labour economist – специалист по экономике труда
an energy economist – специалист по экономике (электро) энергии
a monetary economist – специалист по монетарной экономике
an international economist – специалист по мировой экономике

congestion – перенаселенность
to cut across – не соответствовать
a detailed treatment – детальный, подробный анализ
an individual household – отдельное домашнее хозяйство
to aggregate – собирать в одно целое
aggregate – совокупность
in the aggregate – в совокупности
aggregate – совокупный
the relative output – относительный объем производства
general equilibrium theory – теория общего равновесия
to study simultaneously – одновременно изучать
the complete pattern – полная структура, система, схема
to lose track of the phenomena – потерять след явлений
to devise judicious simplifications – выработать разумные упрощения
to keep the analysis manageable – позволять проводить анализ
to distort reality – искажать реальность
to preserve the simplicity of the analysis – сохранить простоту анализа
to neglect the chain of indirect effects – пренебрегать косвенным воздействием, совокупностью (цепочкой) косвенных результатов, эффектов
to secure higher wages – получить более высокую заработную плату
indirectly induced effects – воздействие, вызванное косвенными причинами
partial analysis – частичный (неполный) анализ
to sweep under the carpet – прятать, маскировать {доел. замести под ковер)
to simplify deliberately – намеренно упрощать
to retain a manageable analysis – сохранить возможность анализа (выполнимый, поддающийся выполнению анализ)
the breakdown of consumer goods – классификация (подразделение) товаров потребления
a single bundle – отдельная единица, величина (доел. набор)

III. Translate into English

1. Макроэкономика – это один из основных разделов экономической теории, который изучает поведение экономики как

единого целого. Она анализирует взаимодействие факторов, влияющих на рост национального производства, а также такие процессы, как безработица, инфляция, и т. п. Объектом макроэкономики является именно взаимодействие этих величин внутри экономики, при этом сами эти величины рассматриваются упрощенно, абстрактно.

2. Микроэкономика – это один из основных разделов экономической теории, изучающий поведение отдельных экономических единиц, их взаимодействие на рынках, в результате которого формируются цены на производимые товары и услуга и т. д. Микроэкономика стремится к детальному рассмотрению поведения какой-либо экономической единицы, при этом не уделяя достаточного внимания косвенному воздействию этого поведения на другие экономические единицы и на экономику в целом.

IV. Explain in English the following words

consumption; exchange; partial analysis; simplification; indirect effect

UNIT 3

I. Read the text

Macroeconomics theories

Macroeconomics descended from the once divided fields of business cycle theory and monetary theory. The quantity theory of money was particularly influential prior to World War II. It took many forms including the version based on the work of Irving Fisher:

$$M \cdot V = P \cdot Q$$

In the typical view of the quantity theory, money velocity (V) and the quantity of goods produced (Q) would be constant, so any increase in money supply (M) would lead to a direct increase in price level (P). The quantity theory of money was a central part of the classical theory of the economy that prevailed in the early twentieth century.

Keynes and his followers

Macroeconomics, at least in its modern form, began with the publication of John Maynard Keynes's *General Theory of Employment, Interest and Money*. When the Great Depression struck, classical

economists had difficulty explaining how goods could go unsold and workers could be left unemployed. In classical theory, prices and wages would drop until the market cleared, and all goods and labor were sold. Keynes offered a new theory of economics that explained why markets might not clear, which would evolve (later in the 20th century) into a group of macroeconomic schools of thought known as Keynesian economics – also called Keynesianism or Keynesian theory.

In Keynes's theory, the quantity theory broke down because people and businesses tend to hold on to their cash in tough economic times, a phenomenon he described in terms of liquidity preferences. Keynes also explained how the multiplier effect would magnify a small decrease in consumption or investment and cause declines throughout the economy. Keynes also noted the role uncertainty and animal spirits can play in the economy.

The generation following Keynes combined the macroeconomics of the *General Theory* with neoclassical microeconomics to create the neoclassical synthesis. By the 1950s, most economists had accepted the synthesis view of the macro economy. Economists like Paul Samuelson, Franco Modigliani, James Tobin, and Robert Solow developed formal Keynesian models, and contributed formal theories of consumption, investment, and money demand that fleshed out the Keynesian framework.

Monetarism

Milton Friedman updated the quantity theory of money to include a role for money demand. He argued that the role of money in the economy was sufficient to explain the Great Depression and aggregate demand oriented explanations were not necessary. Friedman argued that monetary policy was more effective than fiscal policy; however, Friedman doubted the government has ability to "fine-tune" the economy with monetary policy. He generally favored a policy of steady growth in money supply instead of frequent intervention.

Friedman also challenged the Phillips curve relationship between inflation and unemployment. Friedman and Edmund Phelps (who was not a monetarist) proposed an "augmented" version of the Phillips curve that excluded the possibility of a stable, long-run tradeoff between inflation and unemployment. When the oil shocks of the 1970s created a high unemployment and high inflation, Friedman and Phelps were vindicated. Monetarism was particularly influential in the early 1980s. Monetarism

fell out of favor when central banks found it difficult to target money supply instead of interest rates as monetarists recommended. Monetarism also became politically unpopular when the central banks created recessions in order to slow inflation.

Macroeconomics (from the Greek prefix *makro-* meaning "large" and economics) is a branch of economics dealing with the performance, structure, behavior, and decision-making of an economy as a whole, rather than individual markets. This includes national, regional, and global economies. With microeconomics, macroeconomics is one of the two most general fields in economics.

Macroeconomists study aggregated indicators such as GDP, unemployment rates, and price indexes to understand how the whole economy functions. Macroeconomists develop models that explain the relationship between such factors as national income, output, consumption, unemployment, inflation, savings, investment, international trade and international finance. In contrast, microeconomics is primarily focused on the actions of individual agents, such as firms and consumers, and how their behavior determines prices and quantities in specific markets.

While macroeconomics is a broad field of study, there are two areas of research that are emblematic of the discipline: the attempt to understand the causes and consequences of short-run fluctuations in national income (the business cycle), and the attempt to understand the determinants of long-run economic growth (increases in national income). Macroeconomic models and their forecasts are used by governments to assist in the development and evaluation of economic policy.

Macroeconomics encompasses a variety of concepts and variables, but there are three central topics for macroeconomic research. Macroeconomic theories usually relate the phenomena of output, unemployment, and inflation. Outside of macroeconomic theory, these topics are also important to all economic agents including workers, consumers, and producers.

Output and income

National output is the lowest amount of everything a country produces in a given time period. Everything that is produced and sold generates income. Therefore, output and income are usually considered equivalent and the two terms are often used interchangeably. Output can be measured as total income, or, it can be viewed from the production

side and measured as the total value of final goods and services or the sum of all value added in the economy.

Macroeconomic output is usually measured by Gross Domestic Product (GDP) or one of the other national accounts. Economists interested in long-run increases in output study economic growth. Advances in technology, accumulation of machinery and other capital, and better education and human capital all lead to increased economic output over time. However, output does not always increase consistently. Business cycles can cause short-term drops in output called recessions. Economists look for macroeconomic policies that prevent economies from slipping into recessions and that lead to faster long-term growth.

Unemployment

The amount of unemployment in an economy is measured by the unemployment rate, the percentage of workers without jobs in the labor force. The labor force only includes workers actively looking for jobs. People who are retired, pursuing education, or discouraged from seeking work by a lack of job prospects are excluded from the labor force.

Unemployment can be generally broken down into several types that are related to different causes.

- Classical unemployment theory suggests that unemployment occurs when wages are too high for employers to be willing to hire more workers. Other more modern economic theories suggest that increased wages actually decrease unemployment by creating more consumer demand. These more recent theories suggest that unemployment results from reduced demand for the goods and services produced through labor and suggest that only in markets where profit margins are very low and the market will not bear a price increase of product or service, will higher wages result in unemployment.
- Consistent with classical unemployment, frictional unemployment occurs when appropriate job vacancies exist for a worker, but the length of time needed to search for and find the job leads to a period of unemployment.
- Structural unemployment covers a variety of possible causes of unemployment including a mismatch between workers' skills and the skills required for open jobs. Large amounts of structural unemployment can occur when an economy is transitioning industries

and workers find their previous set of skills are no longer in demand. Structural unemployment is similar to frictional unemployment since both reflect the problem of matching workers with job vacancies, but structural unemployment covers the time needed to acquire new skills not just the short term search process.

- While some types of unemployment may occur regardless of the condition of the economy, cyclical unemployment occurs when growth stagnates. Okun's law represents the empirical relationship between unemployment and economic growth. The original version of Okun's law states that a 3% increase in output would lead to a 1% decrease in unemployment.

(from http://community.worldheritage.org/articles/eng/Macroeconomics)

II. Study vocabulary notes

aggregated indicators – совокупные показатели
unemployment rates – уровень безработицы
output – объём производства
emblematic – символичный, знаковый
consequences – последствия
short-run fluctuations – кратковременные колебания
the business cycle – цикл деловой активности (*периодические колебания уровня деловой активности в экономике страны, в которых принято выделять четыре фазы: подъем, бум, спад и депрессию*)
determinants – детерминанты
encompass – охватывать
generate – создавать, производить
therefore – следовательно
interchangeably – взаимозаменяемо, равнозначно
value added – условно-чистая продукция, добавленная стоимость (*валовая продукция фирмы, отрасли, экономики страны в целом за вычетом стоимости материалов и незавершенного производства*)
national accounts – народнохозяйственные балансы, национальные счета (система счетов для наиболее полного отражения результатов функционирования экономики страны в целом)
consistently – последовательно
recession – спад, регресс

brake down into – разделить
profit margins – чистая прибыль
bear – выдерживать
frictional unemployment – фрикционная безработица
appropriate – подходящий
mismatch – несоответствие
cover – включать
regardless of – независимо от
stagnate – заставаться, загнивать
Okun's law – закон Окана *(о влиянии безработицы на объём национального продукта)*, Закон Оукена

III. Translate into English

1. Макроэкономика – наука, изучающая функционирование экономики в целом, экономической системы как единого целого, совокупность экономических явлений. Впервые термин был употреблён Рагнаром Фришем 14 августа 1934 года. Основателем современной макроэкономической теории считается Джон Мейнард Кейнс, после того, как в 1936 году он выпустил свою книгу «Общая теория занятости, процента и денег».

2. Макроэкономика является социальной наукой. Поэтому экономические явления не поддаются точным предсказаниям; за макроэкономическими агентами можно лишь наблюдать и делать прогнозы на этих наблюдениях. Экономическая модель является упрощенной формой для изучения экономики в целом. Многие экономические модели имеют серьёзные недостатки и не учитывают многие важные факторы.

3. Любая экономика состоит из рынков и экономических агентов. В теории выделяют четыре макроэкономических агента и три рынка. Все составляющие части экономики соединены между собой кругооборотом расходов, доходов и реальных ценностей.

4. В макроэкономике рассматриваются четыре экономических агента:

- Домохозяйства – являются владельцами экономических ресурсов (факторов производства), основные потребители товаров и услуг. В качестве дохода получают заработную

плату за использование фирмами рабочей силы: основного ресурса, производимого домохозяйствами. Платят налоги государству и от него же получают необходимые трансферты, такие как пенсия, пособие по безработице, стипендии студентам, и другие.

• Фирмы – основные производители товаров и услуг, главная цель: максимизация собственной прибыли. Являются основными заемщиками на рынке ценных бумаг. Фирмы получают прибыль с инвестиций в товары и услуги. Основными расходами фирм являются налоги, инвестиционные расходы и плата домохозяйствам за ресурсы.

Домохозяйства и фирмы образуют частный сектор экономики.

• Государство – основной производитель общественных благ, основные цели: перераспределение национального дохода, регулирование экономической активности других агентов и рынков. Получает налоги – свой основной источник дохода, платит трансферты домохозяйствам и субсидии фирмам, если необходимо, делает закупки на рынке товаров. Государство неразрывно контактирует с финансовым рынком.

Частный сектор с государством образуют закрытую экономику.

• Иностранный сектор – международная торговля, обращение капитала и ценных бумаг.

Все четыре макроэкономических агента образуют открытую экономику

IV. Make the plan to the text. Retell the text

UNIT 4

I. Read the text

Measuring economic activity

There are a large number of statistics produced regularly on the operation of the world's major economies. The UK's economy is no exception in this respect. You will probably have noticed that often the

headlines in newspapers or important items on television news programs relate to economic data and the implications for individuals and businesses. A prime example of this occurs when interest rates are increased: the media responds by highlighting the adverse effects on businesses with debts and householders with mortgages.

Data is provided on a wide range of aspects of the economy's operation. Statistics are available to show.

* the level of unemployment
* the level of inflation
* a country's trade balance with the rest of the world
* production volumes in key industries and the economy as a whole
* the level of wages
* raw material prices, and so forth.

The main statistics illustrating the economy's behavior relate to the level of activity in the economy. That is, they tell us whether the economy is working at full capacity using all or nearly all, available resources of labor, machinery and other factors of production or whether these resources are being under-utilized.

The unemployment figures for the economy give an indicator of the level of activity. As the economy moves towards a recession and a lower level of prosperity it is likely that unemployment figures will rise. An alternative measure of the level of activity is national income statistics, which show the value of a nation's output during a year. Economists use the term Gross National Product to describe this data. Changes in the level or trends of such key data have great significance for businesses, as we shall see later.

There are numerous sources of data on the economy of which we can make use. The government publishes much through the Treasury, Department of Trade and Industry, the Bank of England and the Department of Employment. The Central Statistical Office, which was established during the Second World War, publishes about half of the government's economic data.

Much of this is contained in its annual publication, "The Annual Abstract of Statistics". It also publishes the equally valuable "Social Trends" annually. Additionally, private organizations, such as the banks, building societies and universities, publish figures on various aspects of the economy's performance.

Economic statistics are presented in many forms, the most common being graphs and tables. Although these statistics can be valuable in assisting managers, they should be treated with some caution when predicting the future trend of the economy and thus helping the business to take effective decisions.

(from https://docplayer.net/15297542-Measuring-economic-activity.html)

II. Study vocabulary notes

to measure – измерять, рассчитывать, оценивать
economic activity – экономическая деятельность
is no exception in this respect – в этом отношении не является исключением
important items – важные вопросы, проблемы
to relate to – относиться к чему-либо, иметь отношение; рассказывать
by highlighting the adverse effects on... – в первую очередь освещая неблагоприятное влияние на...
householder – домовладелец, домохозяин
household – домашнее хозяйство
mortgage – закладная
data – данные
on a wide range of aspects – по самым разнообразным аспектам
statistics are available to show – статистика показывает
trade balance – торговый баланс
key industries – основные отрасли промышленности
wages – заработная плата *(рабочих)*
salary – оклад, жалованье *(служащих)*
raw material prices – цены на сырье
at full capacity – на полную мощность
available resources – доступные, имеющиеся в наличии ресурсы
labor – труд
machinery – оборудование
factors of production – производственные факторы, факторы производства *(труд, земля, природные ресурсы, капитал)*
to be under-utilized – не использоваться полностью
unemployment figures – количество безработных
indicator – показатель

national income – национальный доход
the value of a nation's output – оценка объема производства страны
Gross National Product (GNP) – валовой национальный продукт (ВНП)
trend – направление, тенденция, тренд
the Treasury – Государственное казначейство. Министерство финансов (*в Великобритании)*
the Department of Employment – Министерство по вопросам занятости *(в Великобритании)*
the Central Statistical Office – Центральное статистическое управление
to contain – содержать
equally valuable – такой же важный
building societies – *англ.* строительные общества *(специализированные сберегательные учреждения)*
graphs and tables – графики и таблицы
to assist – помогать, оказывать помощь
they should be treated with some caution – к этим данным следует относиться с некоторой осторожностью

III. Translate into English

1. К официальным статистическим данным по уровню инфляции в стране следует относиться с осторожностью.

2. Валовой национальный продукт – это совокупность товаров и услуг, произведенных национальной экономикой за год.

3. Объем производства продукции в ключевых отраслях промышленности в значительной степени показывает уровень активности населения.

4. Если в экономике отмечается падение производства, то следствием этого становится рост безработицы и понижение уровня зарплаты.

5. Средства массовой информации сообщили об отрицательном влиянии на производство увеличившейся процентной ставки.

IV. Write annotation to the text

UNIT 5

I. Read the text

Mathematical economics

Mathematical economics is the application of mathematical methods to represent theories and analyze problems in economics. By convention, the applied methods refer to those beyond simple geometry, such as differential and integral calculus, difference and differential equations, matrix algebra, mathematical programming, and other computational methods. An advantage claimed for the approach is its allowing formulation of theoretical relationships with rigor, generality, and simplicity.

It is argued that mathematics allows economists to form meaningful, testable propositions about wide-ranging and complex subjects which could less easily be expressed informally. Further, the language of mathematics allows economists to make specific, positive claims about controversial or contentious subjects that would be impossible without mathematics. Much of economic theory is currently presented in terms of mathematical economic models, a set of stylized and simplified mathematical relationships asserted to clarify assumptions and implications.

Broad applications include:

- optimization problems as to goal equilibrium, whether of a household, business firm, or policy maker
- static (or equilibrium) analysis in which the economic unit (such as a household) or economic system (such as a market or the economy) is modeled as not changing
- comparative statics as to a change from one equilibrium to another induced by a change in one or more factors
- dynamic analysis, tracing changes in an economic system over time, for example from economic growth.

Formal economic modeling began in the 19th century with the use of differential calculus to represent and explain economic behavior, such as utility maximization, an early economic application of mathematical optimization. Economics became more mathematical as a discipline throughout the first half of the 20th century, but introduction

of new and generalized techniques in the period around the Second World War, as in game theory, would greatly broaden the use of mathematical formulations in economics.

This rapid systematizing of economics alarmed critics of the discipline as well as some noted economists. John Maynard Keynes, Robert Heilbroner, Friedrich Hayek and others have criticized the broad use of mathematical models for human behavior, arguing that some human choices are irreducible to mathematics.

The use of mathematics in the service of social and economic analysis dates back to the 17th century. Then, mainly in German universities, a style of instruction emerged which dealt specifically with detailed presentation of data as it related to public administration. Gottfried Achenwall lectured in this fashion, coining the term statistics. At the same time, a small group of professors in England established a method of "reasoning by figures upon things relating to government" and referred to this practice as *Political Arithmetick*. Sir William Petty wrote at length on issues that would later concern economists, such as taxation, Velocity of money and national income, but while his analysis was numerical, he rejected abstract mathematical methodology. Petty's use of detailed numerical data (along with John Graunt) would influence statisticians and economists for some time, even though Petty's works were largely ignored by English scholars.

The mathematization of economics began in earliest in the 19th century. Most of the economic analysis of the time was what would later be called classical economics. Subjects were discussed and dispensed with through algebraic means, but calculus was not used. More importantly, until Johann Heinrich von Thünen's The Isolated State in 1826, economists did not develop explicit and abstract models for behavior in order to apply the tools of mathematics. Thünen's model of farmland use represents the first example of marginal analysis. Thünen's work was largely theoretical, but he also mined empirical data in order to attempt to support his generalizations. In comparison to his contemporaries, Thünen built economic models and tools, rather than applying previous tools to new problems.

Meanwhile a new cohort of scholars trained in the mathematical methods of the physical sciences gravitated to economics, advocating and applying those methods to their subject, and described today as moving

from geometry to mechanics. These included W.S. Jevons who presented paper on a "general mathematical theory of political economy" in 1862, providing an outline for use of the theory of marginal utility in political economy. In 1871, he published *The Principles of Political Economy*, declaring that the subject as science "must be mathematical simply because it deals with quantities." Jevons expected the only collection of statistics for price and quantities would permit the subject as presented to become an exact science. Others preceded and followed in expanding mathematical representations of economic problems.

(from https://en.wikipedia.org/wiki/Mathematical_economics)

II. Study vocabulary notes

mathematical economics – математическая экономика (направление экономической теории, связанное со строгой математической формализацией теоретических допущений и выводов)
by convention – по определению, согласно правилу
difference – разница, противоречие
matrix algebra – алгебра матриц
rigor – точность, тщательность
generality – универсальность, обобщение
propositions – утверждения
meaningful – конструктивный, содержательный
testable – контролируемый, поддающийся проверке, проверяемый
stylized – стилизованный
implications – значения
induced – вызванный, навязанный
irreducible – неприводимый, неприменимый
to coin – придумать, изобрести
reasoning by figures upon – математическое, числовое обоснование
political arithmetick – политическая арифметика (термин У. Петти для обозначения науки, занимающейся измерением и изучением устройства экономической, социальной и политической структуры общества; давала информацию государственным правителям для управления страной)
at length – подробно
velocity of money – скорость обращения денег

numerical – числовой; цифровой; численный
mathematization – математизация
dispense with – обходиться без чего-либо
marginal analysis – маржинальный анализ (анализ себестоимости продукции или услуг)
generalizations – обобщения
cohort [koʊhɔːrt]| – группа, поколение
outline – основные принципы, положения
precede – идти вперёд, превосходить

III. Translate into English

1. Математическая экономика – сфера теоретической и прикладной научной деятельности, целью которой является математически формализованное описание экономических объектов, процессов и явлений.

2. Математические методы позволяют чётко, просто, строго и обобщённо формулировать ключевые теоретические положения и делать на их основе практические выводы.

3. Утверждается, что математика позволяет экономистам формулировать содержательные и проверяемые гипотезы в отношении широкого круга комплексных явлений, описание которых без привлечения математического аппарата представляется более сложным.

4. Современное производство – это строго сбалансированная работа многих предприятий, которая обеспечивается решением огромного числа математических задач. Этой работой занята огромная армия экономистов, плановиков и бухгалтеров, а расчеты ведут тысячи электронных вычислительных машин. Среди таких задач и проведение расчетов планов производства, и определение наиболее выгодного размещения строительных объектов, и выбор наиболее экономных маршрутов перевозок и т. д. Математическая экономика занимается также формализованным математическим описанием уже известных экономических явлений, проверкой различных гипотез на экономических системах, описанных некоторыми математическими соотношениями.

5. Нелегкой проблемой в математической экономике является сопоставление теории и практики: экономические показатели измерять

крайне трудно – измеряются они не на лабораторных установках, наблюдения удается проводить крайне редко (вспомните переписи!), проводятся они в разных условиях и содержат массу неточностей. Поэтому здесь трудно использовать опыт измерений, накопленный в других науках, и требуется разработка специальных методов.

6. Развитие математической экономики вызвало появление многих математических теорий, объединяемых названием «математическое программирование».

Ⅳ. Summarize the text

UNIT 6

Ⅰ. Read the text

Mathematical optimization

In mathematics, mathematical optimization (or optimization or mathematical programming) refers to the selection of a best element from some set of available alternatives. In the simplest case, an optimization problem involves maximizing or minimizing a real function by selecting input values of the function and computing the corresponding values of the function. The solution process includes satisfying general necessary and sufficient conditions for optimality. For optimization problems, specialized notation may be used as to the function and its input(s). More generally, optimization includes finding the best available element of some function given a defined domain and may use a variety of different computational optimization techniques.

Economics is closely enough linked to optimization by agents in an economy that an influential definition relatedly describes economics *qua* science as the "study of human behavior as a relationship between ends and scarce means" with alternative uses. Optimization problems run through modern economics, many with explicit economic or technical constraints. In microeconomics, the utility maximization problem and its dual problem, the expenditure minimization problem for a given level of utility, are economic optimization problems. Theory posits that consumers maximize their utility, subject to their budget constraints and

that firms maximize their profits, subject to their production functions, input costs, and market demand.

Economic equilibrium is studied in optimization theory as a key ingredient of economic theorems that in principle could be tested against empirical data.

Optimality properties for an entire market system may be stated in mathematical terms, as in formulation of the two fundamental theorems of welfare economics and in the Arrow–Debreu model of general equilibrium. More concretely, many problems are amenable to analytical (formulaic) solution. Many others may be sufficiently complex to require numerical methods of solution, aided by software. Still others are complex but tractable enough to allow computable methods of solution, in particular computable general equilibrium models for the entire economy.

Linear and nonlinear programming have profoundly affected microeconomics, which had earlier considered only equality constraints. Many of the mathematical economists who received Nobel Prizes in Economics had conducted notable research using linear programming: Leonid Kantorovich, Leonid Hurwicz, Tjalling Koopmans, Kenneth J. Arrow, and Robert Dorfman, Paul Samuelson, and Robert Solow. Both Kantorovich and Koopmans acknowledged that George B. Dantzig deserved to share their Nobel Prize for linear programming. Economists who conducted research in nonlinear programming also have won the Nobel prize, notably Ragnar Frisch in addition to Kantorovich, Hurwicz, Koopmans, Arrow, and Samuelson.

Linear optimization

Linear programming was developed to aid the allocation of resources in firms and in industries during the 1930s in Russia and during the 1940s in the United States. During the Berlin airlift (1948), linear programming was used to plan the shipment of supplies to prevent Berlin from starving after the Soviet blockade.

Nonlinear programming

Extensions to nonlinear optimization with inequality constraints were achieved in 1951 by Albert W. Tucker and Harold Kuhn.

The Kuhn–Tucker approach generalized the classic method of Lagrange multipliers, which (until then) had allowed only equality

constraints. The Kuhn–Tucker approach inspired further research on Lagrangian duality, including the treatment of inequality constraints.

Functional analysis

It was in the course of proving of the existence of an optimal equilibrium in his 1937 model of economic growth that John von Neumann introduced functional analytic methods to include topology in economic theory. Following von Neumann's program, Kenneth Arrow and Gérard Debreu formulated abstract models of economic equilibria using convex sets and fixed–point theory. In introducing the Arrow–Debreu model in 1954, they proved the existence (but not the uniqueness) of an equilibrium and also proved that every Walras equilibrium is Pareto efficient; in general, equilibria need not be unique.

In Russia, the mathematician Leonid Kantorovich developed economic models in partially ordered vector spaces, that emphasized the duality between quantities and prices.

(from https://en.wikipedia.org/wiki/Mathematical_optimization)

II. Study vocabulary notes

input values – входные ценности
optimality – оптимальность
specialized notation – специализированное обозначение
scarce – ограниченный, скудный
expenditure minimization – минимизация расходов
posit – утверждать
subject to – благодаря чему-то
budget constraints – бюджетное ограничение
input costs – затраты на ресурсы
test against – тестировать на
properties – свойства
fundamental theorems of welfare economics – фундаментальная теорема экономики благосостояния
Arrow–Debreu model of general equilibrium – модель Эрроу-Дебре-МакКинзи (*модель общего равновесия, нейтральная к типу производственной функции*)
amenable – поддающийся
sufficiently – достаточно

tractable – послушный, сговорчивый
in particular – в частности, в особенности
computable general equilibrium model – вычислимая модель общего равновесия
equality constraints – ограничение типа равенства
acknowledge – признавать
Berlin airlift – Берлинский воздушный мост (нем. Berliner Luftbrücke) – название операции западных союзников по авиаснабжению Западного Берлина продовольствием во время блокады города со стороны СССР.
Lagrange multipliers – множители Лагранжа (*дополнительные множители, преобразующие целевую функцию экстремальной задачи выпуклого программирования и помогающие проверить оптимальность найденного допустимого решения*)
duality – двойственность, дуальность
treatment – трактовка
convex sets – выпуклое множество
fixed–point theory – теория неподвижных точек
Pareto efficiency – эффективность по Паретто (критерий эффективности системы в условиях свободной конкуренции **(**степень использования ресурсов**,** при которой улучшение положения субъекта невозможно без ухудшения положения другого**)**
partially ordered vector spaces – частично упорядоченное векторное пространство
qua – в качестве, как

III. Translate into English

1. В математике, информатике, экономике или менеджменте, математическая оптимизация (альтернативно, оптимизация или математическое программирование) являются выбором лучшего элемента (относительно некоторых критериев) от некоторого набора доступных альтернатив.

2. В самом простом случае проблема оптимизации состоит из увеличения или уменьшения реальной функции, систематически выбирая входные ценности из позволенного набора и вычисляя ценность функции.

3. Математическое программирование – это область математики, разрабатывающая теорию, численные методы решения многомерных задач с ограничениями. В отличие от классической математики, математическое программирование занимается математическими методами решения задач нахождения наилучших вариантов из всех возможных.

4. Задачи линейного программирования были первыми подробно изученными задачами поиска экстремума функций при наличии ограничений типа неравенств. В 1820 году Фурье и затем в 1947 году Данциг предложил метод направленного перебора смежных вершин в направлении возрастания целевой функции – симплекс-метод, ставший основным при решении задач линейного программирования.

5. Линейное программирование (LP), тип выпуклого программирования, изучает случай, в котором объективная функция *f* линейна, и набор ограничений определен, используя только линейные равенства и неравенства. Такой набор называют многогранником, если он ограничен.

6. Термин «принцип Парето» был введен в обиход Джозефом Джураном, признанным светилом управленческого консультирования. Джуран утверждал, что во всех деяниях человека большая часть результатов достигается меньшей частью усилий. Этот принцип также называется «законом дисбаланса».

7. Optima ограниченных равенством проблем может быть найден методом множителя Лагранжа. Optima проблем с ограничениями равенства и/или неравенства может быть найден, используя 'Karush–Kuhn–Tucker условия.

8. Множители Лагранжа [Lagrange multipliers] – дополнительные множители, преобразующие целевую функцию экстремальной задачи выпуклого программирования (в частности, линейного программирования) при ее решении одним из классических методов – методом разрешающих множителей (методом Лагранжа). Полученная функция носит название лагранжиан или функция Лагранжа.

Ⅳ. Make the plan to the text. Retell the text

UNIT 7

Ⅰ. Read the text

Econometrics

Econometrics is the application of mathematics, statistical methods, and computer science, to economic data and is described as the branch of economics that aims to give empirical content to economic relations. More precisely, it is “the quantitative analysis of actual economic phenomena based on the concurrent development of theory and observation, related by appropriate methods of inference”. An introductory economics textbook describes econometrics as allowing economists "to sift through mountains of data to extract simple relationships." The first known use of the term "econometrics" (in cognate form) was by Polish economist Paweł Ciompa in 1910. Ragnar Frisch is credited with coining the term in the sense in which it is used today.

Basic econometric models: linear regression

The basic tool for econometrics is the linear regression model. In modern econometrics, other statistical tools are frequently used, but linear regression is still the most frequently used starting point for an analysis. Estimating a linear regression on two variables can be visualized as fitting a line through data points representing paired values of the independent and dependent variables.

For example, consider Okun's law, which relates GDP growth to the unemployment rate. This relationship is represented in a linear regression where the change in unemployment rate (Δ Unemployment) is a function of an intercept (β_0), a given value of GDP growth multiplied by a slope coefficient β_1 and an error term, ϵ:

$$\Delta \text{ Unemployment} = \beta_0 + \beta_1 \text{Growth} + \varepsilon.$$

The unknown parameters β_0 and β_1 can be estimated. Here β_1 is estimated to be −1.77 and β_0 is estimated to be 0.83. This means that if GDP growth increased by one percentage point, the unemployment rate would be predicted to drop by 1.77 points. The model could then be tested for statistical significance as to whether an increase in growth is associated with a decrease in the unemployment, as hypothesized. If the estimate of β_1 were not significantly different from 0, the test would fail to find evidence that changes in the growth rate and unemployment rate

were related. The variance in a prediction of the dependent variable (unemployment) as a function of the independent variable (GDP growth) is given inpolynomial least squares.

Econometrics may use standard statistical models to study economic questions, but most often they are with observational data, rather than in controlled experiments. In this, the design of observational studies in econometrics is similar to the design of studies in other observational disciplines, such as astronomy, epidemiology, sociology and political science. Analysis of data from an observational study is guided by the study protocol, although exploratory data analysis may by useful for generating new hypotheses. Economics often analyzes systems of equations and inequalities, such as supply and demand hypothesized to be inequilibrium. Consequently, the field of econometrics has developed methods for identification and estimation of simultaneous-equation models. These methods are analogous to methods used in other areas of science, such as the field of system identification in systems analysis and control theory. Such methods may allow researchers to estimate models and investigate their empirical consequences, without directly manipulating the system.

One of the fundamental statistical methods used by econometricians is regression analysis. Regression methods are important in econometrics because economists typically cannot use controlled experiments. Econometricians often seek illuminating natural experiments in the absence of evidence from controlled experiments. Observational data may be subject to omitted-variable bias and a list of other problems that must be addressed using causal analysis of simultaneous-equation models.

(from https://en.wikipedia.org/wiki/Econometrics)

Ⅱ. Study vocabulary notes

precisely – точно
quantitative analysis – количественный анализ
concurrent development – параллельное развитие
methods of inference – стратегия логического вывода
to sift through – рассматривать, изучать

inpolynomial least squares – многочлен, полученный методом наименьших квадратов
exploratory data analysis – разведочный анализ данных (метод статистического анализа, предполагающий изучение имеющихся данных; применяется для нахождения связей между переменными в ситуациях, когда отсутствуют или недостаточны априорные представления о природе этих связей)
simultaneous-equation models – система одновременных уравнений (СОУ)
empirical consequences – эмпирические последствия
regression analysis – регрессионный анализ
omitted-variable bias – смещение вследствие пропущенных переменных
causal analysis – причинный анализ

Ⅲ. Translate into English

1. Эконометрика – наука, изучающая количественные и качественные экономические взаимосвязи с помощью математических и статистических методов и моделей.

2. Теоретическая эконометрика рассматривает статистические свойства оценок и испытаний, в то время как прикладная эконометрика занимается применением эконометрических методов для оценки экономических теорий.

3. Важным этапом возникновения эконометрики явилось развитие статистической теории в трудах Ф. Гальтона, К. Пирсона, Ф. Эджуорта. Эти учёные предопределили первые применения парной корреляции.

4. Для адекватного описания сложных внутренне неоднородных экономических процессов, как правило, применяются системы эконометрических уравнений. В более простых случаях можно использовать и простые изолированные уравнения.

5. Наблюдение за экономическими данными показывает, что линейные соотношения часто встречаются на практике. При этом логично начинать анализ, опираясь на самую простую предпосылку, которая коррелирована с общей теорией.

6. Эконометрика – это не тоже самое, что экономическая статистика. Она на идентична и экономической теории, хотя значительная часть этой

теории носит количественный характер. Эконометрика не является синонимом приложений математики к экономике.

7. Эконометрика связана с изучением эмпирических данных статистическими методами; цель этого – проверка гипотез и оценка соотношений, предложенных экономической теорией. В то время как математическая экономика занимается чисто теоретическими аспектами экономического анализа, эконометрика пытается подвергнуть проверке теории, которые уже представлены в явной математической форме. Однако, часто эти две области экономической науки пересекаются".

8. Теоретическая эконометрика рассматривает статистические свойства оценок и испытаний, в то время как прикладная эконометрика занимается применением эконометрических методов для оценки экономических теорий. Эконометрика дает инструментарий для экономических измерений, а также методологию оценки параметров моделей микро- и макроэкономики.

Ⅳ. Make short summary of the text

UNIT 8

Ⅰ. Read the text

Positive and normative economics

In studying economics, it is important to distinguish two branches of the subject. The first is known as "positive economics", the second as "normative economics".

Positive economics deals with objective or scientific explanations of the working of the economy. The aim of positive economics is to explain how society makes decisions about consumption, production, and exchange of goods. The purpose of this investigation is twofold: to satisfy our curiosity about why the economy works as it does, and to have some basis for predicting how the economy will respond to changes in circumstances.

Normative economics is very different. Normative economics offers prescriptions or recommendations based on personal value judgements.

In positive economics, we hope to act as detached scientists. Whatever our political persuasion, whatever our view about what we would like to happen or what we would regard as "a good thing", in the first instance we have to be concerned with how the world actually works. At this stage, there is no scope for personal value judgements. We are concerned with propositions of the form: if this is changed then that will happen. In this regard, positive economics is similar to the natural sciences such as physics, geology or astronomy.

Here are some examples of positive economics in action. Economists of widely differing political persuasions would agree that, when the government imposes a tax on a good, the price of that good will rise. The normative question of whether this price rise is desirable is entirely distinct. Similarly, there would be substantial agreement that the following proposition of positive economics is correct: favorable weather conditions will increase wheat output, reduce the price of wheat, and increase the consumption of wheat. Many propositions in positive economics would command widespread agreement among professional economists.

Of course, as in any other science, there are unresolved questions where disagreement remains. These disagreements are at the frontiers of economics. Research in progress will resolve some of the issues but new issues will arise and provide scope for further research.

Although competent and comprehensive research can in principle resolve many of the outstanding issues in positive economics, no corresponding claim can be made about the resolution of disagreement in normative economics.

Normative economics is based on subjective value judgements, not on the search for any objective truth. The following statement combines positive and normative economics: "The elderly have very high medical expenses compared with the rest of the population, and the government should subsidize health bills of the aged." The first part of the proposition – the claim that the aged have relatively high medical bills – is a statement in positive economics, it is a statement about how the world works, and we can imagine a research program that could determine whether or not it is correct. Broadly speaking, this assertion happens to be correct.

The second part of the proposition – the recommendation about what

the government should do – could never be "proved" to be correct or false by any scientific research investigation. It is simply a subjective value judgement based on the feelings of the person making the statement. Many people might happen to share this subjective judgement, for example those people who believe that all citizens alive today should be able to purchase roughly equal amounts of luxury and recreational goods after paying for the necessities of life. But other people might reasonably disagree. You might believe that it is more important to devote society's scarce resources to improving the environment.

There is no way that economics can be used to show that one of these normative judgements is correct and the other is wrong. It all depends on the preferences or priorities of the individual or the society that has to make this choice. But that does not mean that economics can throw no light on normative issues. We can use positive economics to spell out the detailed implications of making the choice one way or the other. For example, we might be able to show that failure to subsidize the medical bills of the elderly leads middle-aged people to seek a lot of unnecessary medical check-ups in an attempt to detect diseases before their treatment becomes expensive. Society might have to devote a great deal of resources to providing check-up facilities, leaving less resources available than had been supposed to devote to improving the environment. Positive economics can be used to clarify the menu of options from which society must eventually make its normative choice.

(from https://www.investopedia.com/ask/answers/12/difference-between-positive-normative-economics.asp)

II. Study vocabulary notes

to distinguish two branches of the subject – разграничивать два аспекта предмета
positive economics deals with objective explanations – позитивная экономическая теория предлагает объективные объяснения
the working of the economy – действие экономики
exchange of goods – обмен товаров
the purpose of the investigation is twofold – цель исследования двояка
to satisfy curiosity – удовлетворять любопытство
circumstances – обстоятельства

prescriptions or recommendations – предписания или рекомендации
based on – основанный на
personal value judgments – субъективные оценки ценностей
detached scientists – беспристрастные, независимые ученые
whatever our political persuasion – независимо от политических убеждений
whoever – кто бы ни
whenever – когда бы ни
wherever – где бы ни
in the first instance – прежде всего
actually – в действительности
at this stage – на этом этапе
there is no scope for – нет места
on a large scope – широкомасштабно
to be concerned with – интересоваться чем-либо, заботиться о чем-либо
propositions of the form – формальные утверждения, суждения
in this regard – в этом отношении
to be similar to – быть похожим на
natural sciences – естественные науки
liberal arts, humanities – гуманитарные науки
in action – в действии
to be desirable – быть желательным
to be entirely distinct – быть совершенно несхожим
substantial agreement – принципиальное единомыслие
favorable weather conditions – благоприятные погодные условия
wheat output – производство пшеницы
to command widespread agreement – привести к общей согласованности во взглядах
unresolved questions – неразрешенные вопросы
where disagreement remains – где разногласия продолжают существовать
research in progress – исследования, проводимые в настоящее время
new issues will arise (arose, arisen) – возникнут новые проблемы
to provide scope for further research – создать фундамент, базу, основу для дальнейших исследований
competent and comprehensive research – квалифицированная и всеобъемлющая исследовательская работа
outstanding issues – спорные, остающиеся неразрешенными вопросы
corresponding claim – аналогичное заявление

to claim – притязать на что-либо
search for objective truth – поиск объективной истины
in search of smth – в поисках чего-либо
the elderly – пожилые люди
medical expenses – расходы на здравоохранение
to subsidize health bills – субсидировать расходы на здравоохранение
statement *(syn.* assertion) – заявление
to determine whether or not it's correct – определить, правильно ли это
broadly speaking – в широком значении, в общем понимании
assertion *(syn.* statement) – утверждение, заявление
to assert – утверждать, заявлять
to share one's judgment (view) – разделять чьи-либо суждения, взгляды
roughly equal amounts – приблизительно равные количества
luxury and recreational goods – предметы роскоши и товары для отдыха
to disagree reasonably – приводить разумные возражения
to improve the environment – охранять окружающую среду
the preferences or priorities of the individual or the society – предпочтения или приоритеты отдельных лиц или общества в целом
to make a choice – делать выбор
to throw light on – пролить свет на
to spell out – точно, обстоятельно объяснить
the detailed implications – скрытый смысл, значение
failure – провал, неудача
to fail smth – терпеть неудачу в чем-либо
to fail an exam – провалиться на экзамене
to seek (sought, sought) – искать что-либо
medical check-ups – медицинские осмотры
an attempt – попытка
to attempt *(syn.* to try) – пытаться
to detect smth – выявить, обнаружить
check-up facilities – оборудование для медосмотров
to supposed to do smth – предполагать сделать что-либо
to clarify smth *(syn. to* clear up) – пояснить что-либо
the menu of options – набор вариантов

III. Translate into English

1. При изучении экономики необходимо различать (2 варианта) позитивную и нормативную экономические теории. Если в позитивной теории мы можем оставаться беспристрастными, независимо от наших политических убеждений, то нормативная теория основывается на личной системе ценностей. В этом отношении различие между двумя теориями очень наглядно.

2. Квалифицированная и всесторонняя исследовательская работа может в некоторой степени исправить положение (3 варианта) в области нерешенных вопросов, порождающих (2 варианта) разногласия среди экономистов. В широком понимании никакая рекомендация правительству не может оказаться правильной или ложной, поскольку она основана на субъективных оценках.

3. Позитивная теория может предложить ряд возможных альтернатив, из которых индивид или общество в целом выбирают наиболее приоритетные.

Ⅳ. Resume the text

UNIT 9

Ⅰ. Read the text

A model of the economy

Economists spend a lot of time trying to develop models of the working of the economy. The London Business School, like many universities and also the Treasury, has a model of the economy which it has entered into a computer. The reason for this is that much of its work is concerned with forecasting future economic trends so as to aid decision-making by business and government. The London Business School's model can be fed with economic information, such as changes in tax rates, and it will then predict how the economy will behave. Such predictions are an invaluable aid to business decision-making because, for example, businesses can find out whether people's incomes are Likely to rise or not.

The complete economy comprises many millions of economic units. There are households, as one kind of unit. There are also firms, and the

departments of both central and local government. These units together decide the economy's total spending. They also decide its total income and its total level of production of goods and services. But in order to develop a simple model of the economy we need to ignore the government sector and the possibility of transactions between households and foreigners. Suppose we are dealing with an isolated economy, one which has no government. Let's assume that there are two main sectors in the economy: households and firms. Households supply firms with the factors of production that firms need to carry on their concerns.

Thus, households provide labor services, both skilled and unskilled, in return for the payment of wages. They may also supply land for which they are paid rent. Finally, they might supply the finance, which is essential to the business. If the finance is in the form of a loan they receive interest payments, but if they have purchased shares in the business they may be entitled to a share of the profits. Most households provide some factor services or services of productive/actors, to a public or private business. Anyone at work is providing labor, and if you or someone in your family has bought shares in the privatization program (in, for example, British Gas, British Telecom or the water authorities) then they have supplied share capital. Households receive payments for these factor services, that is to say, they earn factor incomes, such as wages, rents and profits.

The other part of our simple model portrays firms supplying households with all the goods and services that they require. In return for these the households pay the firms. These two sets of actions create the model of the circular flow of money, which is shown in Fig. 3.

In fact, there are two flows. One which is monetary and one comprising goods and' services. A flow of factor services from households to firms for which there is an opposite stream of factor payments and a flow of goods and services, which households pay firms. It is this monetary flow in which we are most interested.

What does the figure suggest? It suggests that there are three ways of measuring the amount of economic activity in the economy. First, we can measure the value of goods and services produced, second, we can measure the level of factor earnings. These factor earnings represent the value of factor services supplied. Third, we can measure the value of spending on goods and services. Then, economists refer to the size of the monetary circular flow as

the level of national income.

If we assume that all the goods and services, which are produced are in fact sold and that households spend all their income, then we have arrived at what economists call a neutral equilibrium. The level of income, which is spent and received by the two groups will not alter since as one group receives it, they spend it with the other.

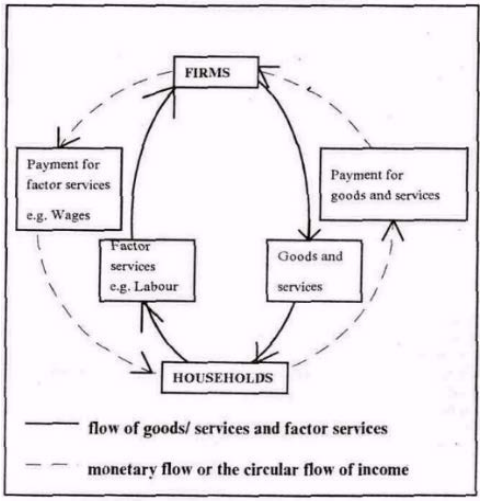

Figure 3. The Circular Flow of Income

The fact that the economy is in a neutral equilibrium means simply that the level of national income, and hence the level of economic activity, are stable and unchanging. (An equilibrium is a point of balance in which there is no inherent tendency to change). If the economy was in equilibrium, it does not mean that everyone who wants a job has one or that the country is importing exactly the same value of goods and services as it is exporting.

(from https://studfile.net/preview/5372970/page:27/)

Ⅱ. Study vocabulary notes

to aid decision-making – помогать, содействовать в принятии решений
the model can be fed with economic information – в модель можно внести экономическую информацию

total income – общий, суммарный доход
total level of production of goods and services – общий уровень производства товаров и услуг
to deal with an isolated economy – иметь дело с изолированной экономикой, to carry on their concerns – продолжать свое дело
to provide labor services – предоставлять рабочую силу (труд)
to receive interest payments – получать платежи в виде процентов
shares – акции
to be entitled to a share of the profits – иметь право на долю прибыли
factor services or services of productive factors – факторы производства
the water authorities – управление водного хозяйства
to supply share capital – предоставить акционерный капитал
factor incomes – доход на факторы производства
to portray – отображать
a monetary flow – денежный поток
an opposite stream – противоположный поток
factor payments – выплаты (доход) на факторы производства
to measure the amount of economic activity – измерять уровень экономической активности
the value of goods and services produced – стоимость произведенных товаров и услуг
the level of factor earnings – уровень доходов на факторы производства
the value of factor services supplied – стоимость предоставленных факторов производства
the value of spending on goods and services – размер расходов на товары и услуги
a neutral equilibrium – общее равновесие
the circular flow of income – круговой поток (круговорот) доходов
an inherent tendency to change – внутренняя тенденция к изменению

Ⅲ. Translate into English

1. Кругооборот (круговой поток) доходов – это поток товаров и услуг между домашними, семейными хозяйствами (населением) и фирмами (предпринимателями), с одной стороны, и поток денежных платежей за них – с другой стороны.

2. Если рассматривать простейшую модель экономики, то необходимо допустить, что население полностью тратит все полученные доходы на покупку товаров и услуг, а предприниматели продают все товары, которые производят.

3. В уплату за товары и услуги, которые предлагают населению предприниматели, население передает им деньги, которые, в свою очередь, получает от предпринимателей в обмен за факторы производства.

4. Если мы допустим, что схема описывает ситуацию, при которой достигнута эффективность распределения ресурсов, то мы получим модель экономики, находящейся в состоянии общего равновесия.

Ⅳ. Make annotation to the text

UNIT 10

Ⅰ. Read the text

Simulation

Simulation is the imitation of the operation of a real-world process or system over time. The act of simulating something first requires that a model be developed; this model represents the key characteristics or behaviors/functions of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time.

Simulation is used in many contexts, such as simulation of technology for performance optimization, safety engineering, testing, training, education, and video games. Often, computer experiments are used to study simulation models. Simulation is also used with scientific modelling of natural systems or human systems to gain insight into their functioning. Simulation can be used to show the eventual real effects of alternative conditions and courses of action. Simulation is also used when the real system cannot be engaged, because it may not be accessible, or it may be dangerous or unacceptable to engage, or it is being designed but not yet built, or it may simply not exist.

Key issues in simulation include acquisition of valid source information about the relevant selection of key characteristics and behaviors, the use of simplifying approximations and assumptions within the simulation, and fidelity and validity of the simulation outcomes.

Historically, simulations used in different fields developed largely independently, but 20th century studies of systems theory and cybernetics combined with spreading use of computers across all those fields have led to some unification and a more systematic view of the concept.

Physical simulation refers to simulation in which physical objects are substituted for the real thing (some circles use the term for computer simulations modelling selected laws of physics, but this article doesn't). These physical objects are often chosen because they are smaller or cheaper than the actual object or system.

Interactive simulation is a special kind of physical simulation, often referred to as a human in the loop simulation, in which physical simulations include human operators, such as in a flight simulator or a driving simulator.

Human in the loop simulations can include a computer simulation as a so-called synthetic environment.

Simulation in failure analysis refers to simulation in which we create environment/conditions to identify the cause of equipment failure. This was the best and fastest method to identify the failure cause.

A computer simulation (or "sim") is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system. It is a tool to virtually investigate the behavior of the system under study.

Computer simulation has become a useful part of modeling many natural systems in physics, chemistry and biology, and human systems in economics and social science (the computational sociology) as well as in engineering to gain insight into the operation of those systems. A good example of the usefulness of using computers to simulate can be found in the field of network traffic simulation. In such simulations, the model behavior will change each simulation according to the set of initial parameters assumed for the environment.

Traditionally, the formal modeling of systems has been via a mathematical model, which attempts to find analytical solutions

enabling the prediction of the behavior of the system from a set of parameters and initial conditions. Computer simulation is often used as an adjunct to, or substitution for, modeling systems for which simple closed form analytic solutions are not possible. There are many different types of computer simulation, the common feature they all share is the attempt to generate a sample of representative scenarios for a model in which a complete enumeration of all possible states would be prohibitive or impossible.

Several software packages exist for running computer-based simulation modeling (e.g. Monte Carlo simulation, stochastic modeling, multimethod modeling) that makes all the modeling almost effortless.

Modern usage of the term "computer simulation" may encompass virtually any computer-based representation.

In economics and especially macroeconomics, the effects of proposed policy actions, such as fiscal policy changes or monetary policy changes, are simulated to judge their desirability. A mathematical model of the economy, having been fitted to historical economic data, is used as a proxy for the actual economy; proposed values of government spending, taxation, open market operations, etc. are used as inputs to the simulation of the model, and various variables of interest such as the inflation rate, the unemployment rate, the balance of trade deficit, the government budget deficit, etc. are the outputs of the simulation. The simulated values of these variables of interest are compared for different proposed policy inputs to determine which set of outcomes is most desirable.

In finance, computer simulations are often used for scenario planning. Risk-adjusted net present value, for example, is computed from well-defined but not always known (or fixed) inputs. By imitating the performance of the project under evaluation, simulation can provide a distribution of NPV over a range of discount rates and other variables.

Simulations are frequently used in financial training to engage participants in experiencing various historical as well as fictional situations. There are stock market simulations, portfolio simulations, risk management simulations or models and forex simulations. Such simulations are typically based on stochastic asset models. Using these simulations in a training program allows for the application of theory

into a something akin to real life. As with other industries, the use of simulations can be technology or case-study driven.

(from http://community.worldheritage.org/articles/eng/ Simulation_ &_Gaming)

Ⅱ. Study vocabulary notes

eventual real effects – возможные реальные последствия
fidelity – точность, правильность, достоверность
a human in the loop simulation – имитация (на тренажере) деятельности человека в контуре управления
network traffic simulation – моделирование торговли, моделирование торговых сделок, моделирование транспортных перевозок, моделирование транспортных потоков
adjunct to – дополнение
prohibitive – запретительный
stochastic modeling – стохастическое [вероятностное] моделирование
multimethod modeling – множественная диспетчеризация
Monte Carlo simulation – моделирование методом Монте-Карло
Proxy – промежуточный сервер (комплекс программ) в компьютерных сетях, выполняющий роль посредника между пользователем и целевым сервером
risk-adjusted – с учетом риска

Ⅲ. Translate into English

1. Бизнес-симуляция – интерактивная модель экономической системы, которая по своим внутренним условиям максимально приближена к соответствующей реальной экономической единице (подразделение предприятия, предприятие, отрасль, государство).

2. Бизнес-симуляция имеет образовательную цель: получение участником соответствующих навыков и компетенций. Это качественно отличает её от других программных продуктов, в частности экономических игр, которые в большинстве своем относятся к сфере развлечений.

3. Следует отметить, что комплексность и системность подходов, которые присутствуют в концепции бизнес-симуляции, позволяют применять в учебном процессе элементы игрового

процесса, которые при правильном балансе с обучающими задачами повышают эффективность образовательных результатов. Именно это позволяет выделить бизнес-симуляцию в отдельную категорию.

4. Бизнес-симуляция с точки зрения математики – это модель, которая имеет свои входные и исходные данные. Входными данными для математической модели симуляции являются решения участников, которые имеют цифровое выражение. А исходными – результат обработки этих решений специальными алгоритмами, которые имитируют реальные экономические процессы.

5. Моделирование – построение моделей для исследования и изучения объектов, процессов, явлений. стохастическое моделирование отображает вероятностные процессы и события. В этом случае анализируется ряд реализаций случайного процесса, и оцениваются средние характеристики. один подход к классификации математических моделей подразделяет их на детерминированные и стохастические (вероятностные).

6. Моделирование случайных процессов – мощнейшее направление в современном математическом моделировании. Событие называется случайным, если оно достоверно непредсказуемо. Случайность окружает наш мир и чаще всего играет отрицательную роль в нашей жизни.

Ⅳ. Retell the text

Контрольная работа для студентов-магистрантов экономического факультета

❶ Translate from English into Russian

1. Mathematical economics is the application of mathematical methods to represent theories and analyze problems in economics.
2. Microeconomics also deals with the effects of national economic policies (such as changing taxation levels) on the aforementioned aspects of the economy.
3. Economists use the extreme value theorem to guarantee that a solution to the utility maximization problem exists.
4. Formal economic modeling began in the 19th century with the use of differential calculus to represent and explain economic behavior, such as utility maximization, an early economic application of mathematical optimization.
5. When the economy is enjoying a boom, firms experience high sales and general prosperity.

❷ Translate from Russian into English

1. Результатом деятельности всех субъектов производства является формирование той или иной экономической среды.
2. Валовый национальный продукт это совокупностью товаров и услуг, произведённых национальной экономикой за год.
3. Микроэкономика стремиться к детальному рассмотрению поведения какой-либо экономической единицы, при этом, не уделяя достаточного внимания косвенному воздействия этого поведения на другие экономические единицы и на экономику в целом.
4. Математические методы позволяют чётко, просто, строго и обобщённо формулировать ключевые теоретические положения и делать на их основе практические выводы.
5. Развитие математической экономики вызвало появление многих математических теорий, объединяемых названием «математическое программирование».

6. Предметом микроэкономики являются экономические отношения, связанные с эффективным использованием ограниченных ресурсов, а также принятие решений отдельными субъектами экономики в условиях экономического выбора.

❸ Give definitions

1. Supply
2. Mathematization
3. Microeconomic analysis

Тексты для аннотирования

Text 1

Mathematical Economics

Mathematical economics is the application of mathematical methods to represent theories and analyze problems in economics. By convention, the applied methods refer to those beyond simple geometry, such as differential and integral calculus, difference and differential equations, matrix algebra, mathematical programming, and other computational methods. An advantage claimed for the approach is its allowing formulation of theoretical relationships with rigor, generality, and simplicity.

Mathematics allows economists to form meaningful, testable propositions about wide-ranging and complex subjects which could less easily be expressed informally. Further, the language of mathematics allows economists to make specific, positive claims about controversial or contentious subjects that would be impossible without mathematics. Much of economic theory is currently presented in terms of mathematical economic models, a set of stylized and simplified mathematical relationships asserted to clarify assumptions and implications.

Broad applications include:

optimization problems as to goal equilibrium, whether of a household, business firm, or policy maker

static (or equilibrium) analysis in which the economic unit (such as a household) or economic system (such as a market or the economy) is modeled as not changing

comparative statics as to a change from one equilibrium to another induced by a change in one or more factors

dynamic analysis, tracing changes in an economic system over time, for example from economic growth.

Formal economic modeling began in the 19th century with the use of differential calculus to represent and explain economic behavior, such as utility maximization, an early economic application of mathematical optimization. Economics became more mathematical as a discipline throughout the first half of the 20th century, but introduction of new and generalized techniques in the period around the Second World War, as in game theory, would greatly broaden the use of mathematical formulations in economics.

This rapid systematizing of economics alarmed critics of the discipline as well as some noted economists. John Maynard Keynes, Robert Heilbroner, Friedrich Hayek and others have criticized the broad use of mathematical models for human behavior, arguing that some human choices are irreducible to mathematics.

(from https://en.wikipedia.org/wiki/Mathematical_economics)

Text 2

Marginalists and the roots of neoclassical economics

Augustin Cournot and Léon Walras built the tools of the discipline axiomatically around utility, arguing that individuals sought to maximize their utility across choices in a way that could be described mathematically. At the time, it was thought that utility was quantifiable, in units known as utils. Cournot, Walras and Francis Ysidro Edgeworth are considered the precursors to modern mathematical economics.

Augustin Cournot

Cournot, a professor of mathematics, developed a mathematical treatment in 1838 for duopoly a market condition defined by competition between two sellers. This treatment of competition, first published in Researches into the Mathematical Principles of Wealth, is referred to as Cournot duopoly. It is assumed that both sellers had equal

access to the market and could produce their goods without cost. Further, it assumed that both goods were homogeneous. Each seller would vary her output based on the output of the other and the market price would be determined by the total quantity supplied. The profit for each firm would be determined by multiplying their output and the per unit Market price. Differentiating the profit function with respect to quantity supplied for each firm left a system of linear equations, the simultaneous solution of which gave the equilibrium quantity, price and profits. Cournot's contributions to the mathematization of economics would be neglected for decades, but eventually influenced many of the marginalists. Cournot's models of duopoly and Oligopoly also represent one of the first formulations of non-cooperative games. Today the solution can be given as a Nash equilibrium but Cournot's work preceded modern game theory by over 100 years.

(from https://en.academic.ru/dic.nsf/enwiki/10984983)

Text 3

Modern mathematical economics

From the later-1930s, an array of new mathematical tools from the differential calculus and differential equations, convex sets, and graph theory were deployed to advance economic theory in a way similar to new mathematical methods earlier applied to physics. The process was later described as moving from mechanics to axiomatics.

Vilfredo Pareto analyzed microeconomics by treating decisions by economic actors as attempts to change a given allotment of goods to another, more preferred allotment. Sets of allocations could then be treated as Pareto efficient (Pareto optimal is an equivalent term) when no exchanges could occur between actors that could make at least one individual better off without making any other individual worse off. Pareto's proof is commonly conflated with Walrassian equilibrium or informally ascribed to Adam Smith's Invisible hand hypothesis. Rather, Pareto's statement was the first formal assertion of what would be known as the first fundamental theorem of welfare economics. These models lacked the inequalities of the next generation of mathematical economics.

In the landmark treatise Foundations of Economic Analysis (1947), Paul Samuelson identified a common paradigm and mathematical structure

across multiple fields in the subject, building on previous work by Alfred Marshall. Foundations took mathematical concepts from physics and applied them to economic problems. This broad view (for example, comparing Le Chatelier's principle to tâtonnement) drives the fundamental premise of mathematical economics: systems of economic actors may be modeled and their behavior described much like any other system. This extension followed on the work of the marginalists in the previous century and extended it significantly. Samuelson approached the problems of applying individual utility maximization over aggregate groups with comparative statics, which compares two different equilibrium states after an exogenous change in a variable. This and other methods in the book provided the foundation for mathematical economics in the 20th century.

(from https://wikimili.com/en/Mathematical_economics)

Text 4

Functional analysis

It was in the course of proving of the existence of an optimal equilibrium in his 1937 model of economic growth that John von Neumann introduced functional analytic methods to include topology in economic theory, in particular, fixed-point theory through his generalization of Brouwer's fixed-point theorem. Following von Neumann's program, Kenneth Arrow and Gérard Debreu formulated abstract models of economic equilibria using convex sets and fixed–point theory. In introducing the Arrow–Debreu model in 1954, they proved the existence (but not the uniqueness) of an equilibrium and also proved that every Walras equilibrium is Pareto efficient; in general, equilibria need not be unique. In their models, the ("primal") vector space represented quantities while the "dual" vector space represented prices.

In Russia, the mathematician Leonid Kantorovich developed economic models in partially ordered vector spaces, that emphasized the duality between quantities and prices. Kantorovich renamed prices as "objectively determined valuations" which were abbreviated in Russian as "o. o. o.", alluding to the difficulty of discussing prices in the Soviet Union.

Even in finite dimensions, the concepts of functional analysis have illuminated economic theory, particularly in clarifying the role of prices as normal vectors to a hyperplane supporting a convex set,

representing production or consumption possibilities. However, problems of describing optimization over time or under uncertainty require the use of infinite–dimensional function spaces, because agents are choosing among functions or stochastic processes.

(from https://en.wikipedia.org/wiki/Functional_analysis)

Text 5

Agent-based computational economics

Agent-based computational economics (ACE) as a named field is relatively recent, dating from about the 1990s as to published work. It studies economic processes, including whole economies, as dynamic systems of interacting agents over time. As such, it falls in the paradigm of complex adaptive systems. In corresponding agent-based models, agents are not real people but "computational objects modeled as interacting according to rules" ... "whose micro-level interactions create emergent patterns" in space and time. The rules are formulated to predict behavior and social interactions based on incentives and information. The theoretical assumption of mathematical optimization by agents markets is replaced by the less restrictive postulate of agents with bounded rationality adapting to market forces.

ACE models apply numerical methods of analysis to computer-based simulations of complex dynamic problems for which more conventional methods, such as theorem formulation, may not find ready use. Starting from specified initial conditions, the computational economic system is modeled as evolving over time as its constituent agents repeatedly interact with each other. In these respects, ACE has been characterized as a bottom-up culture-dish approach to the study of the economy. In contrast to other standard modeling methods, ACE events are driven solely by initial conditions, whether or not equilibria exist or are computationally tractable. ACE modeling, however, includes agent adaptation, autonomy, and learning. It has a similarity to, and overlap with, game theory as an agent-based method for modeling social interactions. Other dimensions of the approach include such standard economic subjects as competition and collaboration, market structure and industrial organization, transaction costs, welfare

economics and mechanism design, information and uncertainty, and macroeconomics.

The method is said to benefit from continuing improvements in modeling techniques of computer science and increased computer capabilities. Issues include those common to experimental economics in general and by comparison and to development of a common framework for empirical validation and resolving open questions in agent-based modeling. The ultimate scientific objective of the method has been described as "test[ing] theoretical findings against real-world data in ways that permit empirically supported theories to cumulate over time, with each researcher's work building appropriately on the work that has gone before."

(from https://en.wikipedia.org/wiki/Agent-based_ computational_ economics)

Тексты для письменного перевода

Text 1

Econometrics

Econometrics is the study of the specific quantitative regularities and interrelationships of economic objects and processes by means of mathematical and statistical techniques and models. The models used in econometrics yield numerical results on the basis of statistical, forecasting, and planning data. Econometrics is sometimes broadly construed as the modeling of economic processes in general, including abstract theoretical models.

The potential uses of econometrics depend on the degree to which a model reflects the objective laws discovered by economics, on the availability and quality of the data, and on the techniques employed in their evaluation and processing. In some instances, on the other hand, econometrics makes it possible to use factual material in order to concretize and verify theoretical hypotheses and models in the economic sciences.

K. Marx noted the possibility of “mathematically deducing . . . the main laws of crises” from the analysis of such factors as price dynamics and discount rates (K. Marx and F. Engels, Soch., 2nd ed.,

vol. 33, p. 72). Some early attempts at the mathematical formalization of economic and statistical data were made in the 19th and early 20th centuries – for example, V. Pareto's derivation of the hyperbola equation to describe income distribution in the capitalist countries (1897), the works of R. Hooker (Great Britain) on correlation analysis in economics, and the works of the Russian statistician A. A. Chuprov. But it was not until the 1920's and 1930's that econometrics – owing particularly to the works of H. Moore and H. Schultz (USA) – emerged as an independent scientific school that combined economic theory, statistics, and mathematics. The term "econometrics" was introduced by the Polish economist P. Czompa (1910); it was adopted as a scientific term by the Norwegian economist R. Frisch (1926), who was a founder of the International Econometric Society (1930) together with the Americans I. Fisher and C. Roos.

It was within the framework of econometrics that analytical-statistical models were first developed to express the correlation between an economic process and other factors presumed to influence it. An early example of such a model was the "economic barometer," which was based on the empirically observed tendency of some business indicators to lag behind others. The model that was best known the "Harvard barometer," which W. Mitchell helped design–proved incapable of predicting the major economic crisis of 1929–33. The failure of purely empirical constructions led to increased interest in the theoretical validation of econometric models; in bourgeois economics, such validation was based on the subjectivist theory of marginal utility, the general theory of equilibrium of the market, and the works of J. M. Keynes.

(from https://en.wikipedia.org/wiki/Econometrics)

Text 2

Comparative statics

In economics, comparative statics is the comparison of two different economic outcomes, before and after a change in some underlying exogenous parameter.

As a type of static analysis it compares two different equilibrium states, after the process of adjustment (if any). It does not study the motion towards equilibrium, nor the process of the change itself.

Comparative statics is commonly used to study changes in supply and demand when analyzing a single market, and to study changes in monetary or fiscal policy when analyzing the whole economy. The term 'comparative statics' itself is more commonly used in relation to microeconomics (including general equilibrium analysis) than to macroeconomics. Comparative statics was formalized by John R. Hicks (1939) and Paul A. Samuelson (1947) (Kehoe, 1987, p. 517) but was presented graphically from at least the 1870s.

For models of stable equilibrium rates of change, such as the neoclassical growth model, comparative dynamics is the counterpart of comparative statics (Eatwell, 1987).

Comparative statics results are usually derived by using the implicit function theorem to calculate a linear approximation to the system of equations that defines the equilibrium, under the assumption that the equilibrium is stable. That is, if we consider a sufficiently small change in some exogenous parameter, we can calculate how each endogenous variable changes using only the first derivatives of the terms that appear in the equilibrium equations.

One limitation of comparative statics using the implicit function theorem is that results are valid only in a (potentially very small) neighborhood of the optimum–that is, only for very small changes in the exogenous variables. Another limitation is the potentially overly restrictive nature of the assumptions conventionally used to justify comparative statics procedures.

Paul Milgrom and Chris Shannon pointed out in 1994 that the assumptions conventionally used to justify the use of comparative statics on optimization problems are not actually necessary–specifically, the assumptions of convexity of preferred sets or constraint sets, smoothness of their boundaries, first and second derivative conditions, and linearity of budget sets or objective functions. In fact, sometimes a problem meeting these conditions can be monotonically transformed to give a problem with identical comparative statics but violating some or all of these conditions; hence these conditions are not necessary to justify the comparative statics. Stemming from the article by Milgrom and Shannon as well as the results obtained by Veinott and Topkis an important strand of operational research was developed called monotone comparative statics. In particular, this theory concentrates on

the comparative statics analysis using only conditions that are independent of order-preserving transformations. The method uses lattice theory and introduces the notions of quasi-supermodularity and the single-crossing condition. The wide application of monotone comparative statics to economics include production theory, consumer theory, game theory with complete and incomplete information, auction theory, and others.

(from https://en.wikipedia.org/wiki/Comparative_statics)

Text 3

Mathematical optimization

In mathematics, mathematical optimization (or optimization or mathematical programming) refers to the selection of a best element from some set of available alternatives. In the simplest case, an optimization problem involves maximizing or minimizing a real function by selecting input values of the function and computing the corresponding values of the function. The solution process includes satisfying general necessary and sufficient conditions for optimality. For optimization problems, specialized notation may be used as to the function and its input(s). More generally, optimization includes finding the best available element of some function given a defined domain and may use a variety of different computational optimization techniques.

Economics is closely enough linked to optimization by agents in an economy that an influential definition relatedly describes economics qua science as the "study of human behavior as a relationship between ends and scarce means" with alternative uses. Optimization problems run through modern economics, many with explicit economic or technical constraints. In microeconomics, the utility maximization problem and its dual problem, the expenditure minimization problem for a given level of utility, are economic optimization problems. Theory posits that consumers maximize their utility, subject to their budget constraints and that firms maximize their profits, subject to their production functions, input costs, and market demand.

Economic equilibrium is studied in optimization theory as a key ingredient of economic theorems that in principle could be tested against empirical data.

Optimality properties for an entire market system may be stated in mathematical terms, as in formulation of the two fundamental theorems of welfare economics and in the Arrow–Debreu model of general equilibrium. More concretely, many problems are amenable to analytical (formulaic) solution. Many others may be sufficiently complex to require numerical methods of solution, aided by software. Still others are complex but tractable enough to allow computable methods of solution, in particular computable general equilibrium models for the entire economy.

Linear and nonlinear programming have profoundly affected microeconomics, which had earlier considered only equality constraints. Many of the mathematical economists who received Nobel Prizes in Economics had conducted notable research using linear programming: Leonid Kantorovich, Leonid Hurwicz, Tjalling Koopmans, Kenneth J. Arrow, and Robert Dorfman, Paul Samuelson, and Robert Solow. Both Kantorovich and Koopmans acknowledged that George B. Dantzig deserved to share their Nobel Prize for linear programming. Economists who conducted research in nonlinear programming also have won the Nobel prize, notably Ragnar Frisch in addition to Kantorovich, Hurwicz, Koopmans, Arrow, and Samuelson.

(from https://en.wikipedia.org/wiki/Mathematical_optimization)

Text 4

Macroeconomics theories

Macroeconomics descended from the once divided fields of business cycle theory and monetary theory. The quantity theory of money was particularly influential prior to World War II. It took many forms including the version based on the work of Irving Fisher:

In the typical view of the quantity theory, money velocity (V) and the quantity of goods produced (Q) would be constant, so any increase in money supply (M) would lead to a direct increase in price level (P). The quantity theory of money was a central part of the classical theory of the economy that prevailed in the early twentieth century.

Keynes and his followers

Macroeconomics, at least in its modern form, began with the publication of John Maynard Keynes's General Theory of Employment,

Interest and Money. When the Great Depression struck, classical economists had difficulty explaining how goods could go unsold and workers could be left unemployed. In classical theory, prices and wages would drop until the market cleared, and all goods and labor were sold. Keynes offered a new theory of economics that explained why markets might not clear, which would evolve (later in the 20th century) into a group of macroeconomic schools of thought known as Keynesian economics – also called Keynesianism or Keynesian theory.

In Keynes's theory, the quantity theory broke down because people and businesses tend to hold on to their cash in tough economic times, a phenomenon he described in terms of liquidity preferences. Keynes also explained how the multiplier effect would magnify a small decrease in consumption or investment and cause declines throughout the economy. Keynes also noted the role uncertainty and animal spirits can play in the economy.

The generation following Keynes combined the macroeconomics of the General Theory with neoclassical microeconomics to create the neoclassical synthesis. By the 1950s, most economists had accepted the synthesis view of the macro economy. Economists like Paul Samuelson, Franco Modigliani, James Tobin, and Robert Solow developed formal Keynesian models, and contributed formal theories of consumption, investment, and money demand that fleshed out the Keynesian framework.

Monetarism

Milton Friedman updated the quantity theory of money to include a role for money demand. He argued that the role of money in the economy was sufficient to explain the Great Depression and aggregate demand oriented explanations were not necessary. Friedman argued that monetary policy was more effective than fiscal policy; however, Friedman doubted the government has ability to "fine-tune" the economy with monetary policy. He generally favored a policy of steady growth in money supply instead of frequent intervention.

Friedman also challenged the Phillips curve relationship between inflation and unemployment. Friedman and Edmund Phelps (who was not a monetarist) proposed an "augmented" version of the Phillips curve that excluded the possibility of a stable, long-run tradeoff between inflation and unemployment. When the oil shocks of the 1970s created a high unemployment and high inflation, Friedman and Phelps were vindicated.

Monetarism was particularly influential in the early 1980s. Monetarism fell out of favor when central banks found it difficult to target money supply instead of interest rates as monetarists recommended. Monetarism also became politically unpopular when the central banks created recessions in order to slow inflation.

(from https://www.sfu.ca/~dandolfa/macro2005.pdf)

Topics for reports:

1. Demand & Supply Curves
2. Mathematicians & Economists
3. Use of Mathematics in Economics
4. Fundamental Methods of Mathematical Economics.
5. Mathematical economics as a form of pure mathematics
6. Testing predictions of mathematical economics
7. Adequacy of mathematics for qualitative and complicated economics
8. Comparative statistics
9. Agent-based computational economics
10. Theory of Games and Economic Behavior

Topics for presentations:

1. Functional analysis
2. Differential decline and rise
3. Variational calculus and optimal control
4. Nonlinear programming
5. Mathematical optimization
6. Econometrics
7. The Nature of Mathematical Programming
8. The Mathematical Theory of Optimal Processes
9. Fundamental Methods of Mathematical Economics
10. Numerical Methods in Economics

Лексический минимум

1. by convention – по определению, согласно правилу
2. difference – разница, противоречие
3. matrix algebra – алгебра матриц
4. rigor – точность, тщательность
5. generality – универсальность, обобщение
6. propositions – утверждения
7. meaningful – конструктивный, содержательный
8. implications – значения
9. to coin – придумать, изобрести
10. reasoning by figures upon – математическое, числовое обоснование
11. at length – подробно
12. velocity of money – скорость обращения денег
13. mathematization – математизация
14. marginal analysis – маржинальный анализ (анализ себестоимости продукции или услуг)
15. generalizations – обобщения
16. outline – основные принципы, положения
17. input values – входные ценности
18. optimality – опртимальность
19. specialized notation – специализированное обозначение
20. scarce – ограниченный, скудный
21. expenditure minimization – минимизация расходов
22. posit – утверждать
23. subject to – благодаря чему-то
24. budget constraints – бюджетное ограничение
25. input costs – затраты на ресурсы
26. properties – свойства
27. sufficiently – достаточно
28. in particular – в частности, в особенности
29. computable general equilibrium model – вычислимая модель общего равновесия
30. equality constraints – ограничение типа равенства
31. acknowledge – признавать

32. Lagrange multipliers – множители Лагранжа (*дополнительные множители, преобразующие целевую функцию экстремальной задачи выпуклого программирования и помогающие проверить оптимальность найденного допустимого решения*)
33. duality – двойственность, дуальность
34. treatment – трактовка
35. convex sets – выпуклое множество
36. fixed–point theory – теория неподвижных точек
37. partially ordered vector spaces – частично упорядоченное векторное пространство
38. *qua* – в качестве, как
39. aggregated indicators – совокупные показатели
40. unemployment rates – уровень безработицы
41. output – объём производства
42. emblematic – символичный, знаковый
43. consequences – последствия
44. short-run fluctuations – кратковременные колебания
45. the business cycle – цикл деловой активности (*периодические колебания уровня деловой активности в экономике страны, в которых принято выделять четыре фазы: подъем, бум, спад и депрессию*)
46. determinants – детерминанты
47. encompass – охватывать
48. generate – создавать, производить
49. therefore – следовательно
50. interchangeably – взаимозаменяемо, равнозначно
51. value added – условно-чистая продукция, добавленная стоимость (*валовая продукция фирмы, отрасли, экономики страны в целом за вычетом стоимости материалов и незавершенного производства*)
52. national accounts – народнохозяйственные балансы, национальные счета (система счетов для наиболее полного отражения результатов функционирования экономики страны в целом)
53. consistently – последовательно
54. recession – спад, регресс
55. brake down into – разделить
56. profit margins – чистая прибыль
57. bear – выдерживать

58. frictional unemployment – фрикционная безработица
59. appropriate – подходящий
60. mismatch – несоответствие
61. cover – включать
62. regardless of – независимо от
63. stagnate – заставаться, загнивать
64. local authorities – местные органы власти
65. to take *(syn.* to make) decisions – принимать решения
66. to play a prominent part – играть заметную (значительную) роль
67. to shape the environment – формировать обстановку, среду, окружение
68. to predict *(syn. to* forecast) – предсказывать
69. to cut back on spending – сокращать расходы
70. general prosperity – всеобщее процветание
71. consumers – потребители
72. to alter – изменяться
73. a recession – упадок
74. total spending – общие, суммарные расходы
75. to decline – снижаться
76. income – доход
77. to purchase *(syn. to* buy) – покупать
78. to cut expenditure – сокращать расходы
79. luxury items – предметы роскоши
80. to affect *(syn. to* influence smb. smth) – влиять
81. to some extent – в некоторой степени
82. to incur *(syn.* to bear, to suffer) losses – нести убытки, потери
83. to borrow from – занимать, брать взаймы
84. to deny the opportunity – лишать возможности
85. to earn interest – получать процентный доход
86. loans – ссуды, займы
87. to default on repayment – не выполнять обязательств по выплате (долгов, процентов и т. п.)
88. a debt – долг
89. profit margins – размеры прибыли
90. householder – домовладелец, домохозяин
91. household – домашнее хозяйство
92. mortgage – закладная

93. trade balance – торговый баланс
94. raw material prices – цены на сырье
95. at full capacity – на полную мощность
96. available resources – доступные, имеющиеся в наличии ресурсы
97. labor – труд
98. machinery – оборудование
99. factors of production – производственные факторы, факторы производства *(труд, земля, природные ресурсы, капитал)*
100. to be under-utilized – не использоваться полностью
101. unemployment figures – количество безработных
102. indicator – показатель
103. national income – национальный доход
104. the value of a nation's output – оценка объема производства страны
105. Gross National Product (GNP) – валовой национальный продукт (ВНП)
106. graphs and tables – графики и таблицы
107. income distribution – распределение дохода
108. an annual income – годовой доход
109. a certain standard of living – определенный уровень жизни
110. government tax policy – налоговая политика государства
111. to devote resources – выделять ресурсы
112. aggregate, *n* – совокупность
113. in the aggregate – в совокупности
114. aggregate, *adj* – совокупный
115. the relative output – относительный объем производства
116. general equilibrium theory – теория общего равновесия
117. to study simultaneously – одновременно изучать
118. to preserve the simplicity of the analysis – сохранить простоту анализа
119. partial analysis – частичный (неполный) анализ
120. to retain a manageable analysis – сохранить возможность анализа (выполнимый, поддающийся выполнению анализ)
121. the breakdown of consumer goods – классификация (подразделение) товаров потребления
122. durables – товары долговременного пользования
123. total income – общий, суммарный доход

124. to provide labor services – предоставлять рабочую силу (труд)
125. shares – акции
126. a monetary flow – денежный поток
127. an opposite stream – противоположный поток
128. the value of goods and services produced – стоимость произведенных товаров и услуг
129. the level of factor earnings – уровень доходов на факторы производства
130. the value of spending on goods and services – размер расходов на товары и услуги
131. the circular flow of income – круговой поток (круговорот) доходов
132. net investment – чистые инвестиции
133. gross investment – валовые капиталовложения
134. depreciation – обесценение *(денег),* снашивание
135. savings – сбережения, накопления
136. direct (indirect) taxes – прямые (косвенные) налоги
137. income tax – подоходный налог
138. corporation tax (on profits) – налог с прибыли (доходов) корпораций
139. VAT (value added tax) – НДС (налог на добавленную стоимость)
140. customs duty – таможенная пошлина
141. excise duty – акцизный сбор
142. beneficial – выгодный, приносящий доход
143. unfavorable *(ant.* favorable) – неблагоприятный
144. the means of payment – средство платежа
145. medium of exchange – средство обращения
146. a standard of value – мера стоимости
147. a unit of account – единица учета
148. a store of value – средство сбережения (сохранения стоимости)
149. a standard of deferred payment – средство погашения долга
150. a financial intermediary – финансовый посредник
151. capital outlay – капиталовложения
152. a promissory note – долговое обязательство
153. to put up the money – вкладывать деньги

154. to redeem – погашать (ценные бумаги)
155. irredeemable stock – не погашаемые ценные бумаги
156. to undertake transactions – проводить, совершать сделки
157. undated stock – ценные бумаги без указания даты погашения
158. to take advantage of – воспользоваться
159. predictable rate of return – предсказуемая норма прибыли

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АНГЛИЙСКИЙ ЯЗЫК

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Компьютерная верстка – *Э. А. Галяутдинова*

Подписано в печать 03.12.2019.
Формат 60x84$^{1}/_{16}$. Офсетная печать.
Объем 4,25 п. л. Тираж 100 экз. Заказ 188

Отпечатано в типографии КРСУ
720048, г. Бишкек, ул. Анкара, д. 2а