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ON THE RELATIONSHIP BETWEEN STOCK AND FLOW INDICATORS IN MACROECONOMIC ANALYSIS OF MONETARY TRANSMISSION CHANNELS

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Abstract. *The purpose of the article is to analyze the channels of monetary transmission through the stock and flow indicators using the method of relationship analysis. By the stock's peculiarities, we can consider four main spheres of the economy: consumer spending, investment, assets, and the monetary sphere (including the foreign exchange market). Interest rate, inflation rate, and expectations can be considered as flows of the respective spheres. Stock theory of money demand is a development of keynesian money demand and a refinement of the transmission channels model in monetary policy. It refers to channels, not to monetary policy instruments, but to stocks of main spheres of the economy. Money, issued by the central bank and the banking system, can flow into these stocks through the respective canals, which brings corresponding macroeconomic consequences. Main economic spheres' stocks are interrelated by flows. The economic cycles are so created. Consumption spendings induce demand for the corresponding means of production – investment spending (and in particular inventory investment). The government can replace the shortage of investment with an expansionary fiscal policy. In consequence, public debt increase and expansionary monetary policy bring devaluation and net exports increase with followed by inflation. The main result is a detailed specification of four economic spheres and the determination of their interrelationships within the economic cycle.*
Keywords: *stocks and flows, money demand, assets, interest rate, expectations, monetary policy transmission channels, monetary transmission.*

Statement of the problem. In economic analysis, the distinction between the nature of stock and flow indicators is crucial. Say's Law, which posits that supply creates its own demand and treats supply and demand as stocks, does not hold. However, when flows are considered, the equality of the two methods of GDP calculation by income and by expenditure becomes evident as an identity of corresponding flow totals. The money supply is a stock. Therefore, the components of the demand for money can be viewed as demand for specific stocks, forming the stock theory of money demand. This theory is closely linked to the channels of monetary transmission, which correspond to their respective flows. Hence, a

deep understanding of economic processes requires awareness of the interrelationships and laws governing stock and flow indicators.

Analysis of latest research and publications. Keynes identified in his analysis of money demand both a flow component, dependent on the volume of output, and a stock component related to speculative demand for assets. His followers, along with representatives of the monetarist school, further developed the transmission mechanism of monetary policy. Currently, such research are being conducted by central banks around the world and supranational financial institutions. Many Ukrainian scholars are studying monetary transmission, including Mishchenko V., Alimpiiev Y., Lepushynskyi V., Kasperovych Y., Seheda L., and Brychka B. The asset price channel is being explored by foreign researchers such as Bordo M., Bernanke B., Borio C., and Cecchetti S.

Objective: To summarize the theoretical foundations of applying stock and flow indicators in the operation of the monetary transmission mechanism and its key channels within the framework of the stock theory of money demand.

Summary of the main research material. A stock is a quantity at a specific point in time. A change in stock for a particular time is also a stock. A flow is a quantity over a specific time interval. A change in flow over a given period of time is a flow. Stocks are related to flows: a stock equals the accumulation of flows over a certain period of time; a change in stock over a given time interval is a flow. A change in flow for a particular time is a stock.

All economic resources owned by a person at a given time are reflected in a balance sheet–all the indicators in it are stocks. The balance sheet shows where the economic resources of the person come from and how they are used. The income and expense accounts of a person over a specific time period contain flow indicators. The balance of payments of a country reflects the flows from the country to the rest of the world and the corresponding counter-flows.

An exchange transaction between two individuals involving certain assets can be considered as the starting point for analyzing economic relationships. These assets are stocks, and the exchange transaction is the corresponding flow. All economic goods and commodities, including consumer goods, are subject to exchange. As a result of consumer spending, a stock, called the consumption fund, is accumulated. During the exchange, there is a bilateral transfer of certain stocks. However, a unilateral transfer of a stock is also entirely possible. Thus, in the system of economic relations, economic agents are interconnected through various flows of stock transfers.

The movement of monetary flows into a certain stock is significant in determining its price. This is most clearly seen in the price formation on the foreign exchange or stock market through the mechanism of matching orders. During each transaction, a certain monetary sum is involved – its volume. The trading volume over a specific period characterizes its activity. Thus, a nearly continuous movement of the stock price is formed – its exchange rate.

Barter is the direct exchange of goods. However, most exchanges in the economy occur with the assistance of a medium of exchange. The medium of exchange is withdrawn from a certain stock for exchange, and for that time, it becomes a flow. The volume of medium of exchange over a specific period is a flow. Meanwhile, the medium of circulation (currency) is constantly in circulation. It should be noted that circulation can only be characterized by

flow quantities, as any exchange occurs almost instantaneously (especially compared to the time assets spend in stock). From the model of the circular flow of goods and resources in the economy, it follows the interconnection of the real and monetary economies. The monetary economy reflects, in a way, all the economic events and phenomena of the real economy.

The monetary interest rate, by definition, is the percentage excess over the amount of money provided today by the amount that must be repaid under the terms of a deposit or loan over a certain period. This definition is analogous to that of a forward contract. For each type of asset, the corresponding interest rate can be determined based on the value of the forward agreement to buy or sell a given asset (just like how a synthetic security or loan is created), taking into account the interest rate on money. In this way, the interest rate can be determined for any durable good. There is an interest rate for wheat, metals, real estate, businesses, and so on. Its value fluctuates depending on the asset. The interest rate can also be negative [9].

In this interpretation, the inflation rate can also be considered an interest rate, for example, on real assets or the consumer basket. The consumer basket is a set of consumer goods used to determine the consumer price index (CPI), which measures the change in the price indicator over a certain period as a corresponding flow. The CPI, in essence, is akin to an interest rate. Similarly, producer price index (PPI) and GDP deflator can be analyzed in terms of stocks and flows. In general, this approach can be used to analyze expectations regarding changes in any indicator. The interest rate is important when making investments. In this case, a stock of production means is accumulated. All such flows can be generalized as capital flows (which differ from labor input).

Regarding the neutrality of money: nominal and real interest rates and inflation rates cannot be considered stocks. Interest rates and inflation rates are flows of stocks of different natures. Viewing them as flows is an indication of the non-neutrality of money.

An asset is a stock that generates a flow. Money facilitates the operation of asset markets and balances them with goods and resource markets. When there is an excess of money which is a store of value, it is not withdrawn from the corresponding stocks. People tend to be prudent, saving the surplus for future use, and thus, this excess is transferred into stocks for future purposes [9, p. 237]. Although not the entire population of a country is prudent, only a relatively small part, it is sufficient to regulate the surplus of circulating money in the economy. This effect is expressed in the rise in real estate prices (and, to a lesser extent, in the growth of the stock market). Real estate thus acts as the stock into which money is absorbed to manage the surplus of the medium of exchange.

Such a self-regulating mechanism is possible when money has value as an asset. Money is a stock in the economy, distributed in a certain way among economic agents. When, over a certain period of time, money is withdrawn from these stocks, it circulates. In other words, the difference between the total stock of money and money-assets circulates. Furthermore, note that money in circulation over a certain period can also be an asset at the same time. Thus, the consecutive role of money as "stock – flow – stock – flow –" allows for the consideration of monetary multiplication initially at two levels, and later at any number of levels.

Essentially, the interest on an asset represents the percentage excess of the corresponding forward or future spot price of the asset over the current price by the covered or uncovered

interest rate parity. Thus, for example, the income from bonds with fixed interest rates differs from the income from stocks with unpredictable future profits. In other words, interest is one of the prices in the economy. This current price characterizes a certain future moment or time interval, meaning it reflects the market's evaluation of the expected future values of the corresponding indicators. Interest reflects the rate of change of a specific indicator. The connection between interest and a certain period of time clearly indicates its flow nature. However, if one focuses on the interest at a specific moment in time, it can be considered a stock, which in turn may also change through certain flows. But these flows have a more complex nature: for instance, based on the interest parity condition, one can observe that the flow between flows consists of a pair of exchanges.

Let us take a closer look at the process of accumulation of flows in a stock. A "horizontal" accumulation of flows is possible: an initial stock is increased by the flow for the first year, then the flow for the second year, and so on. A "vertical accumulation of flows" is also possible: consider land, the various plots of which may have different uses: extraction of minerals, growing cereals, grazing livestock, renting out certain premises, industrial use of specific areas, residential building construction, etc. Even within each specific type of use, there is certain differentiation, such as more and less fertile agricultural land, or different premises being rented at different prices; one-room apartments are sold at one price, while two-room apartments are sold at another, and so on. In other words, if we take a certain amount of land stock, different parts of that stock may bring different flows over a certain period, and the total flow is the "vertical" sum of these different flows over the same period (whereas in "horizontal" summing, we add flows across different time intervals). Thus, a stock that accumulates many different potential uses has a much more complex internal structure than a stock of a homogeneous good. Assets, by their nature, are precisely such complex stocks. To stocks of this nature, we can attribute land, real estate, the state budget, the volume of GDP, and employment.

Interest arises when the demand for an asset begins to exceed its supply. The emergence of interest is linked to the scarcity of the asset [9]. This refers to a relatively minor scarcity, sufficient only to raise the price by a few percentage points. However, if the future price greatly exceeds the current one, it becomes a typical scarce asset. The return on such an asset can range from 100% to 400% – several times the initial investment. Therefore, interest has a rent-like nature. As the scarcity of the asset increases, it transforms into a standard rent. For analyzing macroeconomic interdependencies, understanding the nature of rent is of great importance. The functioning of the state, the limitation of aggregate demand, monopolistic power, and the interrelationship of oligopolistic structures can be understood solely through the differences between rent and other types of income. It should be noted that consumer and producer surpluses also have the nature of such "accumulated" stocks.

When considering the relationship between flows and stocks, two types of interest can be distinguished. The first type: the main value has a stock nature, and the interest on it is a flow related to that stock – ordinary interest. The second type: the main value, the denominator in the calculation of interest, has a flow nature, and the derived value associated with that flow is a stock. Such is the relationship between monetary GDP and the money supply in the

country. The coefficient of the relationship between them is the velocity of money. Thus, the essence of this indicator is the same as that of interest. In the Cambridge theory of money, the reciprocal value of the velocity of money is the cash balance coefficient. If this value is considered as interest, more precise conclusions can be drawn compared to the usual analysis based on the velocity of money. Nonetheless, the velocity of money circulation closely resembles the concept of stock returns, allowing for analogous conclusions to be drawn. These two types of interest are related to two-stage multiplication. Flow-1 between stocks-1 can also be considered as stock-2 with the corresponding flows-2. Similarly, flow-2 can be considered as stock-3 with the corresponding flows-3 (which will consist of 2 flows-2 or 4 flows-1). And so on.

The highest degree of scarcity will be associated with a monopoly asset. Among such monopoly assets, the greatest gap may exist between an indefinite future price and current costs. The first use of an asset, which is inherently the most risky, can generate the highest profit – this refers to pure entrepreneurship. Therefore, a small guaranteed profit in conventional economic spheres is essentially interest. In this sense, ownership of knowledge can be considered a monopoly [6]. Combining all of the above, the distinction between interest and profit lies in the corresponding relationship between stock and flow – which one is the primary value and which one is derived. Interest is the ratio of flow to stock, while economic profit is the ratio of stocks to flows, such as the velocity of money, the cash balance coefficient, or the price-to-return ratio of a stock on the stock market.

Among assets, money is the most liquid. Liquidity refers to the ability of a particular asset to be converted into a medium of exchange (which has a flow nature) and, accordingly, into goods and services. When considering money, it is necessary to look at the stocks into which it flows when withdrawn from circulation. Expectations regarding future prices and income from assets are key to the corresponding money flows into these stocks. The sphere of goods circulation includes the use of money solely as a medium of exchange. Consumer expenditures and current production costs relate to this sphere. In this context, money is used exclusively as flows.

The nature of money, as a stock, resembles "accumulated" stocks–assets: having a certain amount of money capital, one can use different portions of it to acquire various assets needed for the production: resources and intermediate goods, necessary labor of workers, production facilities, land, loans, etc. However, the key difference from ordinary "accumulated" stocks lies in the fact that with money, we can represent the value of all possible assets in the economy. This difference can be described as the "direction of accumulation": on a specific asset, we accumulate all its possible uses (but this does not encompass all potential economic operations), whereas in money we can reflect (and thereby determine the value of) all possible economic operations – meaning all potential uses of any assets are represented in money.

This different direction manifests itself in the accumulation on assets and in the accumulation in money – the asset generates flows and flows are converted into money. While these two types of accumulation may appear similar, there are significant differences between them. The realm of "monetary" accumulation encompasses monetary policy (including money creation by the banking system, where commercial bank money is represented in the central bank's money [5, p. 1]),

exchange rates (where we represent one currency in terms of another), and foreign economic transactions (when exporting and importing, we represent goods in a specific currency). The stock market also belongs to this sphere, as it allows for determining the capitalization of different companies – expressing the value of companies in monetary terms.

Money is distinguished from other assets by the fact that a certain volume of money is required in the economy. If the available volume exceeds the necessary amount, money will depreciate – that is, money is a probability measure (limited by a certain upper bound), while the value of assets can increase even with the same money supply.

Now let us try to clearly distinguish the main spheres and the interconnections between them. The first sphere contains simple stocks of goods and labor – the consumption sphere. The second sphere is the sphere of capital flows, which ensure the creation and supply of stocks of goods – investment expenditures. As is known, investment demand is derived from consumer demand. Similarly, the mechanism for balancing aggregate demand and aggregate supply operates through investments in stocks. That is, if we consider the economic cycle starting with the growth of consumer expenditures, then in the next phase, this growth in consumer spending leads to a corresponding increase in investment expenditures. Likewise, a decrease in consumer expenditures causes a reduction in investments.

When investment expenditures become insufficient, according to Keynesian recommendations, the government can support the aggregate output through budgetary expenditures, which leads to a budget deficit and an increase in public debt. Economic agents can invest excess funds in real estate and land markets, which will cause prices in these markets to rise. Thus, the third sphere of "accumulated" assets is derived from the second sphere of capital flows. An increase in investment (when additional fiscal stimulus is not needed) allows the government to increase tax revenues, achieve a budget surplus, and reduce public debt. Likewise, this increase in investment can occur through the withdrawal of money from real estate and land markets. Thus, the relationship between the second (capital flows) and third (accumulated assets) spheres of the economy can be described, with the key indicators from the main macroeconomic identity being the volume of investments and government expenditures.

Excessive government debt and the issuance of money through open market operations with government obligations affect the fourth sphere (of "monetary" accumulation – in the language of stock theory) through the devaluation of the national currency and the corresponding increase in net exports. Among the results of issuing money into circulation is often the growth of the stock market. Conversely, a reduction in government debt, a budget surplus, and a decrease in money supply through open market operations – through the appreciation of the currency – decrease net exports. This illustrates the relationship between the fourth and third spheres of the economy: the money sphere is derived from the asset sphere.

Excessive issuance of money into circulation leads to consumer inflation. That is, the sphere of consumer spending is derived from the monetary sphere. A restrictive monetary policy reduces the price level. Thus, the cycle closes. By analyzing the characteristics of stocks, four main spheres of the economy can be identified, which are derived from one another. This is the sequence in which the economic cycle occurs.

The main channels of monetary transmission–the monetary, interest rate, asset price, and credit (along with the exchange rate) channels–operate within their respective spheres of the economy. Under given macroeconomic conditions, each layer requires a certain amount of money supply to function within it. This is the condition for macroeconomic equilibrium in a monetary economy according to stock theory.

However, money from each of these stocks can flow into any other. In this way, the equilibrium resembles the balance of payments equilibrium, which ultimately balances the accounts of: current transactions, portfolio investments, direct investments, and reserve assets. This equilibrium has a certain circulating nature, where the flow of money between these spheres can alter the equilibrium conditions within them. All economic operations, to some extent, influence this balance.

The distribution between stocks depends on the interest rates they yield, considering risk. Depending on the expected future price of assets, the interest rates on assets reflect the expectations of economic agents (expectation channels). Under equilibrium, the interest rate on each asset should be the same.

Consumer and investment expenditures correspond to the first two spheres of the economy. It is also worthwhile to consider the adjustment of surplus circulating money by its absorption into stocks, particularly the real estate market. The next two components of GDP correspond to the subsequent two spheres. One is related to fiscal policy, while the other is linked to monetary policy.

Stock theory of money demand is a refinement of the model of transmission channels of monetary policy. In this model, the "channels" refer not to monetary policy instruments but to the reserves of key economic spheres. Money issued by the central bank and the banking system can flow into these stocks. The flow of monetary expansion into the appropriate channel creates the corresponding macroeconomic effects. The art of central bank management lies in directing money into the required channel. The identified channels largely coincide with those recognized by most economists. Only the expectations channel is not considered separately in the stock model but is linked with others. In other words, expectations influence the flow of newly created money into each channel.

So, with four main spheres of the economy considered–the sphere of consumer expenditures, the sphere of investment expenditures, the sphere of assets, and the monetary sphere (including the foreign exchange market)–the monetary, interest rate, asset price, and credit (foreign exchange) channels are respectively associated.

The exchange rate reflects nearly all phenomena occurring in a country's economy, including its relationship with the global economy. Monetary policy determines the level of inflation in the country. In turn, the inflation rate, among other factors, is reflected in interest rates. Through monetary mechanisms, the fluctuating movement of countries' economies, their development, economic cycles, and crises occur.

Excessive infusion of money into higher-level spheres will lead to a spillover into the consumer market, causing inflation. Therefore, in the monetary transmission mechanism, which is typically considered, the interest rate channel is regarded as the main one (the effect of changes in relative prices). Following that is the asset price channel (the wealth effect).

Then comes the credit channel. This nesting of key economic spheres within each other follows the structure of the stock model.

Conclusions. The simplest stocks are goods and labor. When exchanging, reciprocal flows of stock transfers occur. Interest rates, inflation rates, and expectations have a similar flow nature. Adding flows is not as simple as adding stocks. One can accumulate stocks through flows over consecutive time intervals. Accumulating different flows during the same time interval is also possible. When it is possible to accumulate such flows in a given stock, complex stock structures arise: assets, land, real estate, budgets, GDP, and employment. However, the stock of money (while preserving the possibility of such accumulation) differs from these stocks: money can reflect the value of any economic operations and assets. The reflection of value in money is characterized by: banking multiplication, the foreign exchange market, export and import operations, and the stock market.

Consumer expenditures (the consumption sphere) on goods stocks (with workers constituting the majority of consumers) generate capital flows (the investment sphere) – investment expenditures (and also investment in stocks). An alternative to investment is the allocation of money into assets and fiscal stimulus (the asset sphere). Excessive government debt devalues the currency and increases net exports (the monetary sphere). Imprudent infusion of money into the economy leads to consumer inflation (the consumption sphere).

The main channels of monetary transmission: the money, interest rate, asset price, and credit (including the foreign exchange) channels, operate in the corresponding economic spheres. Given the macroeconomic conditions, each layer requires a certain volume of money stocks according to the stock theory of money demand. Expected returns in different spheres determine the direction of monetary flows.

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ПРО ВЗАЄМОЗВ'ЯЗОК ЗАПАСОВИХ І ПОТОКОВИХ ІНДИКАТОРІВ У МАКРОЕКОНОМІЧНОМУ АНАЛІЗІ КАНАЛІВ МОНЕТАРНОЇ ТРАНСМІСІЇ

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Анотація. Мета статті − проаналізувати канали монетарної трансмісії через особливості запасових і потокових показників з використанням методу аналізу взаємозв'язків. Згідно з особливостями запасів можна виділити основні сфери економіки: споживання, інвестиції, сферу активів і грошову сферу. Відсоткову ставку, рівень інфляції та очікування можна вважати потоками відповідних сфер. Теорія запасу грошового попиту є розвитком кейнсіанського попиту на гроші та удосконаленням моделі каналів трансмісії в монетарній політиці. Під каналами в цій теорії розуміються не інструменти монетарної політики, а потоки в запаси основних сфер економіки. Гроші, емітовані центральним банком і банківською системою, можуть надходити в ці запаси через відповідні канали, що створює відповідні макроекономічні наслідки. Запаси основних сфер економіки між собою взаємопов'язані потоками, що виявляється в економічному циклі. Споживчі видатки породжують попит на відповідні засоби виробництва − інвестиційні видатки, зокрема, інвестиції у запаси. Нестачу інвестицій держава може замінити фіскальним стимулюванням, яке зі зростанням державного боргу і монетарним стимулюванням зумовлює знецінення грошей, збільшення чистого експорту і споживчої інфляції. Встановлено, що від сфери інвестицій похідною є сфера активів, від якої, в свою чергу, похідною є грошова сфера. Від грошової сфери походить сфера споживання і коло замикається. Проявами цих взаємозв'язків є кейнсіанське фіскальне стимулювання, вплив надмірного державного боргу на грошову сферу та залежність інфляції від надмірної емісії за кількісною теорією грошей. Це все частини загальної закономірності економічного циклу.

Ключові слова. запаси і потоки, попит на гроші, активи, відсоток, очікування, трансмісійні канали монетарної політики, монетарна трансмісія.