

Supply Chain Management in the Financial Markets

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Abstract- The article studies the phenomenon of supply chain management, which is most evident in financial markets along with other areas. Supply chain management has been attracting attention of researchers in relation to the explanation of the investment decision-making process in the financial markets. The article examines approaches to management from perspectives of different theories. Currently, the functioning of the financial markets has seen to become more complicated that hinders the technical analysis of the markets. Agents making decisions in the financial markets are more prone now to demonstrate massive behavior due to restricted information availability. It was revealed that supply chain management is most likely the underlying cause for bank crises and financial bubbles. It was found that management also leads to excess market volatility and mispriced stocks.

Keywords: supply chain management, massive behavior, stock market, information cascade, financial bubble

1. Introduction

Financial markets are an integral part of any economic system, without which efficient allocation of resources is impossible. Concepts of classical capital market theory that take into account fundamental factors often do not consider the behavioral aspects of decision-making by economic agents. At the same time, the indisputable advantages of the classical theory of finance remain an internally consistent methodological basis and consistency of the interrelated set of conclusions, methods, and recommendations, to which alternatives have not yet been developed, which largely explains the widespread use of classical models in practice.

Market efficiency is characterized from the investor's perspective by the inability to make in the market a profit that exceeds the normal one, using only some specific information, and from the point of view of companies and possibly the state as a whole – the ability to create and direct cash flows to investments, distributing them among competing investment projects in an effective way.

There are two types of investors in the financial market [1]: the first type is irrational (noise traders); the second type is rational, that is, professionals. Irrational people do not understand the value of assets and can strongly drive their price up in comparison with its fair value. Rational people are able to adequately assess fair value and at some point realize that the market price is too high, but they cannot do much with that.

For agents who make decisions in financial markets mass (herd, imitative) behavior associated with limited awareness becomes characteristic, which can lead to negative consequences – the formation of financial bubbles,

the fall of financial market indices, and the bankruptcy of companies.

In the financial market, it is not so much the object of supply that is important, as the potential demand for it. Moreover, the transaction costs of moving capital between segments of the financial market (currency market, stock market) are so low that capital moves between segments following liquidity. Thus, unlike other markets, the market reaction (the behavior of players) is important in the financial market, and not the objects of purchase and sale. This determines both the deep differences between the financial market and other markets, and the validity of the existing analogy of its functioning with the biological, rather than mechanical, world [2]. The financial market is heterogeneous in terms of the entities that implement their interests in it. In this regard, the financial market should be considered taking into account the behavior of its participants.

2. Materials and Methods

The goal of this study is to analyze the phenomenon and effect of supply chain management in the financial market. The study seeks to find the underlying reasons for the mass actions of investors and to reveal the relationship of supply chain management and financial bubbles.

The methodological basis of this research is the work of domestic and foreign researchers in the field of supply chain management. The research methods are analysis, synthesis, deduction and formalization.

At the present time, current economic literature pays particular attention to studying the phenomena of irrational motives of agents during decision-making in the financial markets.

3. Results and Discussion

The financial market provides for the gain of the seller or buyer at the expense of the loss of the other party, which is especially typical for secondary markets and financial derivatives markets. This distinguishes financial markets from any other markets for goods and services, where each participant always receives a prize in the form of goods or money.

Although parts of the economic system constantly interact with each other in different ways and for different purposes, economic theory generally assumed that each individual makes decisions separately from others. It is assumed that s/he uses only the information that is received through some common market signals, such as prices. However, in reality, the agents in the system or part of it actually trade with each other, communicate with each other, and learn from each other. In practice, subjects are not always guided by rational motives of behavior in the decision-making process. In many cases, psychological

motivations, limited information, and decision-making by other agents cause subjects to deviate from a rational behavior strategy and imitate the decision-making choices of others.

Informed players know the real return on assets, while uninformed ones only observe its market price, which, presumably, should reflect this return, and calculate the return indirectly. However, in addition to the information that traders get from observing the actions of other players, they also have their own information, in which authenticity they are not sure. The problem of traders' lack of information, the asymmetric distribution of information and its influence on the behavior of investors led to the creation of the concept of an information cascade. The presence of an information cascade can lead to supply chain management in the financial market.

Supply chain management can be defined as a strategy that involves imitation of the behavior of more experienced and reputable market participants or joining the prevailing market trend under the influence of a number of behavioral factors. Such factors include underestimating own analytical abilities and overestimating the analytical abilities of other investors, excessive fears about harming own reputation, overestimating the reliability and importance of information available to other market participants, lack of information.

Starting from the end of the 20th century, there have been conducted a number of studies, as well as several excellent review of the relevant literature, on supply chain management [3-6].

The literature reveals many theoretical approaches to management, which, as a rule, fall into the following categories:

1. Socio-psychological approaches: imitation processes, trends, etc.
2. Information theories and cybernetic approaches: information cascades, positive feedback, etc.
3. Ethological approaches: flocks, hives of bees, swarm of ants, etc.
4. Eco-physical approaches: disaster theory, sandbox analogies, self-organized criticality, etc.
5. Medical model approaches: analogies of diseases and infections, such as infection, epidemics, etc.
6. Socionomic approach.

Shiller [7] is perhaps the most representative proponent of the socio-psychological theory of management. He spent much of his career challenging economic theorists' assumptions about the complete rationality of investors. Many of Shiller's ideas overlap with socionomic theory, especially his Keynesian idea of random waves of excessive optimism and pessimism that lead to the emergence and disappearance of market "quirks". Shiller describes the social dynamics of the stock market bubble as a combination of social enthusiasm, excessive optimism, and selective attention: high demand for an asset is generated by the public memory of past high profits and the optimism that these high profits generate for the future.

Although articles on "reputational management" are often confused with information cascade theories of management [8], they also fall into the category of socio-psychological theories of management, since they use a simple process of "imitation for social gain".

The reputational management is described as exogenous, conscious, rational, and utility-maximizing.

Articles on this topic usually do not mention the theory of equilibrium and do not suggest an evolutionary source of supply chain management, considering it rather as a rational choice. The theory of reputational management usually offers a model of interaction between heterogeneous agents, with young, inexperienced agents fighting for a good reputation in society against older, more experienced agents who are assumed to have superior knowledge or skills.

The medical model of management has a long history, going back to the classical economist David Ricardo [9]. He first described market panic in terms of a "social epidemic" and attributed the panic of 1797 to "an epidemic of unfounded fears of the timid part of society". Thus, Ricardo saw such contagious behavior as irrational, endogenous, and heterogeneous.

The other part of the literature describing management as a social infection relies heavily on the socio-psychological literature. These studies, however, differ from socio-psychological ones in that they rely primarily on unconscious processes that often involve the "contagion" of social mood, whereas theories of social psychology are primarily built upon conscious imitative processes.

Many studies that refer to the medical model expand the scope of the herd instinct by defining "financial contagion" as "the rapid spread from one market to another of declining prices, declining liquidity, increased volatility, and increased correlation associated with the financial intermediaries' own influence on the markets in which they trade" [10].

Models of econophysics have much in common with models of information theory of management, which they often cite approvingly. The most significant difference is that most (but not all) of the econophysical models of management tried to describe the endogenous dynamics of "rational bubbles", while the models of information theory include only exogenous causality. Different versions of econophysical models describe homogeneous and heterogeneous agents, and articles on econophysics differ as to whether the processes involved are conscious or not.

Econophysical models of management include models based on disaster theory, self-organized criticality, and sandpile physics. Although these variants in a physics-based theory have important theoretical differences, they share the same mechanism features.

The socionomic theory of management [11] is new in describing the model of unconscious, pre-rational supply chain management, asserting endogenous dynamics that have developed in homogeneous groups of people in contexts of uncertainty, while unambiguously avoiding traditional economic assumptions of equilibrium and utility maximization.

By separating financial behavior from economic behavior, socionomics simultaneously clarifies and resolves the conflict between endogenous and exogenous causal models of human social behavior. The wave principle assumes that social moods and financial pricing are endogenous and regulated by form. In the socionomic model of financial markets, prices are simply a reflection of the endogenous dynamics of the herd and do not regulate it. On the other hand, neoclassical economics views exogenous shocks as an effect on financial prices, which in

turn govern behavior through the law of supply and demand.

According to socionomics, cognitive uncertainty in survival situations is the context in which people move from a rational basis for action to an instinctive, impulsive mode of unconscious supply chain management. This shift requires a person to refocus away from their own information, processes of assessment or plans and focus primarily on the predicted assessments of others as a guide to action – a reorientation that occurs unconsciously. Rationalizing the resulting action, either in advance or after the fact, completes this complex type of social action.

The herd model that forms the basis of socionomic theory differs in one or more theoretical dimensions from all other herd theories. Financial behavior, as it is conceptualized in socionomic theory, stems from an evolutionarily developed, endogenously regulated, unconscious, irrational, non-maximizing utility herd of homogeneous agents under conditions of uncertainty in which equilibrium is not applicable. The socionomic theory of economics (STE) particularly contrasts with financial models that share the prevailing neoclassical economic assumptions of utility maximization, equilibrium, rational pricing, mechanistic causality, and exogenous shocks. In addition, STE includes the only herd theory that rejects the utility maximization assumption that underlies all other theories of supply chain management.

The author of the management concept [12] believed that the herd instinct is inherent in humans as well as in other animal species. Biologically, management is an analogy and continuation of multicellularity, an expression of the tendency of all homogeneous living beings to unite into ever-larger units. An individual feels incomplete if he or she is alone.

Social psychologist L. Festinger, the author of the theory of cognitive dissonance, said that a person who simultaneously has two conflicting ideas in his/her head (one is his/her own, and the other is the one that s/he observes from the behavior of others) experiences discomfort or even stress [13]. The greater the difference in views between the individual and society, the sharper the dissonance. People tend to lower their stress levels and come up with one idea, either by modifying their original beliefs, or by rejecting what contradicts them. At the same time, acting contrary to their personal beliefs and following the crowd, people try to convince themselves of the correctness of the decision and justify their acts.

The issue of supply chain management in the economy was first raised by T. Veblen on the example of members imitating the behavior of other members of a higher status. He introduced the concept of the “bandwagon effect”. A wagon with musicians playing and accompanied by a crowd was an analog to describe the effect of increasing demand for a product that consumers’ preference for grows along with its price. The desire to buy a product was explained not by maximizing the utility of the quality characteristics of the goods and the price, but by the individual’s desire to match the preferences and, consequently, the consumption of other people. That is, as soon as the product becomes popular, more and more people tend to get into the trend and buy it as well [14].

The herd instinct most strongly manifests itself in cases of weak development of consciousness and, in particular, prediction models. The less we can predict about a given

situation, the less we can model possible outcomes and evaluate them, the more susceptible we are to the herd instinct.

In [15] classify management into rational management and irrational management. Rational management is information-based; rational investors with similar stock preferences adopt the same response to similar information about company characteristics and fundamentals. When the management of investors is rational in response to new information, management moves prices toward the fundamental value of assets; price movement is not likely to reverse. By contrast, irrational management occurs when investors with insufficient information and inadequate risk evaluation disregard their prior beliefs and blindly follow other investors’ actions.

In microeconomics, it is usually assumed that economic decisions reflect the rationally formed expectations of agents. In this case, this is the expected (taking into account the probabilities of estimates) assessment of the manager by the labor market. Managers’ decisions are assumed to be effective and made using all available information.

The behavioral finance literature shows that individual investors are less sophisticated than institutional investors, primarily due to their limited attention, memory, time, education, and processing capabilities. This indicates irrationality of investors, which is classified as behavioral biases or mistakes in their decision-making. These behavioral biases could give rise to deviation of prices of securities from their fundamental values, which results in inefficiencies in financial markets [16].

According to [17], managers make investment decisions with an eye on the decisions of managers who are considered highly qualified. An attempt to make an independent decision that differs from the opinion of authorities may be perceived as a manifestation of low qualifications. In addition, if a mistake is made when making an original decision, it will be detected faster and will have a more noticeable impact on the manager’s professional reputation. This proves that the authorities in the process of supply chain management are those with whom a person wants to associate himself. Therefore, it is very important to assess how much the “mirror effect” affects a person at the time of making a decision.

The study by [18] is devoted to the study of capital market behavior. Many investment companies operate in this market, the main task of which is to invest the funds entrusted to them in various assets characterized by different profits. The goal of an investment company is to make the most effective investments. However, the real investment is made by managers of these companies, and their personal goals, of course, differ from the goal of their investment company. Agent’s performance is evaluated not only directly by the company through the remuneration, but also by the labor market, which determines his/her abilities and establishes his/her reputation. The assessment of its performance by the labor market is very important for a manager, and this is what is considered in the model.

The behavior that is shown in a bank panic – mass withdrawal of deposits from banks, which is often called “run of bank”; or in financial markets, with stock market bubbles [19] – is also explained by the fact that in the case of quick decisions, we are more susceptible to choose on the principle of copying/imitation - supply chain management. Consciousness functions much slower than

the subconscious. In cases where we are forced to make quick decisions, we tend to use the subconscious mind, and the mechanism of learning by imitating just belongs to its area.

The presence of management behavior may lead to an incorrect assessment of stock prices, since the rational decisions of the investors may be influenced by the manifestation of subjective expectations regarding the future evolution of risk and profitability. As a result, the existence of management behavior can provide valuable information in the estimation of financial models used to forecast the evolution of stock prices [20].

Supply chain management has a destabilizing effect on financial markets, which often leads to the formation of a financial bubble, characterized by a significant deviation in the value of an asset frequently towards growth, increased demand, followed by a market crash. The fundamental purpose of the financial market is to attract investment in the real economy and value companies. However, when the market ceases to adequately value company's shares, a phenomenon known as financial bubbles occurs. The explosion of financial bubbles leads to a loss of investor interest in this investment tool and the collapse of the market itself. This is why it is so important to timely track down the process of inflating the financial bubble, determine the reasons for its appearance, identify possible consequences and respond in a timely manner.

Financial bubbles inflate precisely where the majority of stocks are owned by irrational investors, i.e. individuals, because they are able to overestimate the representativeness of recent events, which, when applied to the stock market, means that irrational investors can predict further growth if the market has been going up recently. As Mark Faber writes, "The longer the prices of any asset rise, the more likely it is that the investment mania will culminate and the price increase will be considered permanent." It is at this point that they begin to bet on the further rise of the market, while at the same time, from the point of view of cost analysis, the stocks are most likely to be overvalued rather than undervalued, and are to be sold. Thus, non-informed players tend to assess the situation in the market based on the majority opinion, thereby showing the instincts of supply chain management [21].

The first of the few papers in which the behavior of team members is modeled by a random process that develops over time is an article by [22]. The author considers financial market as a single asset market and aims to present a model that considers not completely independent from each other traders, but individual investors (sellers or buyers) embedded in a market where there can have a collective opinion. Two types of phenomena associated with the same (imitative) behavior of groups of financial market participants (sellers and buyers of assets): bubbles caused by changes in the economic system (rational bubbles), and bursts of supply chain management of groups of participants during short periods when all external conditions are practically unchanged. It is assumed that each market participant at different times can be both a seller and a buyer, while in their mind there is a price below which they do not agree to sell their existing assets, and there is a price above which they do not agree to pay for a unit of asset when buying. These prices change over time. Along with this, they know the price determined in

accordance with the fundamental value based on its information set, a certain "agent-effective price".

All these prices are variables of the dynamic model. The set of their values at successive time points is the model trajectory. The prices at which trading takes place are not only functions of the offered and requested prices, but also depend on individual characteristics. Formal rules for adjusting own prices by an agent, using the prices offered by other agents and the results of transactions, make up the rules for moving from a state at a given time to a state at the next moment. The random nature of the description of the trading process leads to the fact that the behavior of participants in exchange trading is modeled by a random process. As the trajectory of the system, at each time we have a probability distribution on the set of possible states of the system. Topol's study confirmed the possibility of supply chain management of participants in a closed market under little-changing external conditions. His analysis of the model shows that certain probability distribution, in which supply chain management (imitation) is the most likely, is stationary for a random process representing the dynamics of this model.

In 1992, Abhijit Banerjee published the article "A Simple Model of Supply chain management." Banerjee briefly puts two very important ideas. The first is that if the costs associated with supply chain management are high, it will sooner or later trigger mechanisms that will prevent it. There are often situations when the first in the race has advantages – first mover advantage. The ultimate variant of the same effect is "winner takes all", there is a first prize, but there is no second. The big advantages of being first in a line are clear from the example of the financial market. Those who bought shares before they became fashionable, bought them much cheaper, and therefore earn more (or suffer less). Investing in stocks that are very popular means having less opportunity to earn, since such stocks are obviously expensive. This may encourage investors to look for new opportunities. The second important idea of Banerjee is that there are numerous institutional restrictions that prevent people from standing out from others.

Banerjee's paper is considered the forerunner of the information cascade, but works of other authors are recognized as the breakthrough – [23-26]. These authors came up with the term "information cascade", which began to denote a whole avenue of research. The information cascade refers to the behavior of an individual when he or she makes decisions not only on the basis of accumulated information but also taking into account how others act. The formal model of the information cascade implies that individuals make decisions sequentially, that is, one after another, while each subsequent agent sees what all the previous ones have done, but does not know their true preferences.

A cascade is more likely to develop if at the very beginning a larger number of people performed the same action (for example, bought these stocks), even if all of them acted solely on the basis of their private information and these actions turned out to be the same completely by accident. The cascade can be further enhanced by the action of a person who is considered an expert. The basic model of information cascade explains why the prices of certain assets can rise and fall exponentially. If we take an example from real economic life, the information cascade is

depositors' bank runs when they hear about its instability [27].

The destabilizing influence of supply chain management and information cascades is manifested in a significant increase in prices from a fair level, towards growth, as a rule, the formation of the crowd effect, which leads to the appearance of financial bubbles. A financial bubble in the market of a financial asset is understood as a significant excess of the observed price over a certain fair value of the asset over a period of time characterized by a prolonged increase in prices followed by a collapse or significant fall [28].

The crowd effect allows explaining the formation of bubbles in the following way: if there is a uniform idea of the market moving in a certain direction, then the market really begins to move in this direction. The bubble collapses in a similar way. Investors may have opposite opinions about the dynamics of the asset's rate, but under the influence of common fear, they get rid of the asset, thereby leading to a fall in its rate.

Recently, the processes of price and exchange rate formation, characterized by high volatility of interest rates, exchange rates, the value of securities, metals, and commodity assets, have become much more complicated in financial markets. In such conditions, agents who make decisions in the financial markets are characterized by information incompleteness and information asymmetry, which encourages investors to actively search for new sources of information: news, reviews, analytical reports, and also pay attention to the decisions of other market participants. It is the actions of other market agents that in some cases become the determining information for making a decision.

In order to improve the quality of management decisions, agents in financial markets resort to using various methods in analyzing and predicting the dynamics of financial assets, while combining rational and behavioral techniques. In world economic practice, fundamental and technical analysis are used among rational approaches. However, in conditions of lack of information, with limited opportunities for timely receipt and processing of a huge amount of information, agents while making decisions are unable to ensure the rational choice of solutions, while compliance with crowd behavior may sometimes be the only way to solve the problem of choice in a situation of uncertainty [29].

As practice shows, the most pronounced manifestation of the herd effect is in the process of making a decision by a foreign investor to enter the market. Thus, investment decision-making based on the use of knowledge about the advantages of first-movers, i.e. involving the herd factor, occurs when foreign investment flows are functions of flows of other financial investments. The manifestation of the herd factor in the described case is that the critical mass of previous investments acts as a signal for the investor to make a decision on entering a particular market.

When trading in real markets, agents can observe and learn from each other. By acting faster than others, investors can rationally use the information revealed by the actions of other agents, stimulating management effect. Profit-maximizing agents can thus focus on what others also know, instead of learning information that others do not know. Finally, collecting information, especially in foreign exchange markets, requires significant expenditures

that create economies of scale for large investors. Thus, the higher the cost of acquiring information, the higher the motivation for non-informed small traders to imitate large depositors. There are several reasons for a profit/utility-maximizing investor to be influenced into reversing a planned decision after observing others. First, others may know something about the return on the investment and their actions reveal this information. Second, and this is relevant only for money managers who invest on behalf of others, the incentives provided by the compensation scheme and terms of employment may be such that imitation is rewarded. A third reason for imitation is that individuals may have an intrinsic preference for conformity.

The appearance of CNBC aggravated the dependent nature of the stock market by bombarding investors with news about what other investors were thinking. CNBC provided round-the-clock coverage of the market situation, a constant stock ticker with exchange rates at the bottom of the screen, and the latest news from various stock exchanges. Before CNBC, investors received almost all their information about their colleagues from stock exchange telegraph reports. Therefore, when they tried to guess the motives of other bidders, there was some distance between them and the market. In the new world of accessible financial news, investor reasoning is no longer necessary or even impossible. This complicates the already difficult task of an individual investor to come to an independent judgment. Obviously, this becomes an especially important aspect in those moments when investors show a supply chain management. For example, on a day when the market plummets, CNBC puts a bright sign on the screen "Maniac Monday", and every decision of the investor is dictated by panic. Everyone thinks about the same, because it is difficult to think about something other than anybody else.

Thus, as it is possible to conclude after analyzing behavior factors influencing the financial markets, the incompleteness of information or its asymmetric nature causes investors to search for new sources of information: reviews, news, considering the actions of other market players. Leading to supply chain management, such mass actions often lead to financial market instability, a drop in the stock market prices, and even a recession. Hence, studying the causes of mass behavior of the financial market players, their motives during the decision-making process is of paramount importance for financial market analysis and forecasts.

4. Conclusion

The conducted study interpreted the management behavior and assessed its effect of on the financial markets. The efficiency of modern stock market is determined by the existence of a fair price for assets that takes into account the real value of companies, the income received from them in the form of dividends and the demand for future periods. However, the asymmetric distribution of information, lack of information from agents due to the cost of obtaining information, as well as lack of experience and irrationality of sales agents leads to distortions of estimates of the real value of assets, as well as imitation of the behavior of other, more reputable market participants. Investors act in the market not only based on their own personal information, but also from publicly available information, as well as

from the information they receive when observing the behavior of other market participants, which leads to the formation of information cascades. Information cascades occur when people make decisions sequentially (one after another), while ignoring their own information, relying on information received from the behavior (choices) of others. A cascade is more likely to develop if at the very beginning a larger number of people make the same action (for example, buy certain stocks), even if all of them act solely on the basis of their private information and these actions turn out to be the same completely by accident. The cascade can be further enhanced by the action of a person who is considered an expert, because it is assumed that the latter possesses reliable information. The article also examined the phenomenon of financial bubbles, which often follows the information cascades and accompanies supply chain management and which may influence the whole financial market and lead to its instability.

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