DOI: 10.17747/2618-947X-2023-2-198-212
JEL G11, G23, G40, G41
UDC 330.322

Behavioral and cognitive factors in the formation of the heuristic model of the effective interpreter in investing in high-tech companies

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Abstract

The article presents a systematisation of the main factors of cognitive distortions and behavioural heuristics that make the switch to the effective interpreter model irreversible in portfolio investments, especially in high-tech companies. As the heuristic model of the effective interpreter can be perceived as generally increasing the risks in the system for all stakeholders at the current stage of the evolution of the investment system, the author focuses on the most negative manifestations of cognitive and behavioural factors in his description in the publication. However, this does not mean that it is possible or desirable to return to the rational investor model, as narrative and storytelling's components are too important in the context of 'new economy' industry formation and and fast business expansion by disruptive companies. To better interpret the business potential of companies, stakeholders, especially investors, increasingly need to work with narratives, storytelling, aspects of perception and business trust, rather than the numerical values and ratios of financial reporting and analytics. This is partly due to the fact that the intangible assets of companies in the S&P500 index have accounted for up to 90% of the total market capitalisation over the last two decades.

The author identifies the most significant cognitive and behavioral factors: the increase in the narrative component of equity value, the 'fake it till you make it' approach, the proliferation of cryptocurrencies as the asset with the largest narrative component of value, the boom in IPOs and SPACs in 2020-2021, buybacks as an unproductive signalling tool, the popularisation of chasing triple digit returns based on the survivor bias, the popularity of momentum strategies, the over-reliance on analyst recommendations and assessments, 'pump and dump' schemes, investment gamification and investor extroversion, anchoring and framing, the sunk cost fallacy, the lack of rigorous techniques for invalidating investment theses, and the perception of free money in investing over the past decade and a half. Awareness and tracking of at least the most significant behavioural and cognitive factors in the formation and further development of the heuristic model of the 'effective interpreter' will help to reduce risks in the financial and investment system of the 'new economy' and increase the sustainability of its long-term development.

Keywords: cognitive biases, behavioral heuristics, survivor bias, sunk cost fallacy, representativeness heuristic, market capitalization, stock market, portfolio investment, IPO, SPAC, innovation, narratives, irrational optimism, irrational exuberance, behavioral finance, growth companies, high-tech companies, new economy, cryptocurrencies, momentum strategies, investment thesis.

For citation:

Ilkevich S.V. (2023). Behavioral and cognitive factors in the formation of the heuristic model of the effective interpreter in investing in high-tech companies. *Strategic Decisions and Risk Management,* 14(2): 198-212. DOI: 10.17747/2618-947X-2023-2-198-212. (In Russ.)

高科技公司投资过程中 高效解释 启发法模型形成的行为和认知因素

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摘要
该文章系统阐述了认知扭曲和行为启发式的主要因素。它们在投资组合中，主要是在高科技公司，使转向"高效解释"模型变得不可逆转。由于在投资系统发展的现阶段，"高效解释"启发式模式可能会被认为普遍增加了系统中所有参与者的风险，作者重点阐述了认知和行为因素最消极的表现形式。然而，这并不意味着回归理性投资者模式是可能的或可取的，因为在"新经济"产业的形成和颠覆者公司的业务建设中，叙事和讲故事意义重大。为了更好地解读公司的商业潜力，参与者尤其是投资者，越来越需要使用叙事、讲故事、商业中的接受和信任问题，而不是财务报表和分析的数值和比率来。部分原因是，在过去二十年中，S&P500 指数公司的无形资产占总市值的比例高达 90%。
最重要的认知和行为因素包括：增加股东价值的叙事部分、"fake it till you make it" 方法、密码货币发展（这种资产的价值具有最大的叙事成分）、2020-2021 年的 IPO 和 SPAC 热潮、无益的信号工具 — 回购、普及基于倖存者偏差的即时增益法、战略动力流行、过度依赖分析师的建议和估计、"pump and dump"方法、投资游戏化、投资者外向性、沉锚效应和框架效应、沉没成本误区、取消投资论文的严格方法缺乏，以及对过去十五年投资中资金自由使用的看法。认识和跟踪至少是形成和进一步发展"高效解释"启发法模型的最重要的行为和认知因素，将有助于降低"新经济"金融和投资体系的风险，提高其长期发展的可持续性。
关键词： 认知扭曲、启发法、倖存者偏差、沉没成本误区、代表性启发法、市值、股票市场、组合投资、IPO、SPAC、创新、叙事、非理性乐观、非理性繁荣、行为金融学、成长型公司、高科技公司、新经济、密码货币、战略动力、投资论文。

供引用:
Ilkevich S.V.（2023）。高科技公司投资过程中 高效解释 启发法模型形成的行为和认知因素。战略决策和风险管理。14(2)：198-212（俄文）DOI：10.17747/2618-947X-2023-2-198-212。(俄文。)

Introduction: the transition from the model of the rational investor to the model of the effective interpreter

Over the past three decades, behavioural and cognitive aspects of valuation have come to the fore and largely determine the fundamental performance and dynamics of companies. In the article [Ilkevich, 2022], which logically preceded this work, a comparative analysis of the ten main characteristics of the rational investor model and the effective interpreter model was carried out. It explained why the effective interpreter model with all its pros and cons, including a higher level of risk in the investment system, is a new reality in terms of the typical decision-making pattern in the investment industry, both at the level of retail investors and at the level of active and passive fund managers, as well as other types of institutional investors. In the context of this publication, it seems appropriate to consider and systematise the set of cognitive and behavioural factors that determine and consolidate the transition to a new heuristic model of investment decision-making.

Since the emerging realities of portfolio investment in high-tech companies are such that manipulative aspects and problems of objective perception based on evidence and critical thinking are becoming more pronounced, the focus in this article on the factors of cognitive biases and behavioural heuristics will be primarily on the negative aspects of the factors under consideration. This is not to say that the efficient interpreter model is so inherently flawed that it would in any way be desirable or realistic

to return to the 'good old' rational investor model, which worked quite reliably in the context of business valuation for 'old economy' sectors. This would not be a fully consistent conclusion after examining all aspects of the 'dark side' of the effective interpreter model. It seems that the transition to a new heuristic model is irreversible.

This article discusses a fundamentally different category of issues. The behavioural and cognitive landscape of the new economy sectors is so complex that interpretive aspects of decision making come to the fore. Increasing the efficiency of perceptions and interpretations (primarily related to the realism of ideas about the true potential of companies' business models and the distribution of probabilities of various business development scenarios) for stakeholders in the investment industry is a complex interdisciplinary scientific and practical task. Systematising the factors of cognitive biases and behavioural heuristics in the context of raising general awareness and self-reflection among investors is the first stage in solving this type of problem, as it improves awareness of a complex and multifactorial phenomenon.

The question of the possibility and feasibility of distinguishing between behavioural and cognitive factors needs to be addressed separately. In a sense, this question is similar to the dilemma of which came first - the egg or the chicken. Cognitive aspects (mainly heuristics) undoubtedly determine to some extent the individual and group behavioural dynamics of economic agents. At the same time, behavioural patterns influence and to a large extent determine the matrix of cognitive perception. Without claiming to have a definitive answer to this question, it must be stressed that, in the context of this study, behavioural and cognitive factors represent a single heading and a conglomerate of aspects. Through their combined action, they lead to the final consolidation of the model of an effective interpreter of the stock market in the context of the modern economy. It is worth noting that there are studies with their own empirical methods that insist on the productivity of distinguishing and differentiating behavioural and narrative expectations in investment decisions [Johnson, Tuckett, 2022]. The central controversial aspects of this issue were discussed by the author in a previous article [Ilkevich, 2022].

Central factors of cognitive biases and behavioural heuristics in the effective interpreter model

Let's now consider the conglomerate of the main factors that reinforce cognitive biases and behavioural heuristics in the model of an effective interpreter. Not all of the factors discussed below are completely new, but even some traditional factors have been given significant specificity and new dynamics in the context of investing in high-tech companies.

Investors held hostage by the narrative under the 'fake it till you make it' approach

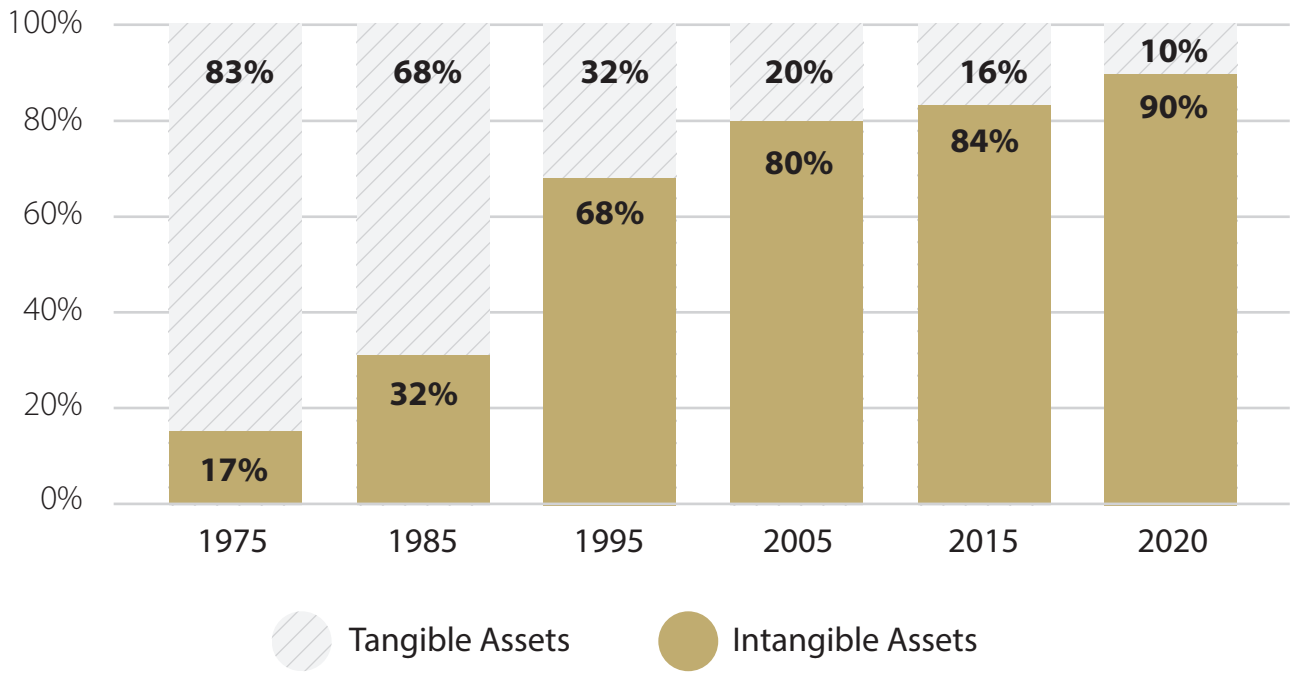
In high-tech sectors, the practical philosophy of 'fake it till you make it' has gained particular popularity, which primarily means the need for a company to appear to partners, customers and investors in the most promising and plausible state possible. In other words, to appear as if the company's resources, competencies, technologies, developments and minimum viable versions of the company's products and solutions already exist or are on their way. As a result, in today's stock market, all companies, but especially young start-ups, become hostage to the narrative and tend to promise what is at the top of the list in terms of feasibility. As a result, the 'fake it till you make it' approach becomes a kind of stock market philosophy of pragmatism, regardless of the true state of affairs, which requires companies to be as generous as possible in terms of promises, but not, of course, outright 'fraud'. Nevertheless, investors are being asked to put their money into those companies that are more the product of a narrative and a myth, in the neutral sense of the word 'myth', at the beginning of their activity, because the initial myth can really trigger the rapid development of a disruptor company.

However, it would be simplistic to see all narratives as just a manipulative and unreliable picture of the future. It's hard to argue that stock market narratives tend to embellish reality - it should always be taken into account. That's why for decades investors in 'growth companies' have lost out to investors in 'value companies', as the share prices of high-tech companies have traditionally been too far removed from fundamental indicators. It was and is, one might think, a kind of 'cognitive tax' on overly optimistic futurist investors.

Only in 2008-2021 was this not the case, but in 2022 it all came crashing down when the NASDAQ index fell by 30%.

Narratives are a 'necessary evil' because they act as a natural market coordination mechanism within the new economy ecosystem, especially when it comes to building a new or emerging industry and funding future champions of new sectors, and when a disruptive company is about to completely change the business landscape in the traditional sector. In this case, a few promises of a 'bright future' based on a visionary idea, and some trust in such promises, are particularly needed at the outset. It is almost impossible to structure and explain this area completely scientifically, as it is rather an art form in itself for investors to successfully determine who should be trusted with the presented picture of the future and a certain 'road map' for the implementation of a business model, and who should

Fig. 1. Ratio of the value of tangible and intangible assets
to the capitalisation of the S&P500 over the period 2000–2022



Source: https://www.oceantomo.com/intangible-asset-market-value-study/.

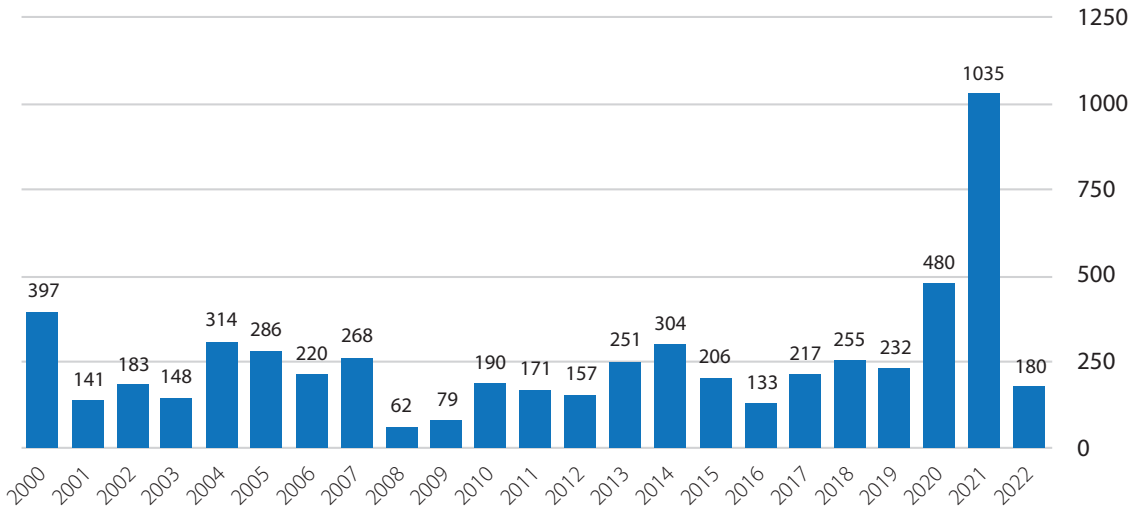
not. Despite the large subjective component of such decisions about trust, narrative and storytelling as phenomena have become an objective, significant and functioning mechanism for coordinating economic actors in the realities of the modern economy.

It is worth emphasising that 'fake it till you make it' is not just a business custom or an informal institution in terms of the breadth of the practice and the form in which it has become established. The narrative component of corporate value is de facto institutionalised, if only by the fact that companies without positive profitability or even significant revenues and cash flows are, in principle, allowed to go public, especially in North America. Thirty years ago, in the early 1990s, stock exchanges and underwriters required a company going public to have at least two or three years of positive profitability. Therefore, the most that could threaten investors in a future public company was incompletely reliable accounting. But then the primary measure of business success became assumptions and storytelling about future free cash flows, in other words a certain narrative component of value based on the plausibility of the investment thesis, which could be trusted or not.

Undoubtedly, this business valuation model has its very strong points - first and foremost, the fastest possible scaling of future giants of new industries. This is one of the reasons why American big tech has become so dominant in the global economy, while European companies and the European investment infrastructure have lagged behind, sticking to more conservative and traditional approaches to valuing a company. Strategically, the philosophy of liberalising the rules and speeding up the listing of high-tech companies from promising and revolutionised sectors has proved to be correct. Here, as they say, 'the score is on the scoreboard' - in the sense of which countries now have which global champion companies in various sectors of the 'new economy'. However, the downside is that the narrative component of value, which is the dominant part of the capitalisation of many high-tech companies, is likely to be undermined or even eliminated, as the value of listed (and already traded) high-tech companies, especially unprofitable ones, can in a sense be split into two components. They are objective (based on cash flows and profitability) and subjective-narrative (based on plausible promises of future cash flows and high business margins due to an innovative business model and intangible assets).

Using simpler and already established terminology, we can say that the intangible (immaterial) assets of companies (including intellectual property and reputation) are coming to the fore in investors' perceptions. They reach, according to estimates by

Fig. 2. Number of IPOs on the US stock exchanges in 2000–2022



Source: https://stockanalysis.com/ipos/statistics/.

some research organisations, 90% of the definition of capitalisation of the S&P500, and the share of tangible (material) assets in determining capitalisation has fallen to 10%, which is twice less than twenty years ago (Fig. 1). As the economy, on the whole, moved away from an industrial base and became more structurally focused on services and knowledge, there has been something of a 'creeping revolution' in the importance of the factors that now influence company valuations.

Whether it is possible to say that the situation with such a high importance of intangible assets in determining the value of a company has now gone too far or, conversely, that this is just a normal situation ('the new normal') in the modern innovative and transforming landscape of the economy is a very debatable question. However, there are a number of factors that could help to perpetuate the current state of affairs. They include further digitalisation, a further increase in the number of internet users and the introduction of 5G, as well as the general potential of the technologies of the Fourth Industrial Revolution.

An important and interesting question is also whether there is a long-term equilibrium value for the share of intangible assets that would still be very innovative but at the same time ensure the sustainability of the investment system. Let's say 82 or 85% in the context of the S&P 500, and in the context of the more industrial and export-oriented German economy, the value for the DAX30 index could be 70%, to illustrate. Incidentally, the same research company, OCEAN TOMO, makes the following assessment for the European equity market: the trend towards the increasing importance of intangible assets continues for the S&P Europe 350 index, albeit to a lesser extent, with an increase from 71% in 2015 to 74% in 2020[1].

IPO and SPAC boom in 2020-2021 as aggressive trading narratives

The IPO boom of recent years can also be interpreted in the context of the 'fake it till you make it' trend as a kind of particularly aggressive and massive 'narrative trading'. Fig. 2 shows the number of annual IPOs on the US stock market from 2000 to 2022. Obviously, 2020 and especially 2021 have become a shock year in terms of the volume of new companies going public, which can also be interpreted as an indicator of irrational abundance in the investment system, when new companies try to go public in time and not be late for a kind of 'festival of abundance'. The IPO boom began in June 2020. There was a sharp increase in transactions on a monthly basis, coinciding with the flow of 'helicopter' money into the economy and the rapid strengthening of the metanarrative about the generally unique prospects of high-tech companies, especially in the digital, biotech and alternative energy sectors, in what was then thought to be an indefinitely long pandemic era. In 2020-2021, the whole pipeline of SPAC deals, which were used to accelerate many IPOs, including the most dubious and even fraudulent, as in the case of Nikola, also attracted special attention. SPACs are shell companies that have no operations, business model or business plan other than to acquire a private company with the money raised in an IPO, allowing the private company to go public quickly. A recent study found that IPOs through SPACs are particularly likely to lead to lower share prices for companies that use this controversial accelerated placement vehicle [Klausner et al, 2022].

By way of comparison, the Russian IPO market is, to put it bluntly, not very active in terms of the number of transactions. Moreover, over the past decade and a half, there has been a decline in the placement of new

[1] https://www.oceantomo.com/intangible-asset-market-value-study/.

companies (Chart 3). This is a separate major problem of financing and business development in Russia. Of the 'new economy' companies, only three have gone public in the last three years: Ozon (24.11.2020), Positive Technologies (17.12.2021), Whoosh (14.12.2022). One 'new economy' company a year is very few. The structural, innovative restructuring of the Russian economy may take a long time, partly due to the underdeveloped investment infrastructure.

It would not be an exaggeration to say that many IPOs in recent years have become not just a game of chance for investors, but a phenomenon akin to a lottery. Moreover, a recent study on the spillover effects of the popularity of gambling on the stock market in different regions of the world quantitatively confirms this comparison [Chen et al., 2021]. In fact, we can say that there are not only successful metaphors and allegories, but also a correlation between the popularity of lotteries and the most risky stocks. A study of spillover effects found that when the general attitude towards gambling in a particular region or community is highly positive, investor demand for 'lottery' (high-risk) stocks increases, and these stocks generate characteristic positive short-term excess returns. Managers of such companies are more likely to split shares at the IPO, then conduct so-called stock splits to increase exposure to a wider range of retail investors, or, as is often the case, dilute shares to meet increased demand for low-cost lottery shares. As a result, IPOs with such measures are more profitable on the first day of placement [Chen et al., 2021]. This, one might assume, will greatly reduce expected future profitability.

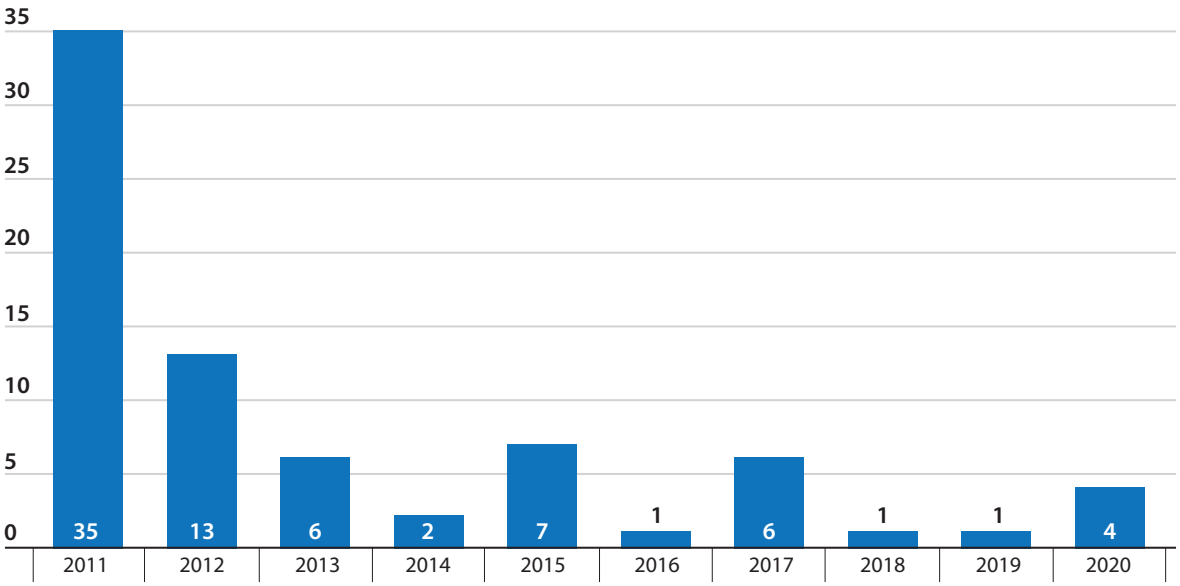
Russian IPOs have become particularly notorious in recent years. To understand why, just look at the stock charts (even to February 2022) of many of the companies that have recently entered the equity market: VK, Ozon, Fix Price and a host of others.

Buybacks as an unproductive signalling tool to increase the narrative component of shareholder value

The narrative component in the value of high-tech companies has also been strengthened in recent years by the so-called buybacks (share repurchases by companies), which became an important factor in the 'acceleration' of the share value of many companies in 2018-2022, especially the high-tech giants. As shown in Fig. 4, over the past twenty years, with the exception of the very difficult crisis year of 2009, share buybacks by companies have exceeded the total volume of dividend payments. The ability to buy back record amounts of shares has been underpinned by record profits for the tech giants. Buybacks have largely become an end in themselves, as the market (especially in the US) highly values their signalling role [Kurt, 2018]. It goes without saying that management has to demonstrate a willingness to buy back its shares in the belief that they will only go up in price. In other words, from the point of view of signalling effects in relation to their business, companies act on the principle of 'you need such a cow yourself'.

In deep market downturns, this practice often makes sense (based on decades of statistics), as it can be the most effective investment of the free cash flows of fundamentally very undervalued companies. Moreover, in such situations, there is often a case to be made for using borrowed funds for such purposes (subject to the financial stability of the company). However, when aggressive buybacks occur at market peaks, this game

Fig. 3. Number of IPOs on the *Moscow Exchange* in 2011–2020



Source: https:// conomy.ru/analysis/articles/213.

of 'doubling down' on a business can go too far at some point. Instead of business development, demonstrative and signalling motives come to the fore. Thus, following unproductive motives, considerations and practices, the company spends a disproportionate amount of resources on buying its own shares at price levels at which a rational investor would no longer buy (at least to further increase an issuer in its portfolio). The result is an additional aggravating factor within the general philosophy of 'fake it till you make it' logic, but for an established company.

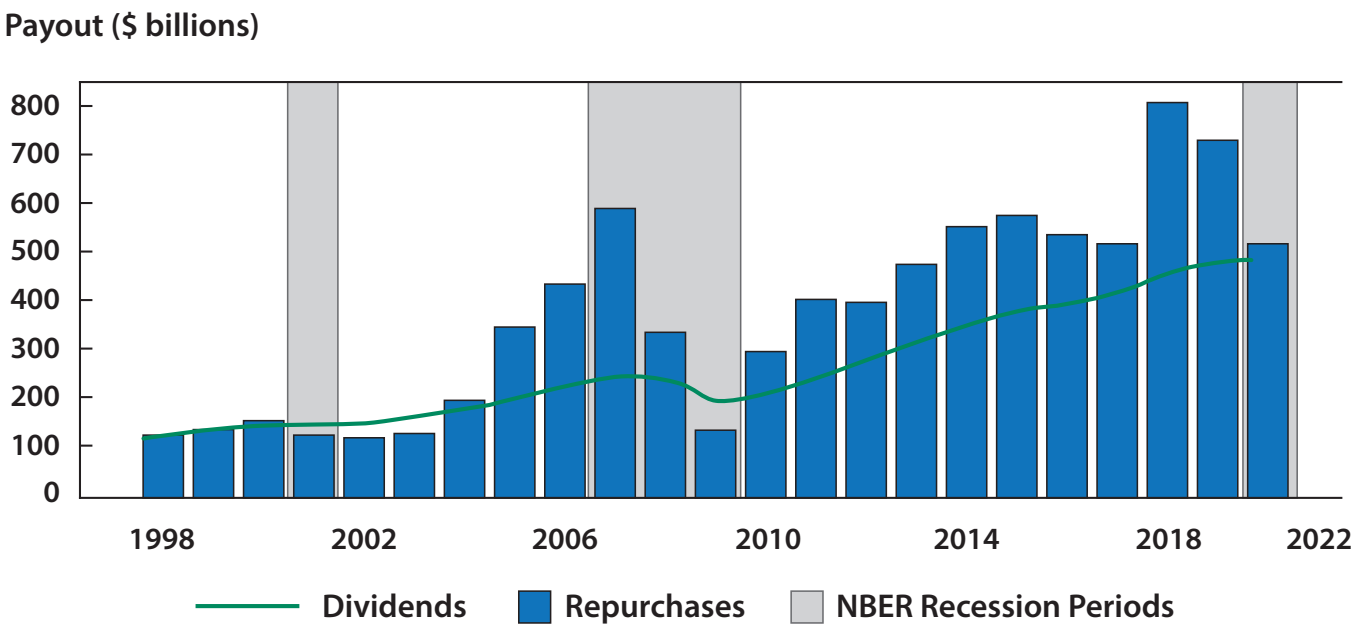
In particular, this type of practice can be considered in the context of the cognitive bias known as the 'endowment effect', whereby economic agents tend to value their asset slightly higher, more valuable, than if they did not already have it and were only thinking about acquiring it. The human psyche is characterised by a defence mechanism in relation to a previously made decision in the context of choosing between alternatives. In the same way, companies with an aggressive buyback policy find themselves in a situation where they have to come up with as many justifications as possible to buy back shares instead of developing promising areas and businesses. Such practices are approved by certain cohorts of investor enthusiasts (as they lead to a 'pumping' of the company), but such short-termism can be costly for the company in terms of business quality and strategy. Therefore, an important regulatory and institutional task arises - to redirect the country's corporate resources towards innovation and sustainable development, limiting the rental practice of share buybacks [Palladino, Lazonick, 2021]. With the growth of executive stock option compensation plans, the link between increased open market share repurchase activity and compensation may not be coincidental. Research shows that managers, as corporate insiders, can use share buybacks for personal gain [Palladino, 2020].

Popularisation of cryptocurrency trading as the asset class with the largest narrative in the cost

Cryptocurrencies themselves are perhaps the purest form of narrative value of a financial asset in the modern financial system [Azqueta-Gavaldón, 2020]. As a hypothesis, it is logical to assume that cryptocurrencies have important similarities with so-called beta stocks with a high influence of market sentiment. Such a comparison often comes to mind for analysts, practitioners and researchers. Indeed, a recent study found that bitcoin's returns are broadly similar to those of high-sentiment beta stocks [Jo et al., 2020]. It is also reasonable to assume that investors in high-tech companies as a cohort overlap and are highly correlated with the cohort of crypto investors. At least one study has found that a significant proportion of crypto investors are tech-savvy and active users of the digital economy with a propensity for high risk and gambling, which in turn points to the potential risks of excessive psychological involvement in the crypto market [Steinmetz, 2023].

One of the reasons why all this is happening is that investors in high-tech stocks and cryptocurrencies are using funds to buy both types (classes) of assets, figuratively speaking, out of the same pocket. If even one asset class falls significantly, this type of investor

Fig. 4. S&P500 share buybacks and dividends in 1998–2020



Source: [Chen, Obizaeva, 2022].

becomes poorer and therefore less willing to buy into the asset class that has not yet fallen. Moreover, there is a strong temptation to sell the 'expensive' asset class that has not fallen at a 'high' price, reduce the position in it and buy the collapsed 'cheap' asset at 'low' prices (relative to recent experience). Here we can assume a significant anchoring effect in the perception of which asset classes are expensive and which are cheap in the current paradigm, as well as a cognitive distortion due to recent experience (recency bias). The same thing happens when one of the two asset classes under discussion - high-tech stocks or cryptocurrencies - goes up in price. In this case, investors feel richer - and are more likely to buy an asset class that has not yet risen in price.

As a result, there is some hybridisation in the logic of investors' perceptions between the two asset classes - equities and cryptocurrencies. One study examined the relationship between the cryptocurrency market and the Dow Jones Industrial Average [Zhang et al., 2018]. The authors focused on the top 20 cryptocurrencies from 2013 to 2018 and constructed a composite cryptocurrency index (CCI). The results showed that the Composite Cryptocurrency Index and, significantly, even the Dow Jones Industrial Average were correlated with each other. It could also be argued that a common problem for investors in both cryptocurrencies and high-sentiment stocks is the representativeness heuristic, which gives disproportionate weight to recent experience compared to long-term averages when analysing the prospects of scenarios and their probability distributions. However, such a hypothesis needs to be examined and confirmed separately.

Popularisation of the 'search for X' based on the survivor's mistake

To a large extent, the phenomenon of 'chasing Xs' is the desire of investors to make a quick buck by finding stocks that will multiply in value in a relatively short period of time when market participants significantly overestimate the company's potential in a positive direction. Thanks to disruptive innovation, it relies not only on the representativeness heuristic mentioned above, but also on another type of retrospective cognitive bias - survivor bias. The investment industry (both brokers, active and passive fund managers and analysts) deliberately exaggerate the survival of companies with disruptive and breakthrough innovations in order to attract attention and funds. Due to the excessive mythologisation of the winners of previous technological breakthroughs, a retrospective analysis of the emergence of the current leaders of high-tech markets and sectors often rejects scenario analysis. It favours pseudo-determinism and embraces the principle that 'history is written by the winners' (i.e. ignoring the possibility that other companies could become the current established high-tech leaders). This approach may be partly appropriate for establishing the organisational culture of companies within the framework of the ideology of a 'great' and/or 'unique' company, but when it penetrates the minds of investors and managers, there is a decrease in the critical perception of reality and an excessive reliance on faith in the company.

Thus, the desire to 'make X' (as often expressed by investors in tech companies and cryptocurrencies) and the survivor's fallacy are important components of the narrative and mythologised perception of tech companies. Research in this regard shows that when investors are aware of the level of risk, they can manage the situation more effectively and make more profits than when they are not aware of the risk [Nguyen et al., 2019]. Therefore, self-reflection in the context of understanding one's own susceptibility to survivor error when constructing an investment thesis, as well as when building an investment position in a particular issuer, is critical for equity market participants, especially in relation to disruptor companies.

Sunk cost errors and lack of techniques for unwinding an investment thesis

'Chasing Xs' and the survivor's mistake are not so bad. Irrational, mystical, intuitive perception leads many investors to disorganised decision-making and a lack of a structured approach to assessing the business prospects of high-tech companies.

One of the most common types of cognitive error is an approach that can be described as 'breaking the mark'. An investor who has bought into a high-risk company will often take a 60-70-80% loss on his investment position and then hope for a recovery in the share price. But when that recovery does occur, it is quite likely to be a classic example of a turnaround company (according to Peter Lynch), where the company has been able to overcome the difficulties of growth and back up the initial positive narrative with the real evolution of its business model. In such cases, it is statistically better for the investor to hold the position. However, an investor who has been tormented by a long 'sitting out' of a deep negative position is often simply happy to have the opportunity to at least recoup his investment after all the anxiety and disappointment. The chance to break even is perceived subjectively and post-traumatically as a kind of gift of fate and relief from suffering, and the shares of the company become toxic and psychologically traumatic for the investor, despite the restoration of the price level.

An even more common manifestation is the averaging of a position, not because of the strengthening of any fundamental or even technical signals of the original investment thesis, but simply because of a significant fall in the company's share price itself. In such cases, the investor becomes a hostage to anchoring and viewing

the situation through the prism of recent events (recency bias). The same Lynch has a famous joke: if you bought shares of a company for 10 thousand dollars at 30 dollars each, and a little later your neighbour bought shares of the same company for 30 thousand dollars at only 3 dollars, but then the shares of the company are still the same, let's go to the near-zero mark - which of you two has more losses? The problem, Lynch jokes, is that not all retail investors can answer this question immediately...

Research shows that even for professional managers, frequent investment feedback and reports do not help to reduce the effect of sunk costs. Only a high frequency of feedback combined with high affective commitment can suppress the desire to continue an unprofitable investment project [Chen et al., 2020]. Notably, strong evidence of this type of fallacy was found in subjects with high cognitive ability, who did not reduce the sunk cost bias [Haita-Falah, 2017]. This is a very interesting and revealing result. It confirms Warren Buffett's famous statement in an interview that he would rather entrust the management of funds to a manager with an IQ of 140 (provided that he is reflective, critical, reasonably doubtful and cautious in his decisions, a person who is able to stop in time and admit his mistakes) than to a fanatical and categorical manager with an IQ of 180 in his decisions. This is because a manager of the second psychological type will, sooner or later, definitely run his fund into the ground.

The popularity of impulse (momentum) and swing strategies

A special feature of the high-tech sector is that momentum strategies are based not only on long-term statistical observations, but also on the expectation of a continuation of the company's rapid growth. The principle of extrapolation of past success is particularly strong in the minds of investors, fuelled by the installation of so-called faith in the company. This, in turn, leads to particularly dramatic gaps between expectations and extrapolations in current share prices and their fundamental value.

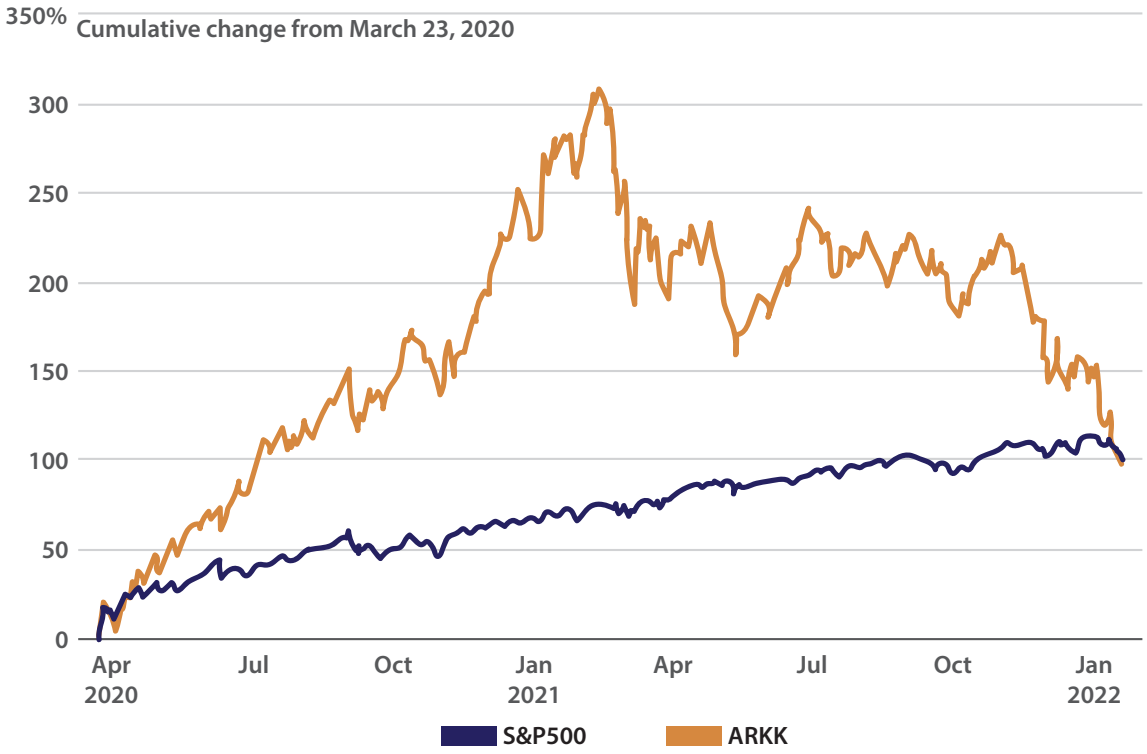
From a technical perspective (reading and interpreting price charts), following the 'trend is your friend' principle as a general investment approach is understandable and generally productive in reducing risk compared to counter-trend trading approaches, especially for less experienced retail investors. Although it is worth noting in the context of the general principle that there is no single method for recognising a trend as broken, the subjective factor is quite strong here: what and how each investor saw for themselves on the chart. This is a separate major epistemological problem in deciding what a trend is in a given situation. In itself, following the 'trend is your friend' principle means that the investor is simply forced to take a position, if not on local tops that confirm the trend, then on weak corrections at a price level close to the top. When investing in high-tech companies, this carries additional risks as investors often get into overheated stocks with a larger gap between current valuations and fundamentals. All of this, as research shows, leads to the herd effect also creating some institutional demand for overpriced securities [Demirer, Zhang, 2019]. In addition, as far as momentum strategies in tech stocks are concerned, it is advisable to re-engage with the cryptocurrency market, where this type of strategy has become particularly popular [Grobys, Sapkota, 2019].

Swing strategies (swing trading) are also unproductive when investing in high-tech companies. Most significant price movements are not accompanied by publicly available information. What other information do investors use to establish certain 'fair' prices around which they can expect fluctuations and make money from periodic partial or complete 'loading' and 'unloading' of an investment position in the issuer? Research shows that investors rely more on anchoring and framing [Brady, Premti, 2019]. In other words, many investors' trading approaches explicitly and implicitly use swing approaches.

Traditionally (and rightly), swing trading approaches are generally considered to be healthy (including by increasing market liquidity as speculators with swing strategies complement market makers), especially when such approaches are based on the use of options to control the risk of investors' positions [Thomsett, 2013]. However, when valuing high-tech companies, investors lack the necessary anchor in terms of a more or less accurate understanding of the 'fair' value of the company in order to trade the cyclical short and medium-term fluctuations in the share price. The inability to predict periods of market consolidation leads to large losses for investors. Broad assumptions do not allow an objective assessment of a company's value. Under these conditions, the anchoring and framing effect in investors' perceptions naturally increases: when a company's share price has fallen by 40-50-60 percent or more, it starts to look very interesting to many investors, even though the 'fair' value may still be much lower. This is a significant difference from traditional sectors, where for a company with a proven business model, more understandable earnings and cash flows, one can speak with relative accuracy about market under- or overvaluation, despite the increasingly common value traps) for value investors in today's more dynamic business landscape.

Due to the even more dynamic industrial landscape of the 'new economy', market participants have a natural tendency to reconsider their positions more often, as the competitive disposition changes many times faster than in traditional 'old' industries. High-tech companies are characterised by higher volatility [Kudryavtsev, 2018]. However, the problem is that the reliability of investors' interpretations and decisions is significantly reduced.

Fig. 5. Cumulative change in S&P500 and ARK Innovation (ARKK) from April 2020 to January 2022



Source: https://markets.businessinsider.com/news/stocks/stock-market-analysis-sp500-cathie-wood-ark-tech-selloff-rotation-2022-1#-1.

Over-reliance on analyst recommendations and estimates

In the absence of an objective centre of gravity for the value of high-tech stocks, consensus estimates are perceived as the best available targets. Even a concept such as narrative authority has emerged [Leins, 2022; Stolowy et al., 2022], which has its 'dark side', as the lack of an informed view by many investors of the 'fair' value of companies with a high narrative component leads to an exaggeration of the degree of expertise of analysts. For example, if the average expectation of Alibaba's share price in a year's time, based on the opinions of 25 experts, is USD 330, and the lower estimate of the five most sceptical experts is USD 240 (as in 2020, the parameters of this example are close to real events), then investors get the false impression that it is virtually impossible for the share price to fall below USD 180. After all, it is impossible for such a large number of experts to be so wrong at the same time. This logic is somewhat more applicable to traditional 'old economy' sectors, but when it comes to valuing the business of high-tech companies, experts are likely to become hostages to framing and herd behaviour. In the case of Alibaba, the share price fell to USD 65 in 2022, which was simply inconceivable on the basis of analysts' forecasts.

A number of studies [Corredor et al., 2014] have shown that the prevailing market mood, the so-called market sentiment, also influences analysts' forecasts (which are erroneously perceived as a completely objective and mathematically verified assessment of a company), especially for those stocks that are difficult to value. Both cognitive biases (distortions) and strategic behaviour have been found in analysts' forecasts [Karamanou, 2011], whereby analysts flexibly and adaptively adjust their opinions to the dynamically changing consensus forecasts of their peers. This, in turn, means that while international best practices for regulating public analyst forecasts may reduce analysts' optimistic bias somewhat, cognitive biases and behavioural factors (in particular herd and strategic behaviour, perception of consensus pressure) significantly bias analysts' estimates towards an exaggerated stock price growth outlook. Even if, as a distant allegory, we can compare analysts here

to members of a party who come to a party meeting with fairly autonomous and critical ideas on an issue, but during the meeting vote for a certain unified party line, what is called 'hesitating together', with the party line. Research has uncovered a wide range of cognitive phenomena in analysts' forecasting, and it is time to talk about the need for a separate science – 'analyticology'. One characteristic, for example, is that security prices tend to cluster in rounded price increments. The results show that the prices of technology stocks cluster at levels significantly higher than those of non-technology stocks, especially during periods of rising positive sentiment and high investor expectations in certain industries and sectors. The causal relationship here arises precisely because investors tend to cluster price values, not vice versa [Blau, 2019]. However, weak forecasters tend to be overconfident in the sense that they make extreme forecasts, and their confidence intervals are less likely to include the possible achievement of price levels [Deaves et al., 2019].

A recent paper examines the stock market's irrational reaction to analyst recommendation revisions as a function of the level of investor sentiment prior to the publication of analyst reports. Analyst revisions have a more pronounced effect on downgrades, which is related to the sentiment effect. Investors tend to react less to upgrade (downgrade) news when their prior beliefs are pessimistic (optimistic), indicating that they are overconfident [Kim et al., 2021].

'Pump and dump' schemes

'Pump and dump' schemes, which can be translated into Russian as 'pump and dump' or 'acceleration and drain' schemes, are largely a derivative phenomenon of the factors already discussed: the strengthening of the narrative component of stock prices, the popularity of impulse (momentum) strategies, and excessive faith in analysts' recommendations or their collective consensus. However, there is a reason why it is advisable to identify pump-and-dump cycles as a separate behavioural factor in the formation of an effective interpretive model: the relatively high degree of coordination of market participants' actions. To compare this to an orchestra in terms of the degree of synchronisation is perhaps unnecessary, but here too there is a 'first violin' (a market participant who creates a narrative that is super positive for the company).

It is also characteristic that many of the investors in such an asset assume that there will be a dump at some point, but hope to react before others. Pump and dump schemes continue to be the bane of equity markets, particularly markets and exchanges where small- and mid-cap companies are traded. The proliferation of schemes in these markets affects market integrity by discouraging investment and listing [Austin, 2021].

Launch of Exchange Traded Funds (ETFs) for high-tech companies

Since 2020, there has been a sharp increase in the inflow of funds into exchange-traded funds (ETFs) composed exclusively of shares of high-tech companies, including certain sectors - IT, biotech, space launches. This has led to greater opportunities for manipulation. The particular danger is that these types of funds have further weakened the vigilance of retail investors and can be expected to have reinforced the combined effects of a number of cognitive biases, notably the representativeness heuristic, the survivorship bias and, of course, the reliance on experts. In addition, manipulative narratives about the 'bright future' of individual industries and sectors have intensified throughout the market and near-market infrastructure (analysts, forecasters).

Perhaps the most striking and widespread example in terms of direct and indirect consequences for the entire investment industry is the ARK Innovation fund, which has become a kind of pyramid or Ponzi scheme. ARK was a disaster for new investors. The incredible growth rates of some of its stocks were too hard to resist; inexperienced investors predicted similar growth rates far into the future. If, for example, a fund invests USD 3 billion in the shares of a company with revenues of USD 100 million, and the share price rises by a factor of 3 to 10, this is a 'caliph for an hour' situation and a 'last fool's calculation' for those who buy shares at an accelerated price. There is an aggressive and cynical abuse of the rhetoric of innovation, progress and technological revolution with deliberately manipulative targets in a distorted system of incentives and interests (including moral hazard).

ETFs like ARK Innovation have essentially become serial pump and dump cycles. Fig. 5 illustrates this very clearly by comparing the situation at the time of the Covid collapse in the spring of 2020 and the subsequent rush into tech companies. By January 2022, the 'drain' that followed the 'overclocking' had put everything back in its place. This is what happens when fund companies have an average intangible share of capitalisation of more than 98%.

It is important to note that in the face of growing problems, techniques have emerged that seek to reduce the importance of cognitive biases in portfolios. Human Factors (H-Factor) is an actuarial portfolio tool developed by New York-based asset management firm New Age Alpha (newagealpha.com) that aims to reduce the risk of human behaviour in stock selection. H-Factor does not attempt to find high returns by using traditional methods such as generic smart beta and factor funds. Instead, H-Factor quantifies and avoids the risk of human bias in stock selection. The model uses as probabilistic values two parameters that we know for certain about the listed company: the current share price and the company's profitability as measured by published financial

results. Based on these two inputs, we can calculate the probability that a company will generate growth based on its share price, given that it has done so over the last 16 reporting periods. Even in high-tech industries, portfolios built to maximise the utility of the H-factor successfully reduce downside risk and preserve shareholder wealth, as opposed to cases such as the ARK fund, which selects speculative stocks with no track record, prone to high volatility and drawdowns.

'Robinhooders' and 'Reddits' as a trend for the gamification of investing

Pump and dump cycles intersect with the general trend towards the gamification of investing (or rather speculation). There is an ongoing debate in the research community about whether or not additive apps such as Robinhood and Reddit constitute gamification [Brown, 2020]. However, some manifestations of gamification do resemble gaming behaviour - individually and even collectively. Reddit users behave in ways reminiscent of quests in multiplayer online games. 'Reddits' as an investment 'quest' 'dispersed' from a rational position unpromising shares. For example, the offline computer game store Game stop [Rudegeair et al., 2021], whose business model could not withstand competition from online distribution [Ponczek, 2020], and their virtual opponent, in a sense the 'boss' of the final level of the game, were investment and hedge funds that 'shorted' Game stop with a large position.

The ease of investing through brokers on platform solutions with a simplified interface has led to investors taking on too much risk. Research claims that the success of the Robinhood app is due to the continuous expansion of the user base through various interface design techniques. This leads to the implementation of platform capitalism, which extracts rents from different revenue streams, with higher rents coming from more frequent and riskier trading behaviour. According to some researchers, the narrative of the democratisation of finance that occurs through the widespread use of mobile technologies thus obscures the capitalist logic and predatory practices that underlie financial technologies [Tan, 2021].

Investing in high-tech companies as a psycho-cognitive trap for extroverts

In an abstract and speculative way, one could assume that a number of the factors already mentioned and others (the same collective gamification of investing) lead to a particular vulnerability of extroverts when investing in high-tech companies. Indeed, several studies have been carried out in this direction in recent years. As a result, more extraverted people pay higher prices for financial assets and buy more financial assets when assets are overvalued than less extraverted people [Oehler et al., 2018]. Extroverted investors are risk-averse, so they are more likely than introverted ones to allocate money to risky assets and to use mental shortcuts and simplified heuristics when making investment decisions [Ishfaq et al., 2020].

Perception of free use of money in the investment area

The creation of cognitive distortions over the last decade and a half (2007-2022) has been facilitated by a particular 'macroeconomic climate' of low interest rates and the growth of retail investing (including through mobile applications). Even the so-called leverage (borrowed funds for a margin position) of leading international brokers (e.g. Interactive Brokers) over the last decade has only cost investors 2-4% per year, not to mention the fact that many financial derivatives (e.g. futures) have free 'wired' shoulders in their structure.

How do low interest rates affect investor behaviour? Research shows that when interest rates are low, people become more risk-seeking. Low interest rates lead to a significant increase in the reallocation of portfolios into risky assets across different population groups [Lian et al., 2019].

Of course, the almost 'free' money also directly increased the calculated values of the 'fair' capitalisation of companies through the NPV formulas of estimated future cash flows. This, in turn, influenced both analysts' valuations and the formation of mass investor psychology. There has even been an inversion between the real economy and the stock market, especially in the US. Over the past decade, especially in 2017-2018 and 2020-2022, low economic growth and employment problems acted as a kind of marker for investors that the Federal Reserve would keep interest rates low or cut them, so bad news from the economy led to higher valuations of companies, especially big tech and high-tech start-ups. The stock market began to play less of a proactive role as a leading indicator of the economy (following the principle that 'markets live by expectations') and began to play a more reactive role: revaluing companies, especially high-tech companies, in inverse proportion to the state of production and employment dynamics in the economy as a whole.

Conclusion

The article has highlighted and to some extent specified the main aspects of the influence of cognitive and behavioural factors on the overall formation of a model of an effective interpreter. However, this publication does not claim to be a complete representation of all aspects (especially given their changing nature) that together form the current paradigm for assessing the business of high-tech companies. The central thesis is that awareness and tracking of at least the key behavioural and cognitive factors of the heuristic model of an effective interpreter will help to reduce risks in the financial and investment

system of the new economy and increase the sustainability of its development. Speculation as a component of the economic cycle mechanism stimulates investment activity, therefore, it is not entirely bad as long as it is not carried out excessively through manipulative actions that end up causing panic among investors [Taskinsoy, 2021]. The current level of distortion and manipulation appears to be high and unproductive, so the number one task for all stakeholders in the financial and investment system is to raise awareness and consciousness (what is called 'awareness' in international approaches, methods and guidelines) in the systemic, holistic presentation, and at the same time with good detailing of specific cognitive-behavioural issues.

It should also be borne in mind that, at the level of the financial and investment system as a whole, the period of capital inflows into the high-tech sector can be replaced by a fairly long and even multi-year period of outflows. In this respect, 2022 has become just that, although it is difficult to predict exactly how long the current wave of outflows will last. The lack of dividend growth for the vast majority of companies, together with the reduced balance in the portfolios of the majority of private investors, will lead to greater destruction of the value of their investments in the event of many years of market stagnation. This poses a major threat to public welfare, as the depletion of retail savings will coincide with difficult times for pension systems in many countries around the world, as well as the general problem of the erosion of the middle class. Thus, there may be an effect of overlapping crisis phenomena in several segments of the financial system at the same time, affecting the long-term ability of 'new economy' companies to attract capital.

The factors identified in the article are also relevant for describing the risks associated with the formation of a national investment culture in Russia. An opportunistic or irrational national investment culture for large cohorts of retail investors can become a breeding ground for self-perpetuation and the reproduction of cognitive and behavioural distortions. This assumption may seem too general or speculative, but a clear illustration of the accumulating problems with the 'investment mentality' is the structure of investments, especially in foreign stocks, by Russian retail investors, which is characterised by taking the highest risks. This indicates a low awareness of what kind of game investors are actually playing and according to what rules. Taking all this into account, even in the period before February 2022, the Central Bank of the Russian Federation constantly threatened to restrict retail investors' access to foreign shares. Moreover, in the current dramatically changed conditions it simply cancelled foreign shares for unqualified investors, which seems to be a suboptimal approach even taking into account the extraordinary situation with infrastructure risks in the attitude of Russian brokers towards investors. It would be possible to leave investors the opportunity to buy foreign shares in the amount of at least 20-30% of the portfolio value, guided more by long-term considerations of developing the awareness of market participants and not by total paternalistic protection of them from mistakes. If high-risk Russian investors turn to crypto exchanges rather than the NASDAQ, it is not yet known who will benefit. This is a separate, multi-dimensional issue.

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The article was submitted on 20.08.2023; revised on 26.09.2023 and accepted for publication on 08.10.2023. The author read and approved the final version of the manuscript.
文章于 20.08.2023 提交给编辑。文章于 26.09.2023 已审稿，之后于 08.10.2023 接受发表。作者已经阅读并批准了手稿的最终版本。