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THE ARCHITECTURE OF THINKING: REFLECTION, CRITICAL THINKING, SENTIMENT AND THEIR INFLUENCE ON ECONOMIC DECISION-TAKING

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Purpose: The article explores how emotions and authority influence inflation forecasts and economic decisions, highlighting the importance of critical thinking in reducing their impact.
Design/methodology/approach: The study conducted an experiment in which participants watched a film about the economic situation and then received either positive or negative comments from experts. The impact of these comments on participants' inflation forecasts was analyzed, using psychological tests to gain a deeper understanding of perception.
Findings: The study found that high cognitive reflexivity and economic knowledge did not fully protect against the influence of expert opinions. Participants' initial differences in inflation forecasting diminished after exposure to expert comments, with heuristic mechanisms often prevailing. Economic education increased knowledge and reflexivity but did not eliminate the impact of emotion and authority on decisions. Critical thinking helped reduce cognitive errors but did not completely eliminate them.
Research limitations/implications: The study's results are limited by the small sample size and specific decision scenarios, which may not capture the complexity of real economic situations. Future research should involve larger, more diverse participant groups and various economic contexts. Nonetheless, the findings highlight the importance of economic education in developing critical thinking to reduce cognitive errors influenced by emotions and authority.
Originality/value: The article offers a fresh perspective on economic decision-making by examining the interplay between cognitive reflexivity, economic knowledge, authority, and emotions. It reveals that while reflexivity and knowledge are crucial, they alone cannot prevent cognitive errors. Critical thinking emerges as a vital element of economic education. The study also underscores the need for analytical skills to enhance rationality in dynamic economic, social, and political contexts.
Keywords: inflation, behavioural economics, behavioural psychology, decision making, media communication, cognition, language pragmatics.
Category of the paper: Research paper.

1. Introduction

This paper examines the impact of sentiment and authority on inflation forecasting and economic decision-making. In particular, it investigated whether high levels of cognitive reflexivity and economic knowledge can protect individuals from irrational cognitive distortions in financial decision-making. For the purposes of the experiment, a psychometric test developed by Anna Matczak was used to assess cognitive reflexivity as a cognitive style focused on introspection and analysis of internal experiences.

In the first part of the article, critical thinking was defined as the capacity for rational and conscious analysis as a tool for reducing cognitive distortions in decision-making processes. Cognitive reflexivity was then characterised in detail based on Matczak's approach. The two phenomena - critical thinking and cognitive reflexivity - were then juxtaposed, examining their interrelationship and potential limitations in the context of the influence of emotional and authoritarian factors. The results of the experiment showed that both sentiment and authority can significantly influence economic decisions, regardless of the participants' level of cognitive reflexivity. It was found that although cognitive reflexivity promotes rational decision-making, its role in protecting against irrational cognitive distortions is limited. Given the results of the study, critical thinking was proposed as a potential remedy for these distortions. Nevertheless, it was emphasised that further research is needed to fully assess the effectiveness of critical thinking as a tool to reduce the influence of emotion and authority on economic decision-making.

2. Literature review

2.1. Critical thinking vs. irrationality

Critical thinking is a complex intellectual process that involves the objective analysis and evaluation of information, arguments and situations with the aim of forming logical, well-founded conclusions (Nęcka, Szymura, Orzechowski, 2013). In the academic literature, critical thinking is often seen as an essential skill in the media space for effective information processing and informed decision-making. As Paul and Elder (2006) note, critical thinking not only supports learning, but also develops the skills needed to solve problems in different areas of life. Key elements of critical thinking include the ability to reason, assess the credibility of information and the ability to question one's own beliefs and be open to new perspectives. It is not only a skill, but also an attitude that requires openness and intellectual honesty. Critical thinkers are able to effectively problem-solve and challenge themselves, making this skill invaluable in everyday life, work and new media.

However, as research by Nobel laureate Daniel Kahneman (2011) shows, even the most informed thinking can be influenced by a number of cognitive traps that interfere with decision-making. One is the confirmation trap, which is the tendency to seek out information that is consistent with one's own beliefs and ignore those that might challenge them. Another is the anchoring effect, in which the first piece of information processed by the recipient influences his or her subsequent decisions and judgements, even if it is irrelevant. Another trap is the illusion of control, i.e. the belief that people can influence random events, which often leads to erroneous judgements. These traps arise from heuristics and cognitive errors that cause human thinking to be sometimes distorted and not always rational (Kahneman, 2011). In contrast, Dan Ariely, a specialist in behavioural economics, draws attention to the common manifestations of irrationality in human behaviour. In his book The Power of Irrationality, Ariely (2012) provides numerous examples of situations in which human decisions are predictably irrational. The 'free-for-all' effect illustrates the tendency to assign high value to things offered for free, even though their actual value may be low. Ariely's research shows that customers choose Hershey's chocolates 90% of the time when they are offered for free, even when in reality the more valuable Lindt truffles cost only US$0.26. Another mechanism is the theory of relativity, in which people judge the value of objects based on how they compare with others. A more expensive product placed next to a cheaper one often appears more valuable, even if its actual quality remains the same. Ariely also points to the phenomenon of procrastination, which is the tendency to put off important decisions and actions until later, resulting from a resistance to taking actions that involve risk or effort. This phenomenon leads to the postponement of important issues, which can have negative consequences. In his research, Ariely also describes the phenomenon of rationalised dishonesty, which refers to situations in which people, given the opportunity to gain financial benefits, rationalise their dishonest behaviour while considering themselves honest. This phenomenon shows how flexible human morality can be in the face of material gain. Decision paralysis, on the other hand, refers to a situation in which people are presented with too many options to choose from, so that they may feel overwhelmed by this, ultimately leading them to abandon any decision, which in turn causes frustration and reduces satisfaction with the choices they have made. The IKEA effect is another example illustrating human irrationality and occurs when consumers assign a higher value to items they have made or assembled themselves, as in the case of IKEA furniture, for which they are willing to pay more than for ready-made products. Also important in everyday decisions is a mechanism that Ariely calls the 'pain of loss' or the phenomenon of emotional discomfort associated with loss. This pain is usually much stronger than the joy of achieving a gain of equal value. This makes people more inclined to avoid risk than to pursue gain, driven mainly by the desire to protect themselves from loss. Another manifestation of irrationality is illogical financial choices, resulting from different approaches to money. Consumers find it easier to spend money gained from winning the lottery than money they have earned themselves. In addition, the placebo effect reveals how strongly human decisions can be influenced by

expectations. People often believe in the efficacy of drugs or therapies simply because they think they will work, which shows how human beliefs influence the perceived effectiveness of different actions. These examples illustrate how irrationality is ingrained in everyday consumer decisions and how different factors can distort a person's judgement in the decision-making process.

According to Dan Ariely, it is critical thinking, the definition of which was quoted at the beginning of this chapter, that provides an effective remedy for the tendency towards irrational decisions. One of the key aspects of critical thinking is the analysis and evaluation of information. Critical thinkers are more likely to question often erroneous automatic reactions, allowing them to seek reliable evidence and make informed decisions. Questioning is another important element of critical thinking, as it encourages reflection on the motives behind people's decisions. Ariely draws attention to the fact that human choices are predictably irrational and often made unconsciously. Awareness of cognitive errors is another defence mechanism against irrationality. Critical thinking makes it possible to identify the pitfalls of thinking, allowing a more informed approach to analysing situations and avoiding the influence of heuristics, simplifications or automatisms in thinking on decisions made in many areas of human life. Overt Dan Ariely points to openness to new perspectives as an inhibitor of irrationality in the architecture of thinking. It requires the readiness and intellectual and emotional maturity of the human individual to change position under the influence of new evidence. Ariely notes that people often cling to beliefs even in spite of facts, leading to unfavourable decisions. Critical thinking promotes flexibility and acceptance of nuance, allowing people to adapt to new information.

2.2. Cognitive reflectiveness and irrationality

Cognitive reflectiveness, defined as the ability to reconsider, analyse, and assess one’s own thoughts and beliefs, plays a pivotal role in the decision-making process. In psychological literature, cognitive reflectiveness is described as a process of conscious control over one’s thinking, enabling the careful consideration of available information and more accurate decision-making. Through reflectiveness, an individual gains greater resistance to impulsivity and cognitive biases that may lead to suboptimal decisions (Matczak, 2011). Reflection is a process that accompanies individuals at various stages of adulthood and is associated with specific internal experiences that influence the interpretation of situations one faces (Matczak, 2020). The introspective nature of reflection allows an individual to analyse their internal experiences, actions, and states of consciousness. Matczak (2020) suggests that reflection particularly applies to individuals in a state of doubt, who strive to understand their behaviour in the context of the situation, identifying their personal theories and transitioning from the subconscious to full awareness. Reflection is a dynamic and developmental process that not only promotes a critical perspective on past experiences but also facilitates future planning and the development of self-awareness. According to Matczak (2020), reflection takes on different

qualities at various stages of adulthood, shaped by developmental norms and life experiences, which form its foundation. Although reflection can foster personal growth and the acquisition of life wisdom, it does not guarantee these outcomes. The potential for reflective functioning is available to all adults, although not all fully utilise it.

Cognitive reflectiveness also engages the ability to critically evaluate and control one's thoughts. This enables an individual to consciously "brake" automatic reactions and reconsider their choices before making decisions. Such an approach promotes resistance to emotional influences and social pressure, which, in an economic context, can translate into more deliberate and reasoned financial management. Critical analysis of one's thoughts also helps in reducing cognitive biases such as hindsight bias or anchoring, which often lead to flawed assessments of financial situations. Cognitively reflective individuals, aware of these biases, are less prone to impulsive consumption and behaviours driven by advertising. Research indicates that individuals with higher cognitive reflectiveness are more likely to make sound financial decisions and avoid typical cognitive biases, such as hasty purchases, emotional investing, or decisions influenced by fleeting trends (Juanchich et al., 2019).

Cognitive reflectiveness is reflected in Daniel Kahneman's (2011) theory of thinking systems, in which the fast, intuitive System 1 is contrasted with the slower, analytical System 2. Cognitive reflectiveness is strongly linked to System 2, as it requires conscious, effortful analysis of information. This allows an individual to "switch" from the automatic System 1 to the deliberate System 2, often leading to more thoughtful decisions. In financial contexts, this can result in less impulsivity and greater caution, which in turn leads to better risk management. Cognitive reflectiveness also facilitates a flexible and adaptive switching between intuitive thinking in System 1 and analytical thinking in System 2, which is particularly important in financial decision-making. For instance, when new, uncertain information arises in the financial market, reflective individuals are able not only to dismiss the immediate reaction of System 1 (such as an emotional response to sudden price changes) but also to consciously process this information using System 2. As a result, their decisions are less susceptible to risks arising from heuristics and cognitive biases that could lead to poor choices, such as excessive risk in investments or avoiding risk due to fear of failure.

The findings from the research conducted by Juanchich, Sirot, and Bonnefon (2019) emphasise that individuals with higher levels of cognitive reflectiveness exhibit greater resistance to cognitive effects such as heuristics or distorted perceptions of risk. One example of such effects is the anchoring heuristic, which leads to excessive reliance on initial information (the "anchor"), even when it is not relevant in the given context. Cognitively reflective individuals are able to consciously detach from initial impressions and analyse the situation based on actual facts and data. This kind of reflectiveness helps to avoid hasty decisions that, in the financial world, can lead to losses — for example, when an investor buys stocks merely due to a temporary price increase, ignoring fundamental market indicators. According to the researchers, cognitive reflectiveness also protects against hindsight bias,

which involves interpreting past events as more predictable than they actually were. This effect often leads individuals to make errors by relying too heavily on intuition or past experiences, rather than making an objective assessment of facts. Thanks to cognitive reflectiveness, individuals are more likely to analyse new information in a fresh context, leading to more accurate assessments of future opportunities and threats.

In the literature, cognitive reflectiveness is often described as a key component of emotional intelligence, which is defined as the ability to recognise, process, and manage emotional information and use it for adaptive functioning (Mayer, Salovey, 1997). Cognitive reflectiveness supports this process by enabling individuals to effectively distinguish between emotions and thoughts and to analyse facts independently of subjective experiences. In the context of financial decisions, this allows for making choices that are not only more thoughtful but also more emotionally stable, which is crucial in situations fraught with uncertainty and risk, typical of economic decisions. An example might be the situation in the investment market, where strong emotional pressure arises due to sudden price fluctuations. Individuals with well-developed cognitive reflectiveness are able to consciously identify the impact of emotions such as fear of loss or the euphoria of anticipated gains, allowing them to act more objectively rather than succumbing to transient emotions. This ability to separate emotions from the thinking process is a key aspect of emotional intelligence, contributing to greater emotional stability and more effective decision-making. Furthermore, cognitive reflectiveness supports the development of competencies related to emotional self-regulation, such as self-control or the ability to maintain composure under financial pressure. Cognitively reflective individuals who can analyse their emotions and their impact on decision-making are better prepared to manage stress and act in a manner consistent with their long-term financial goals. In this way, cognitive reflectiveness enhances the ability to make more conscious decisions in situations where emotions may jeopardise rational decision-making, which is a key aspect of emotional intelligence and holds particular importance in the rapidly changing financial environment and the new media landscape saturated with messages laden with strong emotional appeal.

2.3. The difference between cognitive reflectiveness and critical thinking

Cognitive reflectiveness, as described by Anna Matczak (2011), is a characteristic of cognitive style related to the tendency for careful and prolonged contemplation of hypotheses and the analysis of various solutions before making decisions. Individuals exhibiting reflectiveness adopt a thorough and insightful approach to tasks, enabling them to avoid errors and make more accurate decisions (Matczak, 2011). Cognitive reflectiveness is associated with response latency, as reflective individuals often consider multiple options, comparing them to select the best possible decision. In contrast, critical thinking is a broader cognitive process that focuses on evaluating arguments and evidence, as well as the ability to recognise and analyse various perspectives. Key elements of critical thinking include the assessment of arguments,

a structured approach to problem-solving, and self-awareness, which refers to the capacity to understand and question one's own beliefs (Paul, Elder, 2006).

Although cognitive reflectiveness and critical thinking share common elements, they differ in their objectives and processes of execution. Cognitive reflectiveness concentrates on the meticulous consideration and analysis of a problem, which aids in avoiding mistakes and making more informed decisions, while critical thinking is directed towards evaluating arguments and consciously making decisions based on available evidence. The process of reflectiveness often leads to delays in action, as the individual focuses on carefully considering all possible options. In the case of critical thinking, decisions are made more quickly due to logical analysis, making it more applicable in situations requiring swift and effective decision-making (Matczak, 2011; Paul, Elder, 2006). Cognitive reflectiveness is most commonly applied in the context of individual cognitive styles, which can be particularly beneficial in the learning process and in resolving personal issues. Conversely, critical thinking finds broader applications, such as in public debates, education, and everyday decision-making in both personal and professional contexts.

In summary, cognitive reflectiveness pertains to a deep analysis and contemplation of one's thoughts and decisions, whereas critical thinking is a more dynamic skill of evaluating information and arguments, allowing for conscious choices and careful decision-making based on available knowledge and evidence.

Recent research on cognitive reflectiveness indicates its growing importance in social and economic contexts, as well as in decision-making processes. The ambivalent role of reflectiveness is the subject of analysis by researcher Agnieszka Jankowska, who, in her article on cognitive reflectiveness, highlights situations where reflectiveness may lead to high cognitive costs and may hinder the perceptual process. Reflectiveness, often considered a positive trait, can lead to excessive analysis of situations. In cognitive terms, individuals who are overly reflective may spend too much time contemplating various options and analysing problems, making it difficult for them to make effective decisions. Jankowska points to the ambiguity of reflectiveness and suggests that in certain contexts it may even be "undesirable" (Jankowska, 2019). In situations requiring rapid decision-making or improvisation, excessive reflectiveness can become a hindrance. People may struggle to act under time pressure, resulting in decreased effectiveness of their actions. On the other hand, Ellen Langer, studying common cognitive tendencies in the modern world, notes that mindlessness is becoming increasingly dominant. Langer emphasises that reflectiveness remains a key competence in the face of growing individual autonomy and widespread access to information (Langer, 2016). Meanwhile, in her research on cognitive styles, Ewa Czerniawska points to significant differences between reflective and impulsive individuals, highlighting that reflectiveness influences the decision-making process. According to Czerniawska, reflectiveness can determine the way information is processed and solutions are selected, which is an important aspect of individual cognitive styles (Czerniawska, 2020). Elżbieta Hałas, in her sociological

examination of reflectiveness, underscores its significance for social theory and critical analysis. Hałas asserts that reflectiveness acquires particular value in social analysis, especially in light of complex interactions between the individual and the social system (Hałas, 2018).

Critical thinking plays a fundamental role as a tool for defending against emotional influences and manipulation, especially in the digital world saturated with information and disinformation. The ability to critically analyse content becomes a vital resource for individuals seeking to make informed rather than impulsive decisions. In an era of fake news and media manipulation, critical thinking supports effective filtering of information, which is crucial to avoiding misleading content. As noted by Lewandowsky and Cook (2020), individuals capable of critical thinking are better at identifying credible sources, distinguishing them from those employing manipulative techniques or bias. Critical thinkers are able to recognise moments when emotions distort judgments and exercise control over their reactions. Contemporary media often influence audiences through subtle manipulative techniques that appeal to emotions. Critical thinking acts as a barrier against media narratives aimed at eliciting specific emotional responses. According to Nęcki (2013), individuals with high critical thinking skills can recognise attempts at manipulation, allowing them to make more conscious decisions that are resistant to external pressure. One of the most important elements of critical thinking is the ability to ask questions that encourage deeper analysis of information and scrutiny of its sources. Ariely (2012) emphasises that critical thinkers are more likely to question the veracity of information and seek evidence rather than accepting content uncritically. This approach fosters decisions based on evidence rather than sentiment. Critical thinking also strengthens self-reflection, enabling individuals to better understand their own values and beliefs. Kahneman (2011) also notes that self-awareness is crucial in avoiding decisions based solely on emotions or fleeting impulses. Critical thinking further develops analytical skills essential for solving problems that require logical reasoning and calm analysis. This ability facilitates thoughtful decision-making, irrespective of emotional pressure, which, as Gigerenzer (2007) emphasises, is key to achieving accurate and balanced choices. According to the researcher, through the capacity to filter content, self-reflect, and analyse emotions, critical thinkers are more resistant to manipulation, which helps them maintain autonomy of thought and avoid irrational decisions.

3. Method description

The study was conducted between April 2023 and February 2024 among university students in Poland who are not analysts. A total of 412 participants took part in the experiment, including 326 women, 83 men, and 3 individuals who did not specify their gender. At the beginning, participants filled out a demographic questionnaire. Due to the dynamic economic situation in Poland during the study period, characterized by rising inflation, participants were shown

a video. The material aimed to standardize the cognitive understanding of the economic environment and neutralize media information presented in Polish media. By employing priming techniques, all participants responded to questions from the same cognitive level.

After watching the video, participants received a message that included a description of the economic situation and its prospects both domestically and internationally, along with information about an inflation rate close to the target value of 2.1%. After reviewing this message, participants estimated the inflation rate both qualitatively and quantitatively. In the next step, participants were randomly assigned to read either a positive version of an expert's commentary (Group P) or a negative version (Group N). They then had the opportunity to modify their inflation estimates. This approach allowed researchers to examine the impact of expert comments on students' perceptions of inflation and understand how different presentations of information could influence decision-making in the context of economic uncertainty.

During the experiment, participants completed an economic knowledge test. Based on the results, their level of knowledge was defined as low, average or high. To measure the level of cognitive reflexivity, the Reflexivity Questionnaire by Anna Matczak and Aleksandra Jaworowska (2020) was used.

4. Results

Table 1.
Tests for the normality of the distribution of the variable: percentage result obtained in the economic knowledge test for groups with low, average and high levels of cognitive reflectivity

Level of cognitive reflexivity	Test	Value of statistics	Value p
low	Test Shapiro-Wilka	0,95	0,0888
	Test Lillieforsa	0,19	p < ,01
average	Test Shapiro-Wilka	0,98	0,0001
	Test Lillieforsa	0,12	p < ,01
high	Test Shapiro-Wilka	0,90	0,0001
	Test Lillieforsa	0,18	p < ,01

Source: own study based on data collected in the author's study.

Regarding the group with a low level of cognitive reflexivity, based on the result of the Shapiro-Wilk test: $p = 0.0888$ at the significance level $\alpha = 0.05$, there is no basis for rejecting the hypothesis of normality of the distribution of the variable percentage score obtained in the test of economic knowledge. On the other hand, based on the result of the Lilliefors test: $p < ,01$ at the significance level $\alpha = 0.05$, the hypothesis of normality of the distribution of the variable should be rejected. Hence, it should be assumed that the distribution is not normal (Table 1).

Regarding the groups with average and high levels of cognitive reflexivity, both the Shapiro-Wilk test and the Lilliefors test indicate rejection of the hypothesis of normality of the distribution of the variable percentage score obtained in the economic knowledge test at the significance level of $\alpha = 0.05$ (Table 1).

Table 2.
Kruskal-Wallis rank ANOVA for the variable percentage score obtained on the economic knowledge test for groups with low, average and high levels of cognitive reflexivity H (2, N = 409) =16,91043 p =,0002

Level of cognitive reflexivity	N	Sum	Average value
low	35	5788,50	165,39
average	313	62350,50	199,20
high	61	15706,00	257,48

Source: own study based on data collected in the author's study.

There were statistically significant differences in the percentage score obtained in the economic knowledge test by group according to the level of cognitive reflexivity (Table 2).

Table 3.
The p-value for multiple comparisons (two-sided) for the variable percentage score obtained in the test of economic knowledge according to the level of cognitive reflexivity. Kruskal-Wallis test: H (2, N = 409) =16,91043 p =,0002

Level of cognitive reflexivity	low	average	high
low		0,3254	0,0007
average	0,3254		0,0013
high	0,0007	0,0013	

Source: own study based on data collected in the author's study.

Statistically significant differences for the variable percentage score obtained in the test of economic knowledge were noted between groups (Table 3):

- high and low levels of cognitive reflexivity,
- high and average levels of cognitive reflexivity.

Table 4.
Descriptive statistics for the variable percentage score obtained in the test of economic knowledge by group level of cognitive reflexivity

Level of cognitive reflexivity	N	Median	Lower quarters	Upper quarters	Quartile. Range
low	35	53,33000	40,00000	66,67000	26,67000
average	313	53,33000	46,67000	73,33000	26,66000
high	61	73,33000	60,00000	80,00000	20,00000

Source: own study based on data collected in the author's study.

The median percentage score obtained on economic knowledge for those with a high level of cognitive reflexivity was 73.33%, while it was 53.33% for those with low and average levels of cognitive reflexivity (Table 4).

Table 5.
Normality tests of the distribution of the variable first quantitative forecast of the level of inflation by group by level of economic knowledge

Level of economic knowledge	Test	Value of statistics	Value p
low	Test Shapiro-Wilka	0,43	p < 0,0001
	Test Lillieforsa	0,39	p < ,01
average	Test Shapiro-Wilka	0,55	p < 0,0001
	Test Lillieforsa	0,32	p < ,01
high	Test Lillieforsa	0,64	p < 0,0001
	Test Lillieforsa	0,26	p < ,01

Source: own study based on data collected in the author's study.

For all groups by level of economic knowledge, both the Shapiro-Wilk test and the Lilliefors test indicate the rejection of the hypothesis of the normality of the distribution of the variable first quantitative forecast of the level of inflation at the significance level $\alpha = 0.05$ (Table 5).

Table 6.
Kruskal-Wallis rank ANOVA for the variable first quantitative forecast taking into account the level of economic knowledge H (2, N = 409) = 6,663278 p =,0357

Level of economic knowledge	N	Sum	Average value
low	39	8.000,50	205,14
average	246	53.191,00	216,22
high	124	22.653,50	182,69

Source: own study based on data collected in the author's study.

There were statistically significant differences in first inflation forecasting by group according to level of economic knowledge (Table 6).

Table 7.
The p-value for multiple comparisons (two-sided) for the variable first quantitative forecast by level of economic knowledge. Kruskal-Wallis test: H (2, N = 409) = 6,663278 p =,0357

Level of economic knowledge	low	average	high
Low		1,0000	0,9027
average	1,0000		0,0300
high	0,9027	0,0300	

Source: own study based on data collected in the author's study.

Statistically significant differences were obtained for groups with average and high levels of economic knowledge (Table 7).

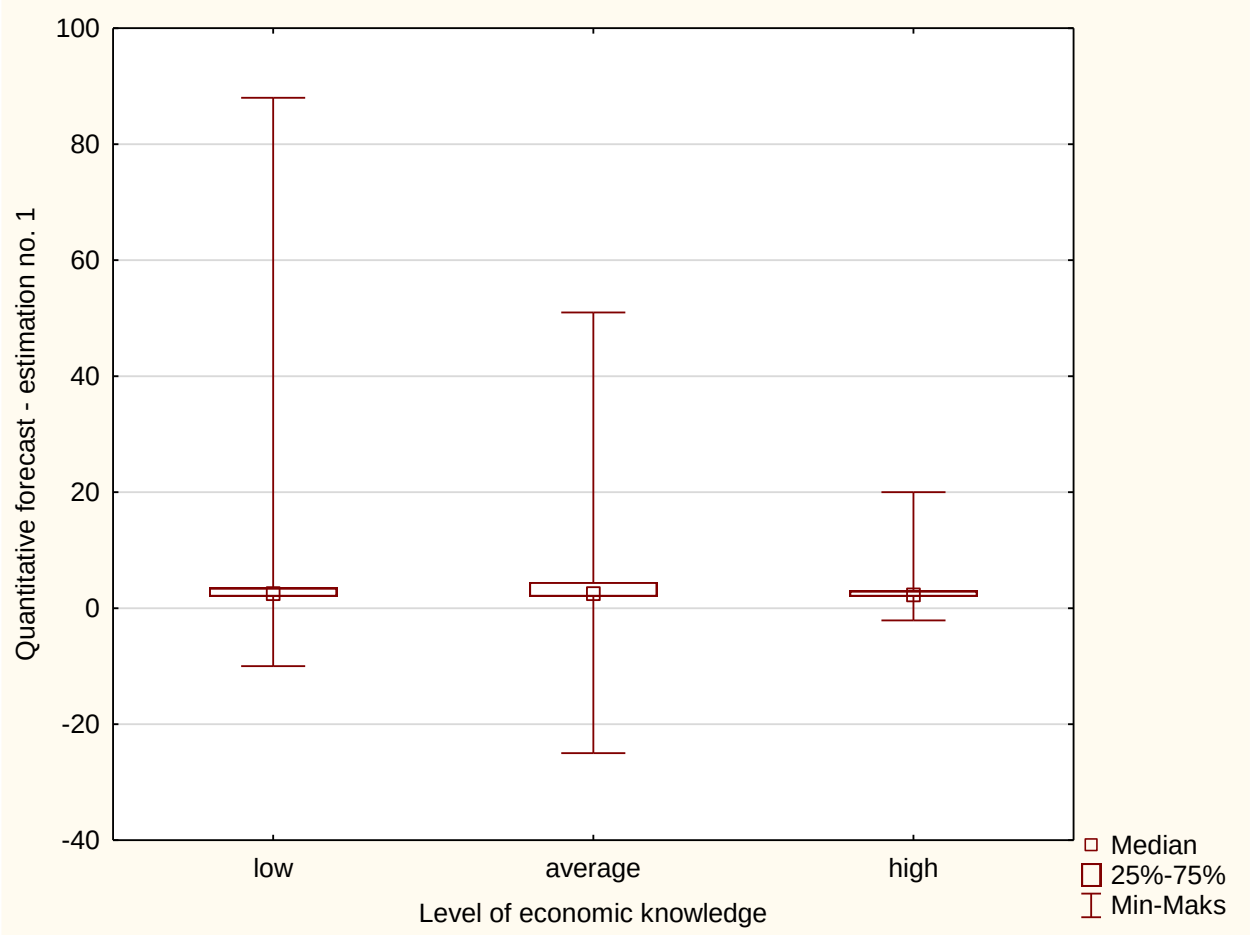

Figure 1. Distribution of results of the first quantitative inflation forecast by level of knowledge (N = 409).

Source: own study based on data collected in the author's study.

The medians of the first quantitative forecast in the group of people with an average and low level of knowledge obtained a value equal to 2.5 and in the group with a high level of knowledge 2.3. However, in the case of the quarterly deviation, the highest value is in the group of people with an average level of knowledge, i.e. 1.25, and the lowest in the group of people with a high level of knowledge, i.e. 0.5 (Figure 1).

Table 8.
Normality tests of the distribution of the variable second quantitative forecast of the level of inflation by group by level of economic knowledge

Level of economic knowledge	Test	Value of statistics	Value p
low	Test Shapiro-Wilka	0,50	p < 0,0001
	Test Lillieforsa	0,38	p < ,01
average	Test Shapiro-Wilka	0,50	p < 0,0001
	Test Lillieforsa	0,32	p < ,01
high	Test Lillieforsa	0,57	p < 0,0001
	Test Lillieforsa	0,32	p < ,01

Source: own study based on data collected in the author's study.

For all groups by level of economic knowledge, both the Shapiro-Wilk test and the Lilliefors test indicate the rejection of the hypothesis of the normality of the distribution of the variable second quantitative forecast of the level of inflation at the significance level α = 0.05 (Table 8).

Table 9.
Kruskal-Wallis rank ANOVA for the second quantitative forecast variable taking into account the level of economic knowledge H (2, N = 409) =,9637121 p =,6176

Level of economic knowledge	N	Sum	Average value
low	39	8.518,00	218,41
average	246	50.766,00	206,37
high	124	24.561,00	198,07

Source: own study based on data collected in the author's study.

There were no statistically significant differences in second inflation forecasting by group according to level of economic knowledge (Table 9).

Table 10.
Wilcoxon paired rank order test for the variables first and second quantitative forecasts with consideration of the level of economic knowledge

Level of economic knowledge	N	T	Z	p
low	27	183,5000	0,132137	0,894876
average	169	5443,000	2,730627	0,006322
high	84	1654,000	0,584231	0,559065

Source: own study based on data collected in the author's study

When comparing the first and second estimates of inflation, statistically significant differences were found for the group of respondents with an average level of economic knowledge. In the group of respondents with low and high levels of economic knowledge, no statistically significant differences were found (Table 10).

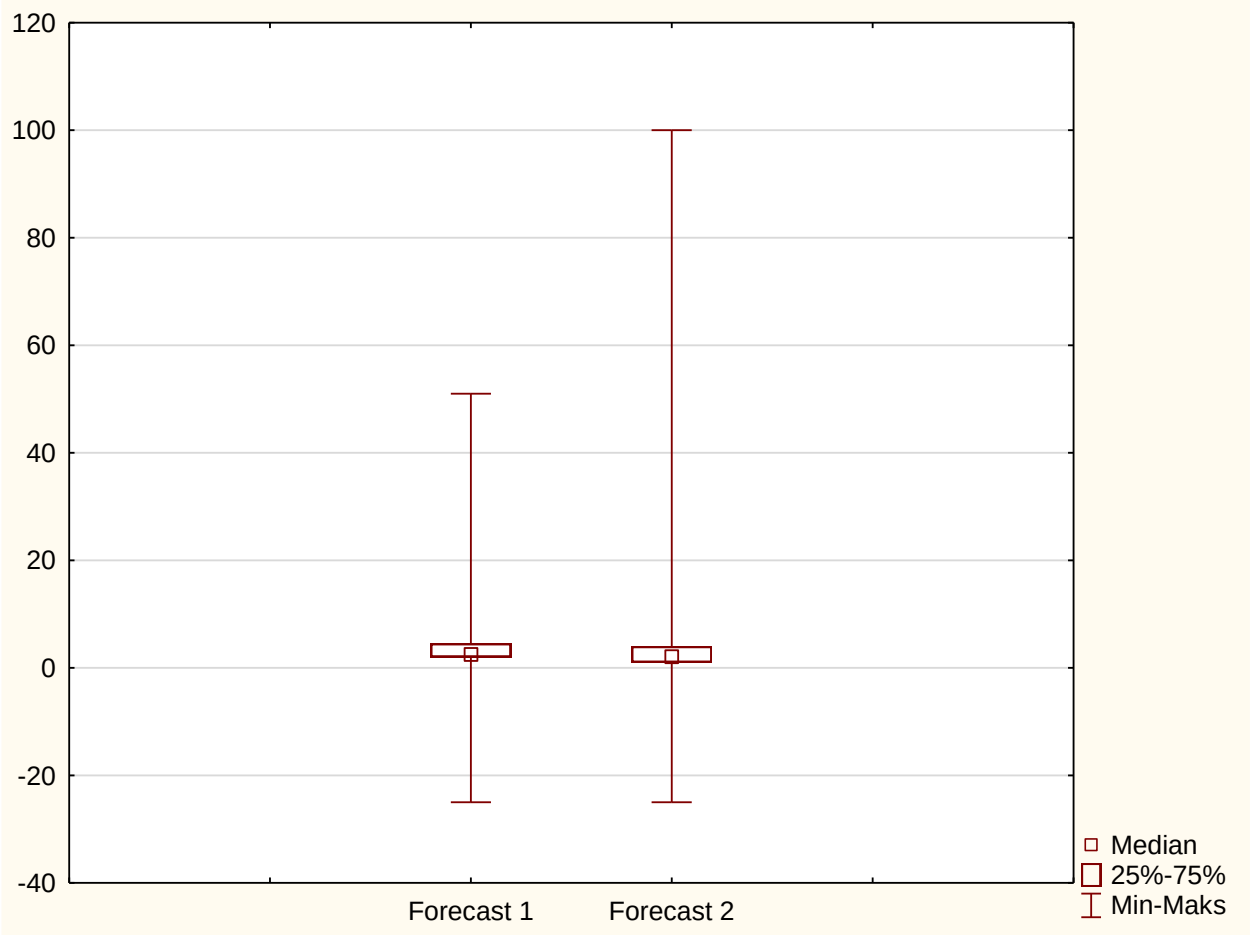

Figure 2. Distribution of results for the first and second quantitative inflation forecasts among people with an average level of economic knowledge.

Source: own study based on data collected in the author's study.

Analyzing the statistics for the first and second inflation estimates, taking into account the levels of economic knowledge of the respondents, the largest reduction in the median was obtained in the group of respondents with an average level of knowledge. For the first estimation it was 2.5 and for the second 2.10 (Fig. 2).

Table 11.
Wilcoxon paired rank-order test for the variables first and second quantitative forecasting with cognitive reflexivity level

Cognitive reflexivity level	N	T	Z	p
low	23	130,5000	0,228112	0,819559
average	214	9143,000	2,601782	0,009275
high	43	435,0000	0,458848	0,646343

Source: own study based on data collected in the author's study.

Further, comparing the first and second inflation estimates, statistically significant differences were found for the group of respondents with an average level of cognitive reflexivity. In the group of subjects with low and high levels of cognitive reflexivity, no statistically significant differences were found (Table 11).

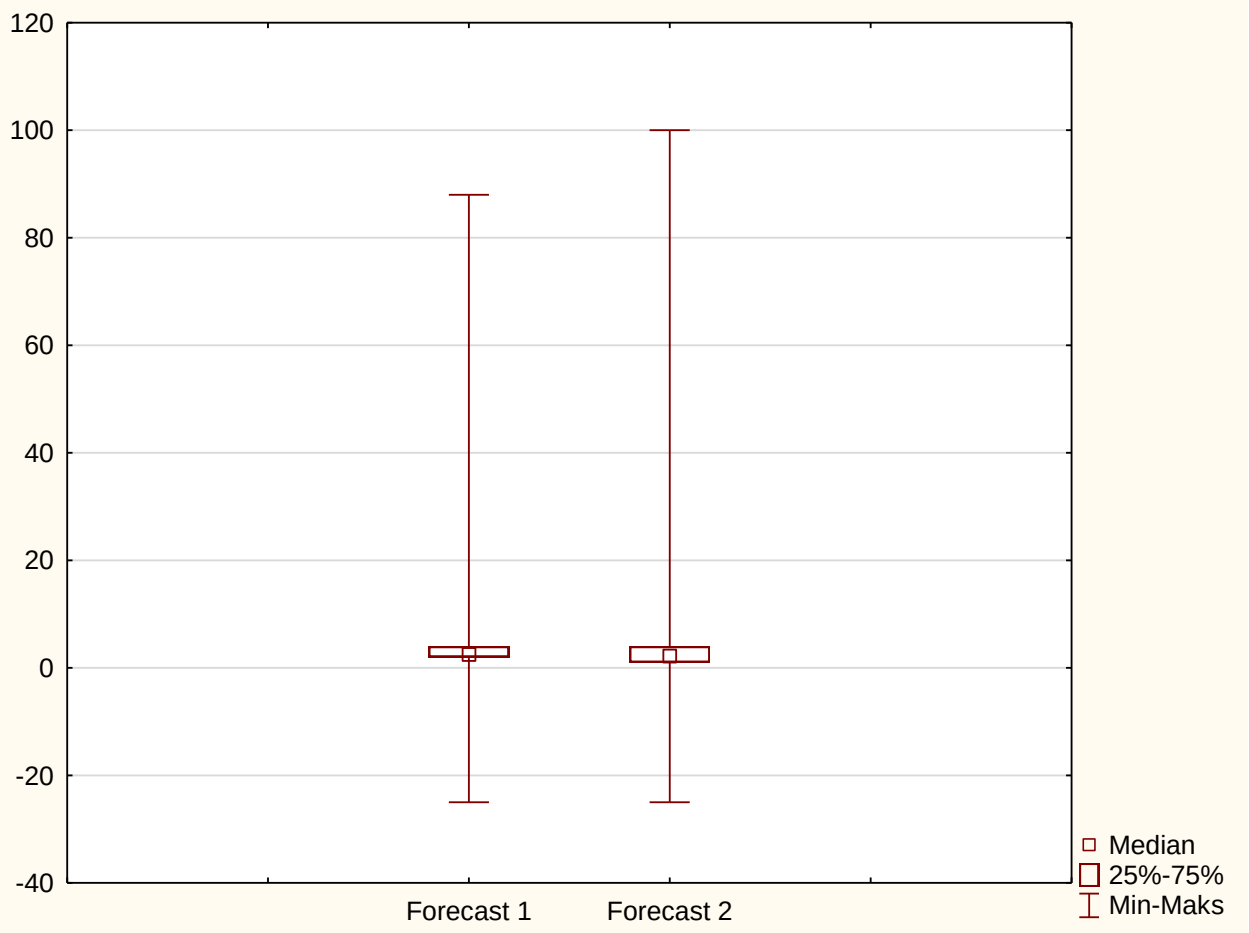

Figure 3. Distribution of scores for the first and second quantitative inflation forecasts in a group of people with average levels of cognitive reflexivity.

Source: own study based on data collected in the author's study.

The median for the group of respondents with an average level of cognitive reflexivity at the first estimate was 2.5, while at the second estimate of inflation – 2.20 (Fig. 3).

5. Discussion

The findings revealed that the group characterized by high cognitive reflectiveness made errors influenced by the sentiment contained in the expert commentary describing the economic situation, as well as by the authority of the person presenting it. Overall, statistical analysis indicated significant differences in the percentage scores obtained in the economic knowledge test between groups with high and average levels of cognitive reflectiveness, as well as between high and low levels. Furthermore, individuals with high cognitive reflectiveness achieved higher percentage scores in the economic knowledge test than those with average and low levels, suggesting a correlation between high knowledge levels and high cognitive reflectiveness.

Statistically significant differences were also found in the first inflation forecast, divided by economic knowledge levels among groups with average and high economic knowledge. However, no statistically significant differences were observed in the second inflation forecast, conducted after reading the expert comments, across groups according to their economic knowledge levels. This may indicate that regardless of their economic knowledge level, participants were estimating the inflation rate in a biased manner. Statistically significant differences were noted in both the first and second inflation forecasts within the group of individuals with an average level of economic knowledge. No differences were found in the groups with low and high economic knowledge, possibly due to small group sizes. Significant differences were also recorded in the inflation forecasts among those with an average level of cognitive reflectiveness, while no differences were noted in the low and high cognitive reflectiveness groups, again likely due to small group sizes.

The research on economic knowledge and inflation forecasting identified significant differences in results between groups with different levels of cognitive reflectiveness. Individuals with high reflectiveness scored better in the economic knowledge test compared to those with average and low levels. These results could suggest that critical thinking skills and a reflective approach to economic issues influence the ability to process and analyze information, which in turn reduces the risk of cognitive errors in estimating inflation levels. However, the experiment showed that high cognitive reflectiveness does not guarantee accurate inflation estimation. In the context of inflation forecasting, significant differences were observed only in the first forecast when grouped by economic knowledge levels. The groups with average and high economic knowledge differed significantly in their predictions. Yet, in the case of the second forecast, conducted after the participants reviewed expert comments, no statistically significant differences were recorded between the groups. This indicates that, regardless of economic knowledge levels, study participants were susceptible to distortions in their assessments, likely stemming from the influence of external information, including expert comments.

This situation underscores the importance of cognitive reflectiveness as a tool for reducing the risk of bias in decision-making. Individuals with higher levels of reflectiveness may be better at critically evaluating external information sources, thus avoiding pitfalls associated with excessive commentary, ultimately leading to more rational inflation forecasts. It is possible that participants, regardless of their economic knowledge, were equally susceptible to the structural features of expert messaging. Strongly biased comments may have neutralized differences arising from knowledge levels, suggesting that even individuals with higher knowledge levels were not resistant to this influence. This could lead to homogenization of forecasts and highlights the potential role of psychological heuristic mechanisms that affect how external information is interpreted, regardless of the knowledge possessed.

Consequently, the study's results suggest that in situations of high market uncertainty, authoritative comments can significantly influence economic decisions, even among individuals more competent in economic matters. This influence confirms the need to pay attention to how forecasts and market analyses are communicated in the media to avoid excessive emotional or biased messaging that could distort inflation predictions, leading to reactions that are not aligned with the actual economic situation. Therefore, critical thinking becomes a crucial tool in counteracting irrationality and susceptibility to sentiment that influences economic decisions. Practicing critical thinking is essential, as cognitive reflectiveness based solely on knowledge is insufficient when human irrationality, emotional influences, and authority come into play.

The study had several limitations. The respondents were young people, specifically students, excluding finance majors. Future studies should include other age groups to verify the potential influence of experience on decisions made in estimating inflation. Additionally, comparisons based on the field of study or profession would be valuable.

The socio-economic situation caused by the COVID-19 pandemic may have significantly impacted the study's results. During that period in Poland, inflation was a major issue, leading to extensive media discussion. This topic was widely covered in the media, with various perspectives on the causes and effects of inflation being debated. Although the authors of the experiment introduced an element aimed at neutralization, this may have affected participants to varying degrees.

6. Conclusion

This article summarizes the results of a study examining the impact of sentiment and authority on inflation forecasting and economic decision-making. The findings indicate that even high levels of cognitive reflectiveness and economic knowledge do not guarantee immunity to the influence of expert opinions. In the initial stages of forecasting, differences were observed among participants with varying levels of economic knowledge; however, after exposure to authoritative comments, these differences diminished. Such results suggest that individuals with higher knowledge, despite advanced cognitive reflectiveness, can still be susceptible to the structural features of expert messaging.

The vulnerability to authoritative messages, regardless of knowledge level, highlights the role of heuristic mechanisms that may neutralize the effects of cognitive reflectiveness and knowledge in decision-making processes. These findings emphasize the limitations of cognitive reflectiveness as a tool for minimizing the influence of emotions and authority, leading to a consideration of the role of critical thinking as a potential remedy.

Critical thinking, defined as the ability to independently analyze and evaluate information, may serve as an effective support in reducing irrational cognitive distortions, which tend to arise frequently in conditions of economic uncertainty. Therefore, developing critical thinking is proposed as an important element of economic education, complementing cognitive reflectiveness and enhancing resilience against emotional and authoritative influences. The study confirms that critical analysis of expert messages can support rationality in financial decisions, which is especially significant in rapidly changing economic conditions.

It is, however, advisable to continue research that more thoroughly analyzes the mechanisms by which emotions and authority influence decision-making processes and contributes to the development of effective training methods in critical thinking and cognitive reflectiveness.

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References

1 Ariely, D. (2008). *Predictably Irrational: The Hidden Forces That Shape Our Decisions.* New York: HarperCollins.
2 Ariely, D. (2012). *Predictably Irrational: The Hidden Forces That Shape Our Decisions.* New York: HarperCollins.
3 Czerniawska, E. (2020). *Styl poznawczy w procesie edukacyjnym.* Warszawa: PWN.
4 Gigerenzer, G. (2007). *Gut Feelings: The Intelligence of the Unconscious*. Penguin Books.
5 Hałas, E. (2018). *Refleksyjność i jej znaczenie w analizie społecznej*. Kraków: Universitas.
6 Jankowska, A. (2019). *Ambiwalencje refleksyjności w edukacji.* Wrocław: Wydawnictwo Dolnośląskie.
7 Juanchich, M., Sirota, M., Bonnefon, J.-F. (2019). *Cognitive biases and decision-making in finance.* Cambridge: Cambridge University Press.
8 Kahneman, D. (2011). *Thinking, fast and slow.* New York: Farrar, Straus and Giroux.
9 Langer, E. (2016). *Mindfulness i refleksyjność: Nowe spojrzenie na rozwój kompetencji.* Nowy Jork: HarperCollins.
10 Lewandowsky, S., Cook, J. (2020). *The Conspiracy Theory Handbook.* Center for Climate Change Communication.

11 Matczak, A. (2011). *Style poznawcze*. Warszawa: PWN.
12 Matczak, A. (2020). *Refleksyjność w życiu dorosłym: Procesy introspekcyjne i ich znaczenie dla rozwoju osobistego.* Warszawa: PWN.
13 Matczak, A., Jaworowska, A. (2020). *Kwestionariusz Refleksyjności.* Warszawa: Pracowania Testów Psychologicznych Polskiego Towarzystwa Psychologicznego.