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# Mind-Brain-Behavior (MBB), in Economic Inflation

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**Abstract**

Everyone has beliefs about how the world works and how they behave depends heavily on their beliefs about how the real world works. Cognitive psychologists believe that the mind actively represents the outside world and the way people interact with and behave with the environment is the result of these changes and manipulations that occur in mental representations. Scientists also believe that in the face of the phenomena of the outside world, there is an interactive relationship between the mind and behavior with the brain; So that the occurrence of a phenomenon, along with the entry of information into the brain, and the analysis and processing of that information by the mind, results in conscious or unconscious behavior in the human. In other words, there is an interactive relationship between brain, mind, and behavior (MBB). Therefore, the present study attempts to examine MBB in the case of human exposure to economic inflation. This is an applied and developmental research with the type of library study and uses the new findings of cognitive science to explain this relationship. The findings indicate that following inflationary shocks and the transfer information of monetary loss to the mind, the activity of the striatum, the ACC, the MPFC, and the amygdala increase and information about emotional actions that are contrary to mental habits transmit to the highest cognitive unit of the brain (PFC). Consequently, it leads to cognitive and behavioral changes in humans. Thus, in the face of economic inflation, the MBB relationship is also confirmed.

**Keywords**: Human Brain, Mind, Behavior, Prefrontal Cortex, Economic Inflation.

## 1. Introduction

Everyone has beliefs about how the world works. Beliefs stem directly from human consciousness in an

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uncertain world. People know that they are alive. Even if they are not aware of future events, they know that what they are doing now can affect what is happening later. Social scientists have a limited understanding of what is going on in people's minds, that is, what motivates, pleases, anger, and scares them. When economists claim that humans are rational and behave in a manner consistent with their understanding of personal interests, they arouse the ire of other disciplines of the social sciences. Because benefits arise from the interplay of preferences, alternatives, and causal beliefs, and what is perceived as the best interests of individuals is a complex mixture of their preferences about different outcomes, their alternatives, and their beliefs about it, and that how their actions and behaviors will affect the world around them. Individual behavior is intentional; they strive to achieve the best results due to resource constraints and choices. But the way they behave depends heavily on their beliefs about how the real world works. Because the world is more complex than one can fully grasp. No belief system can provide a very accurate picture of the world around [1]. Accordingly, cognitive scientists regard the mind as an information processor. A processor that represents and modifies information received from around the world [2], [3], [4], [5], and [6]. Cognitive psychologists believe that the mind actively represents the outside world, and how individuals interact with the environment is the result of these changes and manipulations that occur in mental representations [6]. Scientists also believe that in the face of the phenomena of the outside world, there is an interactive relationship between the mind and behavior with the brain; So that the occurrence of a phenomenon, along with the entry of information into the brain, and the analysis and processing of that information by the mind, results in conscious or unconscious behavior in the human. In the meantime, cognitive psychology scientists have come to the activity of the Prefrontal cortex in studying how the brain relates to mind and behavior, which is central to the human mental processes [7]. The findings indicate that the prefrontal cortex is directly related to each distinct functional unit of the brain. For example, this cortex is associated with the highest levels of perceptual integration and is well connected to structures related to memory, emotions and uncertainties, components of social cognition, and control of essential functions of the body's vital balance. These unique connections make the frontal parts exceptionally suited for coordinating and integrating the activity of other brain structures [8]. Therefore, it is expected that different phenomena can have wide-ranging effects on brain function and consequently, the MBB relationship. Hence, by knowing the relation of the prefrontal cortex to the different cognitive levels of the brain, after examining more about the prefrontal cortex, the relationship between the brain and the mind and human behavior in the face of economic inflation is studied. This is an applied and developmental research with the type of library study and seeks to use the new findings of cognitive science to investigate the human MBB in the face of phenomena such as economic inflation and exposure to money changes.

## 2. PFC and MBB

The Frontal Lobe can be summarized in two areas: The prefrontal cortex and the motor cortex that have no role in cognition. It is based on that some scientists believe that the PFC contains a map of the entire cerebral cortex; the claim first that made by Hughlings Jackson (1884) at the end of the nineteenth century. In other words, this piece as a home for goals, foresight, and planning perhaps be more humane than any other component of the human brain [8]. Among the frontal parts, the prefrontal cortex (PFC) -

which is the front part of the forehead - is located in front of the motor and pre-motor areas. The pre-frontal cortex, as defined by the map of Bradman areas (Figures 1 and 2), includes areas 8, 9, 10, 11, 12, 13, 14, 24, 25, 32, 44, 45, 46 and 47 [9], [7], and [10].

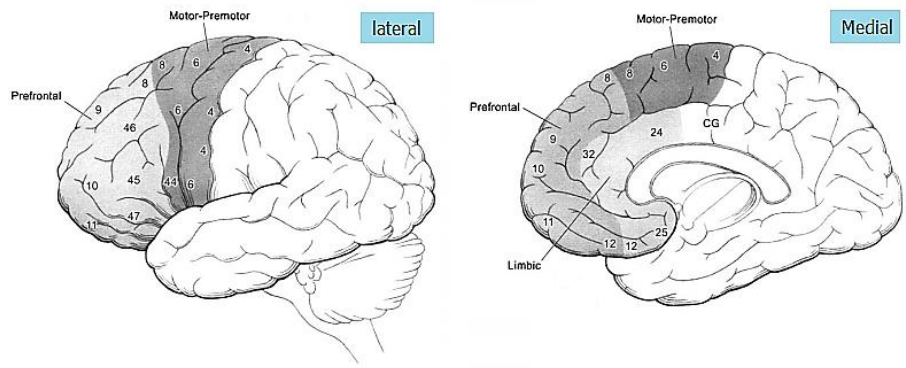


Figure 1: Map of the Bradman frontal lobe areas in the cerebral cortex [11].

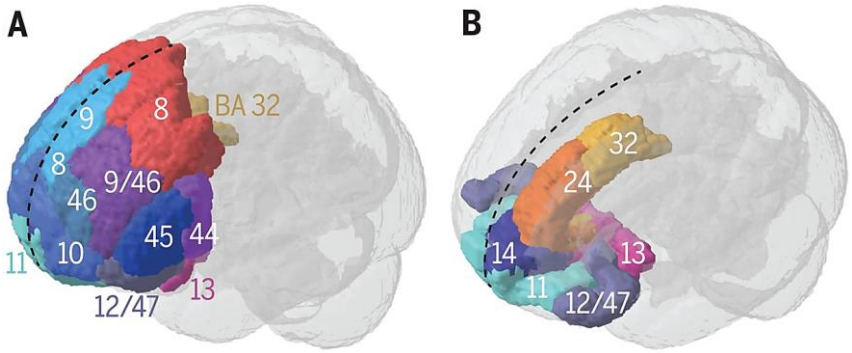


Figure 2: Three-dimensional map of the Bradman areas of the prefrontal cortex [7].

According to Figure 3, the PFC itself is divided into several sections: Orbitofrontal Cortex (OFC); Ventromedial PFC (VMPFC); Dorsomedial Prefrontal Cortex (DMPFC); Dorsolateral Prefrontal Cortex (DLPFC); Ventrolateral Cortex (VLPFC); and Anterior Cingulate Cortex (ACC); [12] and [7].

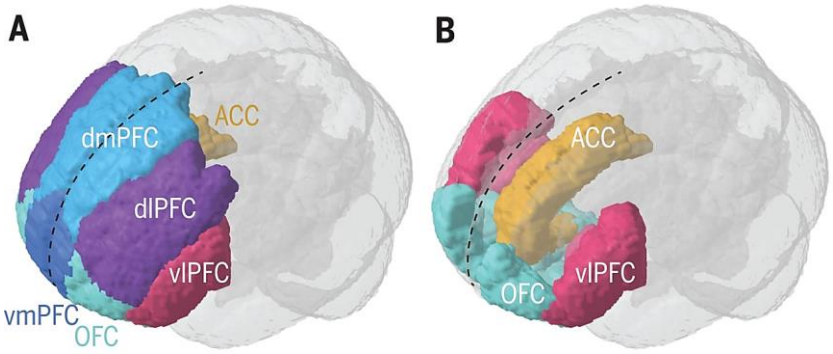


Figure 3: Prefrontal cortex parts in the cerebral cortex [7].

It is generally accepted today that this cortex is associated with multiple cognitive functions [13]. The word cognition is associated with thinking as well as with learning, and that's what makes us a human being. Gaining experience and useful knowledge to guide behavior in responding to environmental and intrinsic phenomena is an essential ability for survival and life satisfaction. Cognition refers to the ability to process information, to recognize, to apply knowledge, and to modify and modify priorities. Cognition is associated with reasoning, learning, understanding, and getting meaningful results in problem-solving and is primarily in the area of action of the prefrontal cortex [7]. According to this, one of the central functions of PFC is to plan for move or action (mental or physical) and then to pursue it.

Subjective planning of motor action (from initial abstract representation to actual motion codes) is performed on the frontal parts. In particular, it is thought that the human prefrontal cortex regulates planned behavior related to sensitivity to reward and punishment. The new view on the neural organism of these processes is that more abstract representation or planning activities are performed in the anterior sections of the PFC and as activities become less abstract and closer to movement boundaries, they move to the posterior sections (and thus, closer to the motor areas). Concerning decision-making, evidence also suggests the role of the OPFC, especially when emotional factors are involved in the decision-making process. Neural imaging studies have provided new information on the many different operations performed or directed by the PFC. From focusing on an environmental stimulus to monitoring how it changes, from keeping something in mind to making complex decisions, it is all done by the PFC [8]. As noted, the prefrontal cortex is directly related to each functional unit and to the highest levels of distinct perceptual integration of the brain. It is also associated with the premotor cortex, the basal ganglia, and the cerebellum, all involved in aspects of motor control and movements. PFC is also associated with the dorsomedial thalamic nucleus, which is considered the highest level of integration within the thalamus, and with the hippocampi and medial temporal structures that are critical for memory, as well as with the cingulate cortex, which is thought to be critical for dealing with excitement and uncertainty. In addition, the PFC is associated with the amygdala, which regulates most emotions and

social cognition, and with the hypothalamus, which is responsible for controlling the homeostatic functions of the body. Finally, the prefrontal cortex is also well connected with brainstem nuclei involved in wakefulness, arousal, and alerting, sleep regulation, and REM[1] dreams. These unique connections make the frontal parts exceptionally be well suited to coordinate and integrate with the activity of other brain structures (Figure 4)[2] [ibid].

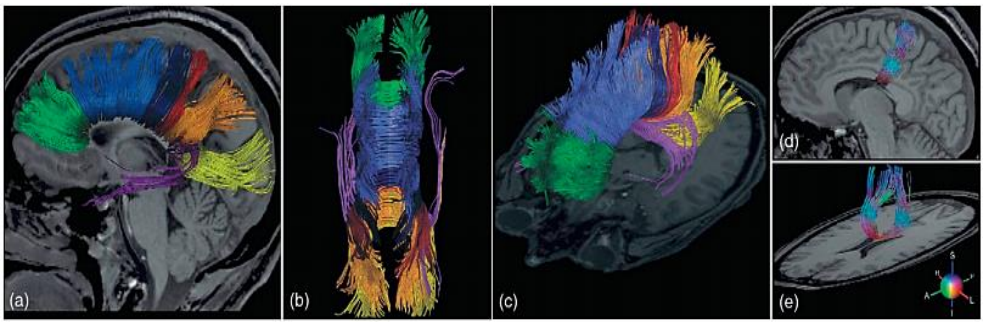


Figure 4: Brain nerve fibers in the form of medial, horizontal, and coronal incisions [8]. a) Midline view of the brain: A bunch of fibers that are drawn in green to the prefrontal cortex; b) Horizontal cutting of the same batch; c) Coronal incision, which shows the same green and blue strands in front of the brain; d) Parabolic view; and (e) Shows the oblique view of a bunch of the corpus callosum that radiates to the

It should be noted, however, that the basal nuclei are located between the cortex and brainstem, which allows these nuclei, and in particular the striatum, to access the cognitive areas of the brain involved in decision making (including the prefrontal cortex) and to access the brain involved in motor control. This connection is maintained by bridges protruding from the basal nucleus toward the thalamus and frontal cortex on the one hand and to the brainstem nucleus on the other (Figure 5).

As the striatum receives information through dopamine-mediated neurons of the midbrain of the brainstem, so by combining the reward (dopamine) with any particular context, the habit is created by the striatum. Habits are formed by repeating a particular neural pathway leading to the reward. Finally, less action potential is needed for future contradictions. This explains why it is so difficult to change behavior when human habits become firmly established [12]. As can be seen, there is an interactive relationship between the brain and the mind; So, Information about the world is received through the mind and through the striatum and bridges protruding from the basal nuclei, transferred to different PFC units of the brain and decision-making and behavior occur in humans. Now, if the received information is information about the phenomenon of economic inflation, as a fatal economic illness [16], it is expected that the relationship between the information received by the mind, its transmission to the brain, and an

[1] There are two main types of sleep: Non-Rapid Eye Movement (NREM), characterized by high amplitude and low-frequency EEG and decreased muscle tone and slow eye movements; and Rapid Eye Movement (REM), which is associated with complete loss of muscle tone and rapid movements of the eyeball. Accordingly, awakening is a process defined by Low-Voltage Fast EEG Activity (LVFA) and high muscle tone [14].

[2] Those interested in viewing visual neural connections can visit: https://www.youtube.com/watch?v=j_fdptHmpio.

outbreak of behavior will be noticed.

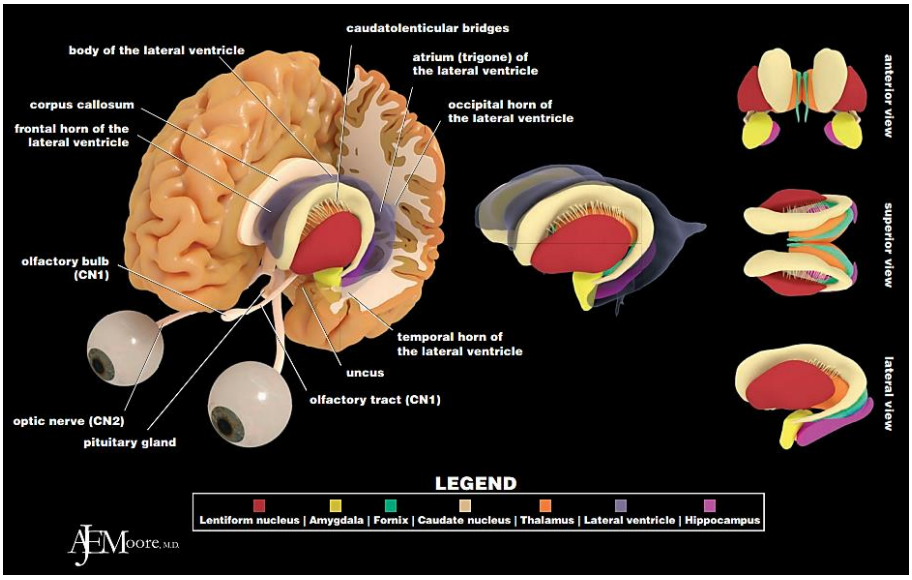


Figure 5: Basal Ganglia of the brain [15]. Basal Ganglia, consisting of five nuclei: Putamen; Caudate; Substantia Nigra; Subthalamic; Globus Pallidus (Also called pallidum). Also called the Putamen, Caudate, and Globus Pallidus nuclei together, the striatum (Corpus striatum).

## 3. Economic Inflation and MBB

In examining the reaction of the human brain to the concept of money and phenomena related to money (E.g., monetary rewards and losses) there have been studies, that here are some examples of these studies: In studies [18] to investigate the effect of the concept of money on the human brain, eight studies have been identified in which the concept of money has been associated with changes in the PFC. Also in seven studies, the concept of money activated the cingulate cortex and nucleus accumbens; Six studies have been identified to activate the insula, striatum, and thalamus; The activity of the amygdala, dorsal caudate, and frontal cortex has been observed in five studies; In four studies, the orbitofrontal cortex was affected by money; the midbrain and putamen in three studies; the frontal gyrus, globus pallidus, parietal lobule and precuneus in two studies; and the cerebellar vermis, cerebellum, frontal pole, fusiform gyrus, hippocampus, hypothalamus, operculum, medial temporal lobe, motor cortex, orbital gyrus, and the precentral gyrus have been associated with the concept of money in one study; so that each of these areas is associated with the PFC sector. Studies examining the effects of monetary reward have observed [19] stimulation of activity in the OFC and frontal lobe areas, and [20] activation of the OFC and VMPFC regions (including the mid-OFC) and the ACC. [21] have also reported large sections of the frontal and middle regions of the limbic system active. Also [22] have studied the prediction and acquisition of monetary loss in the brain and have found that the VLPFC, MPFC, ACC, bilateral striatum (putamen), and amygdala are activated.

As observed in prefrontal cortex studies, money related concepts and related phenomena activate different PFC units and the brain striatum. The striatum has sent this information to various PFC units and it leads to money related cognitive behaviors for individuals; so that by repeating this information, cognitive behavior in the individual becomes a mental habit. Now if this information turns into information about the phenomenon of economic inflation and the shock of losing money, loss related information that is contrary to the usual mental habits of money, through striatum and protruding bridges from the basal nuclei transferred to units such as the amygdala and ACC. That they are, respectively, a unit for emotion regulation and social cognition and a unit for error detection and response to inconsistent situations. Through the link between the PFC with these segments and other cognitive units of the brain, the occurrence of inflationary shocks results in cognitive changes and changes in mental models in humans. This change in mental models, in turn, leads to a change in human preferences and interactions. Now, if these inflationary shocks are persistent, they will lead to changes in the cognitive characteristics and cultural behaviors of the community and alter the decision-making processes and people's choices. So, such a result is obtained that Money and its related concepts, such as losses and economic inflation, affect the mind as well as the prefrontal cortex and related areas and by creating the inevitable effects on the human cognitive system, it results in certain changes in human behavior and, more generally, MBB.

## 4. Summary and Conclusion

The purpose of this study is to investigate the relationship between brain, mind, and behavior in the face of economic inflation and money loss conditions. To this end, after more familiarity with PFC as the highest cognitive unit of the brain, this relationship was studied in a library manner. The findings suggest that sectors such as the limbic system, the amygdala, the striatum, the OFC, the VMPFC, as well as the PFC deal with the phenomenon of money and its related concepts. Thus, information related to economic inflation and monetary loss through the striatum and protruding bridges is transferred from basal nuclei to units such as the amygdala and ACC. That they are, respectively, a unit for emotion regulation and social cognition and a unit for error detection and response to inconsistent situations. Through the link between the PFC with these segments and other cognitive units of the brain, this information is transmitted to different PFC units and leads to the development of money related cognitive behaviors for individuals. Now, if one is facing ongoing monetary shocks, because of conflict with one's mental habits, it has led to changes in the cognitive characteristics and cultural behaviors of the community and changes his decision-making process and choices. Thus, it is concluded that money and its associated concepts, such as losses and economic inflation, affect the mind as well as the prefrontal cor-tex and its associated regions, and by creating unavoidable effects on the human cognitive system, lead to specific changes in human behaviors. Therefore it can be seen that in the face of inflationary conditions and monetary shocks MBB relationship is established.

**Conflict of interest**

No competing financial interests exist.

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