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The Neutrality of Money and Monetary Policy Effectiveness: Theoretical Debates and Empirical Evidence from Brazil

Ricardo da Costa Nunes
PPGCont/Universidade de Brasília, Brasil

Abstract:
Background*: This paper revisits the theoretical framework surrounding the neutrality of money and the efficiency of monetary policy, drawing on the views of economists such as Friedman and Keynes. It provides a historical and theoretical context to the debate, emphasizing the evolution of monetary theory from classical to modern perspectives. In addition to the theoretical analysis, the study includes an empirical case study, described in Section VI, using VAR-GARCH modeling to examine the effectiveness of monetary policy in Brazil. This study investigates the relationships between interest rates, money supply, and industrial production, offering evidence to support or counter the theories. The integration of this case study enriches the paper by providing insights into how monetary policy impacts economic variables, bridging the gap between theories and real-world applications. The findings highlight monetary policy's implications and limitations in achieving economic stability and growth, reinforcing the argument that while monetary policy can have short-term effects, its long-term efficacy is limited.*

Methodology*: This paper employs a historical and theoretical approach to examine the neutrality of money, focusing on the contributions of David Ricardo, Milton Friedman, and John Maynard Keynes. The methodology includes tracing the evolution of monetary theory from classical to modern perspectives, comparing and contrasting classical and Keynesian theories, and applying Karl Popper's scientific methodology to test propositions related to the neutrality of money. In addition to the theoretical analysis, an empirical case study is included, described in Section VI, using VAR-GARCH modeling to examine the effectiveness of monetary policy in Brazil. This study investigates the relationships between interest rates, money supply, and industrial production, providing empirical evidence to support or counter the theories. The paper also references empirical studies and examples to illustrate the implications of the theories discussed, grounding the analysis in observable economic phenomena. This approach aims to highlight the relevance of these theories for contemporary economic policy.*

Results*: The VAR-GARCH analysis shows that previous interest rates significantly impact current rates, indicating effects of monetary policy. However, its impact on the money supply is not significant. The relationship between money supply and interest rate is positive and significant. Granger causality tests reveal short-term causal links from interest rates to money supply and industrial production, but no long-term effects. Overall, monetary policy has short-term impacts but limited long-term efficacy.*

Conclusion: *The analysis highlights differences between neoclassical perspectives, such as those of Friedman, and Keynesian perspectives on the neutrality of money. While neoclassical economists like Friedman argue that money is neutral in the long term, affecting only price levels, Keynesian and Marxist views contend that money plays a role in influencing aggregate demand and investment. This study underscores the complexity of monetary theory and the implications for contemporary economic policy, suggesting that an understanding of the role of money is essential for developing effective monetary strategies. The empirical analysis shows that previous interest rates significantly impact current rates and that there is a significant relationship between money supply and interest rates. However, monetary policy has short-term impacts but limited long-term efficacy.*

Key Word*: Neutrality of Money; Say's Law; Monetary Policy; Empirical Analysis; Brazil Economic Policy.*

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I. Introduction

The evolution of money has been fundamental to the development of economies throughout history. From barter to digital currencies, the function and impact of money on economic exchanges have been the subject of theoretical debates. The controversies surrounding the neutrality/non-neutrality of money in the History of Economic Thought are central to understanding these debates. The theory of the neutrality of money,

which suggests that variations in the money supply affect only price levels and not real production in the long term, is a central idea in classical economics and has been discussed by economists such as Milton Friedman. While David Ricardo acknowledged that money could have short-term effects on real variables, he argued that in the long term these effects are neutralised, impacting only prices.

While Ricardo and other classical economists defend the long-term neutrality of money, John Maynard Keynes and his followers contest this view, arguing that money plays a role in economic decisions and can influence aggregate demand and investments. Recent studies have also explored the influence of money on financial stability and economic crises, highlighting the complexity of the topic and the need for deeper analysis. As Samuelson and Nordhaus humorously point out, *An economist is an expert who will know tomorrow why the things he predicted yesterday didn't happen today* (Samuelson & Nordhaus, 2010, p. 4). This highlights the inherent challenges and unpredictability in economic forecasting.

The theory of money neutrality and Say's Law represent classical economic perspectives with limitations and criticisms, mainly when applied to the short term. The Keynesian view offers a more dynamic understanding of the economy, recognising that aggregate demand can be insufficient and that government intervention may be necessary to stabilise the economy. Therefore, while the theory described is correct within classical economics, it is not universally accepted and is considered incomplete by many modern economic schools of thought.

This article aims to compare and contrast classical and modern theories on the neutrality of money, highlighting areas of convergence and divergence. The main research questions include: How do variations in the money supply affect the economy in the short and long term? To what extent can the theories of Friedman and Keynes be reconciled or contrasted? What are the implications of these theories for contemporary monetary policy? Additionally, the study includes an empirical case study, described in Section VI, using VAR-GARCH modelling to examine the effectiveness of monetary policy in Brazil. This empirical analysis investigates the relationships between interest rates, money supply, and industrial production, providing evidence to support or counter the theoretical claims.

Investigating these questions is important for understanding economic dynamics and guiding effective monetary policies. By providing an analysis of the theories of money neutrality and non-neutrality, along with an empirical examination of monetary policy effectiveness, this study contributes to an understanding of economic mechanisms and monetary policy strategies.

The article is organised as follows: the next section revisits the theory of money neutrality, focusing on the contributions of Ricardo and Friedman. The third section discusses the Keynesian view of money non-neutrality. The fourth section applies Karl Popper's scientific methodology to test the theoretical propositions. The sixth section presents an empirical case study on the effectiveness of monetary policy in Brazil using VAR-GARCH modelling. Finally, the conclusion summarises the main findings and discusses their implications for economic theory and monetary policy.

II. Historical Evolution of Money

The exchange of goods has evolved over the past two thousand years. The chosen currency for facilitating exchanges has evolved to overcome the limitations of previous exchanges at each point in history. The earliest exchanges were carried out using commodity money, such as salt, cattle, and shells, as noted by Jevons below.

Beginning with the primitive method of barter, a series of steps have been made towards a perfect and worldwide system of interchange of commodities, with the least possible use of the precious metals. (Jevons, 1876, p. 150).

People conducted barter exchanges with commodity money using surplus goods produced for personal consumption. The main good produced by the community was chosen as money. Thus, ornamental goods and consumer goods were used as commodity money. Polanyi (1944) also argued that the acceptance and use of certain commodities as money were based on utility and mutual trust among economic agents.

In economic literature, a barter economy (or exchange economy) is a system in which economic transactions are conducted directly by exchanging goods and services without using money. In this type of economy, economic agents rely on direct reciprocity to satisfy their needs and wants (Graeber, 2011). This system can be efficient in small communities with a limited number of goods and services. Still, it becomes complicated and less efficient as the complexity and diversity of the economy increase.

David Ricardo

This evolution of how a commodity is chosen as money is explained by Ludwig von Mises' Regression Theorem (1953). According to this theory, the acceptance of a currency as a medium of exchange derives from its previous acceptance as a consumable good. Initially, the currency must have had value as a useful good before being widely accepted as a medium of exchange.

A particularity of commodity money in this subsistence economy is that it is not desired for its own sake. In "The Wealth of Nations" (Smith, 1776), Smith discusses how certain goods were used as money not for their intrinsic value but for their utility and general acceptance. Producers aim only to increase production and bring it to market, while consumers seek to consume. Subsistence production involves creating food, clothing, and other goods necessary for the producer's survival and their family or community, with profit being a secondary consideration. In these societies, money is desired only as a medium of exchange, facilitating the circulation of goods and services without conferring prestige or encouraging accumulation.

As economies evolved and became more complex, the need for a universally accepted, easy-to-transport, standardised, and value-storing medium of exchange became evident. Concurrently, people selected a good as a medium of exchange for other goods and services. In this way, the use of money became established, allowing its monetary value to form. Therefore, the transition from a barter economy to a monetary economy was necessary to accommodate more complex economies. As Schumpeter observed:

One of the greatest steps in the history of economic civilisation was the introduction of money. Money, by its very nature, facilitates trade and the division of labour, leading to more complex economic systems. (Schumpeter, 1954, p. 79).

Say highlights the importance of money as a medium of exchange, emphasising that currency is not desired for its own sake. When selling a product, the producer seeks to quickly dispose of the money by acquiring other goods and services:

It is important to note that a finished product always creates, from that moment, a market for other products equivalent to its entire value. Indeed, when the final producer has finished their product, their greatest desire is to sell it so that the value of that product does not remain idle in their hands. On the other hand, they are equally eager to get rid of the money that their sale provides so that the value of the money does not remain idle. However, it is not possible to get rid of cash without seeking to purchase another product. Therefore, it is evident that the creation of a product opens, from that exact moment, a market for other products. (Say, 1983, p. 139).

Thus, Say's Law states that production (supply) also generates income by paying wages, profits, interest, land rents, and rentals. These incomes are responsible for purchasing the products (demand). Thus, supply creates its own demand. The neutrality of money ensures the fulfilment of Say's Law. Thus, money is merely a medium of exchange and neutral in terms of its ability to affect the product growth rate, which real variables would determine. This association ultimately validates Say's law (Herscovici, 2003, p.14). Such neutrality was recognised by Ricardo:

Productions are always bought by productions or by services; money is merely the medium by which exchange is effected (Ricardo, 1958, p. 198).

John Stuart Mill

Stuart Mill also acknowledged this neutrality:

According to this [mercantilist] idea, the whole world persists forever in the belief that more pieces of paper equate to more wealth, without people realising that with all their paper money, they cannot buy a greater quantity of any commodity than they could before. (Stuart Mill, 1929, p. 98).

Mill's view on the neutrality of money was rooted in classical economics. He argued that while money serves as a medium of exchange, its quantity does not directly affect the real variables of the economy, such as production and consumption, in the long run. In his seminal work, "Principles of Political Economy," Mill emphasized that the real value of money is determined by the demand and supply of goods and services, rather than the quantity of money in circulation. He believed that any increase in the money supply would lead to proportional increases in prices, leaving the real economy unaffected.

Moreover, Mill's stance on the neutrality of money reinforced the classical idea that the economy is self-regulating. He argued that market mechanisms, driven by supply and demand, would naturally adjust to changes in the money supply, ensuring that money remained neutral in the long term. This view is consistent with Say's Law, which posits that supply creates its own demand, further underpinning the belief that monetary interventions are unnecessary for achieving long-term economic stability.

By recognizing the neutrality of money, Mill contributed to the foundation of classical economic thought, which was later elaborated upon by economists like David Ricardo and further refined by Milton Friedman. His insights continue to influence contemporary debates on monetary policy and its role in economic management.

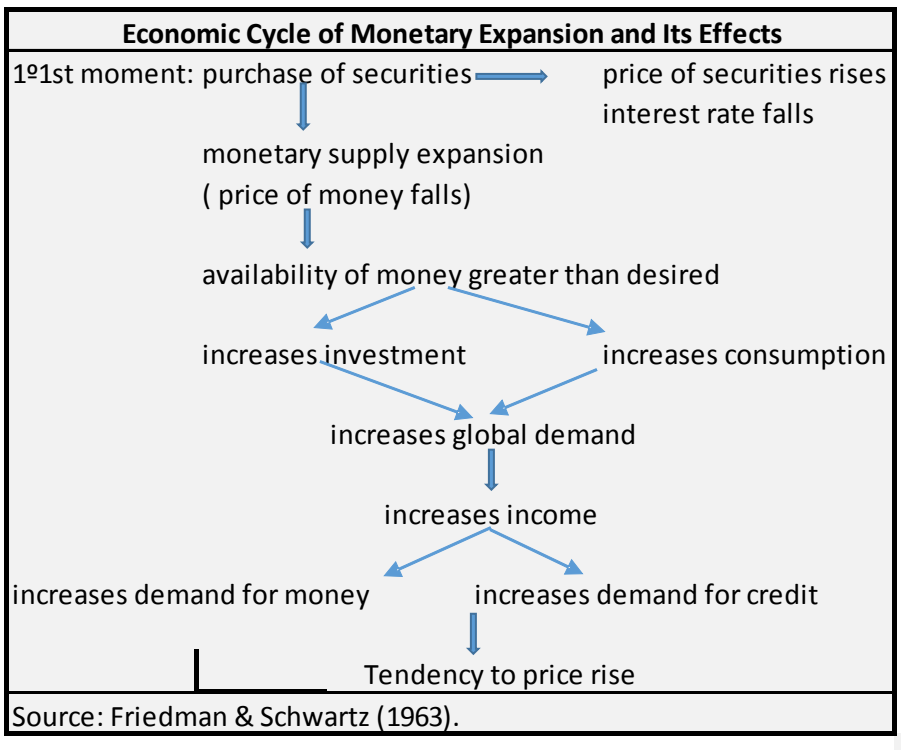
The neutrality of money, as a corollary of Say's Law, determined that purchasing power could not be created or destroyed by money through credit - or conversely, through debt - which would only allow for an intertemporal allocation in favour of present consumption at the expense of future consumption. Thus, all that money can do is enable intertemporal decisions on how to spend the purchasing power created in production.

A barter economy can be considered a simplified model for analysing the fundamental nature of economic exchange and the limitations that arise without a universal medium of exchange like money. Moreover, it allows for exploring how monetary and financial institutions evolved to overcome the inherent inefficiencies of barter, such as the double coincidence of wants problem. In this context, theories like David Ricardo emerged, postulating the neutrality of money – the idea that variations in the money supply have no long-term effects on the economy's real output but only on prices. These theories formed the foundation of classical economics.

In summary, the theory of monetary neutrality, a concept championed by economists such as David Ricardo and Stuart Mill, posits that while changes in the money supply may have real effects in the short term, in the long term, these changes impact only nominal variables, leaving the real fundamentals of the economy unchanged. Mill acknowledged this neutrality and noted that having more money does not make more goods available for purchase. Therefore, the neutrality of money corroborates Say's Law, suggesting that purchasing power cannot be created or destroyed by money, only allowing intertemporal decisions on spending the purchasing power generated in production.

III. The Ricardian Paradigm Revisited by Friedman

Although Friedman agrees with Ricardo's conclusions, he offers a new theoretical sophistication to underpin the analysis. This process has been described in heterodox literature as old ideas in new clothes, according to Nunes and Nunes (2018). In his works, the author recognises that variations in the money supply affect output but only temporarily. This perspective aligns with key insights from the IS/LM framework, illustrating how monetary policy can influence aggregate demand and economic activity in the short run, before prices and wages adjust to their new equilibrium levels. Galí (1992) demonstrated, in a study on the post-war US economy, the adequacy of the IS-LM model in capturing these short-term dynamics. In this scenario, monetary policy affects only nominal variables, with no lasting impact on the real variables of the economy. This finding corresponds with Taylor's (1979) result that there exists a short-run trade-off between inflation and output variability. The variations in the money supply would be proportional to those in prices without altering production, as outlined in the following scheme.



The passage above describes an expansionary monetary policy. Initially, the expansion controls interest rates, but new government interventions repeatedly become necessary after a certain period. In this theoretical framework, expansionary monetary policies increase the money supply to stimulate the economy by reducing interest rates. However, maintaining low interest rate levels requires successive government interventions.

In line with this analysis, we find that, for Friedman, money is a veil that covers a real exchange of goods in the long run. As Friedman and Schwartz (1963, p. 696) state:

In the long run, money is a veil. The real forces are the capacity of the people, their industry and ingenuity, the resources they command, their mode of economic and political organisation, and the like. (1963, p. 696).

In fact, authors like von Hayek (1973), who accepted the hypotheses of the natural rate of unemployment and the neutrality of money, arrived at the opposite conclusion to those who advocate central bank independence: the free market is not compatible with the power of the monetary authority, which is greater the more independent it is. This is because monetary policy would be dangerously potent in the short term. It should be noted that for von Hayek (1973), money is not properly neutral, but should be neutralized to avoid credit inflation, booms, and consequently collapse.

Similarly, Friedman accepts Say's Law only in the long run and argues that the apparent effectiveness of monetary policy is a fallacy. In contrast, Kaldor (1964) and Minsky, working within a different paradigm, argued that the central bank does not have absolute control over interest rates, as these are influenced by a range of economic and financial factors, thereby limiting the effectiveness of monetary policy. According to Friedman, monetary policies may initially boost output; however, GDP returns to its potential level with higher inflation and interest rates, highlighting the complete ineffectiveness of monetary policy in the long term, as described in the scheme above.

The increase in the money supply raised demand without an expansion of supply because there was no hoarding. Hoarding does not occur when all saved income is lent out, ensuring that money circulates efficiently within the economy. Initially, the monetary policy had stimulated GDP growth; however, the rise in prices and interest rates eventually returns GDP to its original level. The increased prices elevate the nominal interest rate (the difference between the nominal interest rate and inflation). This efficient circulation of money means that increased demand, driven by the expanded money supply, does not lead to increases in output. By influencing these rates, monetary policy impacts borrowing and spending behaviours, which can eventually stabilize the economy but often with complex time lags and difficulties in assessing immediate effectiveness.

By disregarding hoarding, the demand for money is viewed primarily as transactional and thus always stable or predictable, depending on income which, in these approaches, tends to be stable. It is this stability of demand that facilitates the control of the money supply by the Central Bank. In the new-classical version of real business cycles, although bank money is seen as passively created to meet demand, the reason for this is also transactional. The proposition of King and Plosser (1994) reinforces this understanding by concluding that the creation of bank money is associated with transactional demand. Thus, the creation of bank money is related to transactional demand and automatically adjusts to accommodate the needs of the economy throughout economic cycles. As the demand for transaction money depends on income, which in these models tends to stabilise after Pareto-efficient cycles, the demand for money is stable, and the money created tends to accommodate demand and cycles.

This transactional view of money demand aligns with the broader understanding that the Central Bank's money supply adjustments are a response to these stable demands rather than a proactive measure to directly influence economic activity. By aligning the supply of money with its transactional demand, the Central Bank ensures that the money supply is consistent with overall economic stability and growth.

According to Friedman, money is a temporary storehouse of purchasing power, and the total money supply would be the sum of demand, time deposits in banks, and currency held by the general public. Regarding this definition, Kaldor (1982, p.13) says: In his critique, Kaldor notes that: *we may agree with this definition, but in either case, all we have is a number, a sum in currency, without knowing what money is.*

Money does not influence economic variables. The natural rate, a real phenomenon, replaces the monetary interest rate. Money does not have an active role in the long term because the essence of the economy is consumption, rendering hoarding senseless. An individual's decision to use money as a store of value finds a substitute in real assets. Moreover, an increase in the demand for money results in a higher cost of holding money, making it more attractive to substitute money with other assets to preserve wealth, increasing the production of reproducible assets. This fact, combined with Ricardo's inherited hypothesis that individuals seek consumption, would lead to the recovery of Ricardo's proposition that savings will be inexorably converted into investment. In this way, money would have a role in the short term, and consequently, Say's law would be reinstated.

Thus, in the long term, Friedman presents a dichotomy between the real and the monetary, suggesting that while monetary factors can influence economic output and employment in the short term, their effects are neutralised in the long term, impacting only price levels and not real variables such as production and employment. Money affects production in the short term, but not in the long term. The dichotomy between the real theory of allocation and distribution and the monetary theory is the same within modernism as in the old quantitative theory.

According to Friedman, the demand for monetary resources and the velocity of money are stable. At the same time, Keynes believes that the demand for hoarding is highly unstable. Another difference is the role of

interest rates as a determinant of investment; for Keynes, the decision to invest is so complex that the interest rate is only one of the determinants.

Therefore, Friedman's result, which is analogous to that of classical economists, reflects the view that money is neutral in the long term. This perspective directly contrasts with the Keynesian and Marxist view that money is not neutral and can significantly impact the economy. The discussion about the invisible hand of classical economists and the self-adjustment of the economy is fundamental to understanding the different perspectives on money neutrality and its relevance in contemporary economic theories.

In sum, although Friedman and Ricardo reached an understanding of Say's Law, it was Friedman who offered cogent and coherent reasoning for its principles. Friedman acknowledged Say's Law in the long term, contending that the perceived efficacy of monetary policy is misleading. The author emphasised that while changes in the money supply might initially increase output, the GDP eventually reverts to its potential level, along with higher inflation and interest rates.

Over time, the constraints associated with commodity money, such as transportation challenges and a lack of uniformity, led to the need for more efficient forms of currency. As a practical solution, societies began to standardise the value of money by initially using precious metals like gold and silver, which were then shaped into coins of consistent size and weight (Friedman, 1991).

Commodity money was replaced by metallic money due to its divisibility and ease of transport. Consequently, the evolution towards more sophisticated forms of currency accompanied the shift from a subsistence economy to a market economy. Metallic money, in turn, was replaced by gold-backed paper money to facilitate payments in different locations. Gold-backed currency was eliminated in the 1970s, completing the transition to modern monetary systems.

However, currencies with characteristics similar to modern ones already existed in ancient cultures, such as the rai stones on the island of Yap. The rai stones, used as currency in Yap, did not necessarily require physical movement to transfer ownership. In many cases, possession of the stones was transferred through verbal or ceremonial agreement while the stone remained in its original location. This monetary system illustrates how different cultures developed unique systems to meet their economic and social needs (Friedman, 1991).

The use of metallic money allowed for greater confidence in the currency, as its value was guaranteed by the precious metal content. It also facilitated large-scale trade and wealth accumulation, as metallic coins were easier to store and transport than commodities. Later, paper money emerged, representing a specific amount of precious metal deposited in a bank. This further simplified transactions, as people could carry and exchange paper notes instead of heavy coins. Over time, the link between paper money and precious metals weakened, and fiat currencies, which have value primarily because they are accepted as payment by the government, became common.

In the 21st century, the monetary economy has continued to evolve with the advent of digital currencies and cryptocurrencies. These new forms of money offer advantages such as fast and secure transactions and the ability to operate without a central authority (Nakamoto, 2008; Antonopoulos, 2014; Tapscott & Tapscott, 2016; Ferguson, 2008). This evolution of money demonstrates how societies' economic and technological needs drive innovation in currency forms. According to transaction cost theory, more efficient forms of money reduce the costs associated with economic exchanges, making transactions increasingly efficient and accessible.

IV. The Keynesian Perspective on Non-Neutral Money

The followers of Lord Keynes expressed criticisms of David Ricardo's theories, particularly regarding the idea of the neutrality of money. Ricardo argued that variations in the quantity of money in an economy only affect prices, with no long-term effects on real production. In contrast, Keynes contended that money plays an active and influential role in economic decisions and outcomes, challenging the Ricardian view of its neutrality. Keynes made this perspective clear by stating:

The theory which I desiderate would deal, in contradistinction to this, with an economy in which money plays a part of its own and affects motives and decisions and is, in short, one of the operative factors in the situation, so that the course of events cannot be predicted, either in the long period or in the short, without a knowledge of the behaviour of money between the first state and the last. And it is this which we ought to mean when we speak of a monetary economy. (Keynes, 1936, p. 408).

Just as Keynes highlighted money's influence on economic decisions, he and the post-Keynesians observe that, in a monetary economy, the essence of business operations lies in entrepreneurs' relentless pursuit of increasing the amount of money. This objective reflects the fundamental nature of a capitalist economy, where maximising financial resources at the end of the production process is central:

The firm deals with sums of money all the time. It has no other objective in the world than to end up with more money than it started with. This is the essential characteristic of a business economy. (CWJMK, XXIX, p. 89).

This pursuit of accumulating money makes it a unique commodity because, unlike other commodities, money is not sought for its intrinsic value but for its ability to facilitate exchanges and store value. This drive for hoarding tends to be greater during times of economic pessimism. It is associated with Keynes's speculation motive. The retention of money leads to the accumulation of idle funds, negatively affecting production. Keynes identified three main motives for the demand for money:

1. Transaction Motive: The need for money to carry out everyday transactions.
2. Precautionary Motive: The need for money to deal with unforeseen events.
3. Speculative Motive: The preference for holding liquidity when asset prices are expected to fall.

The hoarding in Lord Keynes's theory stems from the fact that money is a store of value and is desired for its own sake. Moreover, this tendency to hold money as a store of value increases the demand for money while reducing the money supply available for other transactions. Consequently, hoarding affects the interaction between the demand for and supply of money, directly impacting interest rates and the economy's liquidity. The demand for money is volatile, reflecting the liquidity preference. Thus, variations in the money supply have slight effectiveness in determining the interest rate, as changes in the amount hoarded could offset them. Money is non-neutral because, through the interest rate, it affects the volume of investment and other economic variables.

According to Keynes, investment determines savings and credit financing investment. The level of credit, in turn, is determined by the state of liquidity preference. When agents neither buy nor acquire securities, and entrepreneurs are reluctant to lend, a small portion of prior savings is allocated to financing investments. In an opposite situation, with a reduced liquidity preference, people would buy securities, credit would be facilitated, and investment decisions would be made due to favourable expectations. The volume of financing could exceed the amount of prior savings. This results in the explanatory element of investment being current currency and credit, not savings, as Ricardo postulated. Say's Law is rejected.

Non-neutral money invalidates Say's Law because it recognises that aggregate demand may not be sufficient to absorb all production, mainly due to the behaviour of economic agents regarding liquidity. The possibility of hoarding and money's influence on interest rates and investment introduce the reality of economic imbalances that Say's Law does not consider. This more dynamic and complex view of the economy shows that supply does not automatically create its demand, as Say's Law suggests, making it impracticable in a context where money plays an active role in determining aggregate demand.

The fact that savings are a function of income and not a determinant of investment undermines the adjustment mechanism between savings and investment through the interest rate. The significance of rejecting this postulate is that the interest rate ceases to have a real character, even in the long term. Thus, the proposition that the interest rate is a short-term and long-term monetary phenomenon is justified. In this way, in Keynes's view, there is no dichotomy between the real and monetary sides, and the economy is monetary.

The three characteristics that make money a store of value are:

1. High elasticity of demand as a store of value: Elasticity of demand refers to the sensitivity of the quantity demanded of a good in response to a change in its price. In the context of money as a store of value, high elasticity of demand means that the demand for money increases significantly when economic conditions make it uncertain or risky to hold other forms of assets. In other words, people prefer to hold money because it preserves value better than other assets during periods of uncertainty or economic crisis.
2. Low elasticity of production: The elasticity of production measures the capacity to increase the production of a good in response to an increase in demand. For money, especially in modern monetary systems where issuance is controlled by central banks, the production of money cannot be easily increased according to demand. This means that the money supply is relatively rigid, which helps maintain its value over time. The low elasticity of money production contributes to its stability as a store of value, as it cannot be rapidly inflated.
3. Low elasticity of substitution: Elasticity of substitution refers to the ease with which one good can be substituted for another. In the case of money, it has a low elasticity of substitution, meaning there are not many other assets that can effectively replace it as a store of value. Money is widely accepted and recognised as a medium of exchange, unit of account, and store of value, and few alternatives possess all three functions simultaneously. This characteristic makes money a preferred choice for storing value, especially during economic uncertainty.

Therefore, these three characteristics – high elasticity of demand as a store of value, low elasticity of production, and low elasticity of substitution – explain why money is widely used and trusted to preserve value over time. As a result of these characteristics, when the production of any good increases, the marginal efficiency of investment in this production falls more rapidly than the marginal efficiency of money, potentially reaching negative values. The marginal efficiency of money, on the other hand, declines more slowly and remains positive. The fact that money cannot be substituted by other goods in its function as a store of value makes its elasticity of substitution negligible to the extent that, in Keynes's view, money is sought after for itself.

The maintenance of wealth in the form of money, even when other assets offer returns, and the desire to accumulate wealth in the form of money are the essence of a monetary economy.

Additionally, in the 1980s, the preference for liquidity was influenced by regulatory changes in the banking sector, such as the relaxation of Regulation Q. This allowed banks to offer interest on certain deposits, introducing new financial products. These products expanded alternatives for storing and moving money, encouraging people to hold more liquid but diversified assets. Thus, the idea of an absolute preference for liquidity was mitigated, as there were clear incentives to invest in new financial instruments rather than simply holding idle cash (Lucas & Nicolini, 2015).

During critical economic moments, the greater demand for money as a store of value, related to the speculative motive, plays a pivotal role in reinforcing the non-neutrality of money by influencing economic decisions within a Keynesian theoretical framework. During pessimism, agents transact less due to the increased preference for liquidity. In times of optimism, they act oppositely. The speculative motive is directly related to uncertainty. Keynes observed that when expectations about the future are highly uncertain, economic agents tend to prefer the safety of liquidity. In times of great uncertainty, this preference for liquidity increases significantly, reflecting the agents' risk aversion.

Expectations about the future are uncertain and volatile, making investments risky. According to the author and post-Keynesians, the entrepreneur makes the decision to invest under complete ignorance of the future. This scenario is concerning because, once the decision to invest is made, it cannot be easily reversed without incurring significant costs, leading to irreparable losses if demand expectations are unmet. The liquidity preference thus acts in the endogenous destruction of money through the retention of cash during pessimistic periods and its release during optimistic phases. Agents prefer to hold liquid assets, such as money, which can be quickly converted into other goods or services without significant loss of value.

In this situation, banks lend less because the risk in credit operations is higher. Consequently, the money supply is lower, and interest rates increase. As money acts as a barometer of prevailing confidence in society, it directly influences spending, investment, and lending decisions, impacting economic production and employment. In an extreme case of the liquidity trap, agents would hoard any increase in the money supply, neutralising its effect on the interest rate and, consequently, on the level of investment:

Although it might be expected, ceteris paribus, that an increase in the quantity of money would reduce the interest rate. This will not happen if liquidity preferences increase more than the quantity of money. (Keynes, 1970, p. 168).

The property of money as a store of value is associated with investment decisions. In times of uncertainty, investors tend to hold more money rather than allocate resources to long-term assets, affecting the overall investment level and economic growth.

Heterodox economists disagree with the standard and neoclassical ways of thinking about economics. They also do not think that barter economies are a good way to understand how money works in monetary economies. They argue that this hypothesis fails to capture the essence of a monetary economy. Instead, these economists highlight the importance of social relations, institutions, and power structures in the economy, asserting that barter economies demonstrate how economic exchanges are deeply intertwined with social and cultural dynamics. They also point out that in times of economic crisis or isolated communities, barter systems can unexpectedly re-emerge as a viable means of exchange, showcasing the adaptability of economic systems. Furthermore, studies on barter economies offer valuable insights into the importance of monetary institutions and the complexities of economic coordination in the absence of a common medium of exchange.

These currencies were created by the market, without government interference. According to Friedman and Schwartz (1963), the evolution of currencies occurred naturally as societies sought more efficient ways to conduct economic exchanges. Complementing this view, Hayek (1976) argues that decentralisation in the creation of money would allow for a quicker and more effective adaptation to the economic needs of individuals and communities. This view highlights the efficiency of the free market in the evolution and adaptation of currencies to economic demands.

In contrast, the Keynesian approach emphasises the importance of historical context in economic analysis, explaining why Keynes's theories on the role of money and the need for government intervention differ from the more timeless and abstract neoclassical approaches. The Keynesian perspective offers a dynamic understanding of the economy, especially in periods of uncertainty and change, where crises are seen as inherent to monetary economies. According to Chick (1970), the concept of historical time — which highlights the irreversibility of economic decisions (time axiom) once made — prevents producers from accurately anticipating the demand for their products before the investment matures. The author underscores the role of uncertainty in entrepreneurs' estimates, considering the additional information from the investment plans of other investors.

According to Victoria Chick, when the aim changes, the target also changes. This uncertainty adds a layer of complexity to economic decision-making, making it a challenging and dynamic field.

For orthodox economists, the economy self-adjusts unless there is government interference. For these economists, the government hinders the smooth functioning of the economy. On the other hand, heterodox economists believe that the economy tends towards crisis and that state intervention is necessary to prevent it. This view emphasises the need for government intervention to mitigate crises and ensure economic stability.

The divergence in paradigms between these views is clear: while Friedman, Schwartz, and Hayek argue that the creation of money should be a decentralised market process, the Keynesian approach stresses the necessity of government intervention. For Hayek, decentralisation allows for rapid and effective adaptation, while Keynes contends that government intervention is crucial to dealing with economic crises and uncertainties.

Furthermore, the Keynesian analysis values historical context and evolving economic dynamics, contrasting with the more abstract and timeless neoclassical approaches. This contrast highlights a fundamental disagreement about the role of the market versus the role of the government in the creation and management of money, and about the importance of history and context in economic analyses.

V. Application of the Scientific Methodology in the Analysis of Money

Building on this empirical approach, Karl Popper's scientific methodology complements this perspective by emphasising the importance of observing products and the falsifiability of propositions. Popper (1959, p. 501) argues that the first step in understanding any process must be an examination of its product. In the case of money, the focus is on its debated role regarding neutrality within economies.

An example of the application of Popper's principle of falsifiability is the proposition that 'money is neutral in the long run'. To test this, it would be necessary to identify a scenario where changes in the money supply have a lasting impact on real economic variables such as output and employment, contrary to what the neutrality hypothesis suggests. The controversial issue lies in the hypothesis that, in times of crisis, economic agents tend to hoard money for its own sake, developing a preference for absolute liquidity. Applying Popper's principle of falsifiability (1959), there is a potential to refute the proposition that the function of money is neutral in the long run. Therefore, these characteristics are widely discussed in economic theories.

The persistence of this controversy can be further understood through Thomas Kuhn's framework of scientific paradigms. Kuhn posits that competing paradigms, such as Keynesianism and Monetarism, are often incommensurable, meaning they are based on different assumptions, methodologies, and standards of evidence. This incommensurability makes it challenging for proponents of each paradigm to communicate and reconcile their differences. Moreover, sociocultural factors within the economics profession, including institutional affiliations and professional investments in particular theories, contribute to the resistance to paradigm shifts. As a result, even with empirical evidence, the debate over the neutrality of money remains unresolved, highlighting the complex interplay between theoretical perspectives and real-world economic phenomena. This ongoing debate exemplifies how scientific progress often involves not only empirical validation but also the negotiation of broader conceptual and methodological frameworks (Kuhn, 1962).

In a similar manner, the controversy between Keynes and Friedman on the neutrality of money highlights differing views on its role during economic fluctuations. Keynes argued that money is not neutral, neither in the short nor long term, as it can influence real variables such as output and employment. He emphasised the importance of active monetary and fiscal policies to manage demand and stabilise the economy, especially in times of crisis when there is a preference for liquidity. In contrast, Friedman contended that money is neutral in the long term, asserting that changes in the money supply affect only price levels without lasting impact on real economic variables. He argued that attempts to use monetary policy for economic stabilisation could be ineffective due to time lags and adjustments in expectations. This fundamental disagreement underscores the complexity of monetary theory and its implications for economic policy.

A controversial issue would be the preference for absolute liquidity. The importance given to the preference for liquidity by post-Keynesians is deeply rooted in uncertainty. Keynes argued that in times of economic uncertainty, agents prefer to hold liquidity rather than invest. This view was expanded by post-Keynesian economists such as Hyman Minsky, who observed that a high preference for liquidity in times of uncertainty could reduce investment and financial instability. In monetary economies, the demand for money is attractive due to uncertainty about the future. By postponing the decision to invest, entrepreneurs preserve wealth in the most liquid form: money.

However, the absolute preference for money is mitigated by options such as interest-bearing bank accounts, bonds, shares, property, and other investments that offer returns and potential appreciation, making them more attractive alternatives to simply holding liquid cash. Contrary to absolute preference, arbitrage can intensify during crises due to more significant market price discrepancies. This intensification of arbitrage contrasts with the liquidity preference described by post-Keynesians, where most economic agents tend to hold liquid assets to protect against uncertainty.

The evolution of money over the centuries raises various interpretations and theories. While some economists see money primarily as a medium of exchange, others consider it an essential factor that can interfere with economic growth. Jevons's quote reflects the progressive view of money as a facilitator of exchanges:

Beginning with the primitive method of barter, a series of steps have been made towards a perfect and world-wide system of interchange of commodities, with the least possible use of the precious metals (Jevons, 1876, p. 150).

On the other hand, economists such as Polanyi (1944) argue that the acceptance and use of certain commodities as money were based on utility and mutual trust among economic agents, suggesting that money has a more complex and influential role in the economy. Polanyi highlights that money is not just a facilitator of exchanges but also an element that can shape economic and social relations.

This debate between the function of money as a medium of exchange versus its role as an influencer of economic growth reflects a broader theoretical dispute that can be analysed in light of Thomas Kuhn's ideas on scientific revolutions. Kuhn, in "The Structure of Scientific Revolutions", suggests that the progress of knowledge is marked by paradigms that, from time to time, are challenged and replaced by new paradigms.

Carl Sagan's famous statement, *The absence of evidence is not evidence of absence*, and his defence that *Extraordinary claims require extraordinary evidence*" reinforce the importance of robust evidence to support new theories. This principle applies to the economic debate on the function of money. Convincing evidence must support new theories suggesting that money significantly interferes with economic growth.

The dispute between the theories of Jevons, Polanyi, and other economists can be seen as a manifestation of the paradigm shifts described by Kuhn. While Jevons highlights the progressive efficiency of exchange systems, Polanyi and others suggest that money plays a more dynamic and influential role. This divergence of views enriches the economic debate and illustrates how economic science evolves through the contestation and refinement of theories.

Thus, reflecting on the function of money and its influence on economic growth is crucial for understanding the complexity of modern economies. The exchange of ideas and the constant search for evidence are fundamental for advancing economic knowledge, allowing us to question and test current and future theories.

Professor Keynes disagrees with the idea that money is neutral. The author believes that entrepreneurs seek money to preserve wealth because they cannot satisfactorily estimate the future outcome of their investments. The impossibility of predicting the future is due to information asymmetry and the fact that past events are not good indicators of what may occur in the future. In view of this, hoarding is inherent in a monetary economy.

The interest rate is a monetary phenomenon resulting from the interaction of the demand and supply of liquidity. Credit can be explained by the state of liquidity preference and is governed by a monetary interest rate. Credit is an element capable of postponing crises but also of making them more severe. Ricardo’s proposition that savings determine investment, which would result in a tendency towards equilibrium, is rejected by Keynes, as hoarding is part of the system's own logic. Moreover, the idea that the economy tends towards equilibrium is contested by Keynes, who argues that investment is influenced by credit, which is governed by the state of liquidity preference and can be highly volatile.

Non-neutral money invalidates Say's Law because it recognises that aggregate demand may not be sufficient to absorb all production, mainly due to the behaviour of economic agents regarding liquidity. The possibility of hoarding and money's influence on interest rates and investment introduce the reality of economic imbalances that Say's Law does not consider. This more dynamic and complex view of the economy shows that supply does not automatically create its own demand, as Say's Law suggests, making it impracticable in a context where money plays an active role in determining aggregate demand.

The Marxist perspective complements the Keynesian view by focusing on the accumulation of capital and the crises of overproduction inherent in the capitalist system. Marx interprets the capitalist economy by emphasising the generation of surplus and the accumulation of capital, where the primary objective of capitalists is to transform this surplus into money, thereby increasing their capital. This process leads to overproduction of commodities and underutilisation of workers' purchasing power, resulting in periodic economic crises.

In this context, money is accumulated by capitalists and does not effectively return to the system in the form of wages or consumption, remaining stagnant or being invested in ways that do not support the consumption of the produced goods. This view reinforces how the accumulation of capital and the logic of profit maximisation can lead to recurring economic cycles, highlighting the non-neutrality of money.

Thus, money is not neutral; its functions and impacts vary depending on the economic context and the perceptions of economic agents. In different economic scenarios, the way money is used and valued can directly influence investment, consumption, and savings decisions. The perceptions and expectations of economic agents

shape the effectiveness of money as a medium of exchange, a store of value, and a unit of account, highlighting its dynamic and contextually dependent nature.

VI. Analysis of Monetary Policy Effectiveness on Industrial Production in Brazil through VAR Modelling

The debate on whether money is neutral and the efficiency of monetary policy is a central theme in economic theory, discussed by economists such as Friedman and Keynes. This paper delves into their contrasting views, offering historical and theoretical context. Section VI presents a case study analyzing the effectiveness of monetary policy in Brazil using VAR-GARCH modelling to explore this phenomenon further. This study examines the relationships between interest rates, money supply, and industrial production, providing empirical evidence to support or challenge theoretical claims. By incorporating this case study, Section VI integrates empirical analysis with the theoretical debates discussed earlier in the paper. This approach allows for a practical examination of how monetary policy impacts real economic variables in Brazil, bridging the gap between abstract economic theories and real-world applications. The findings from this case study offer observations that complement the theoretical discussions of Friedman and Keynes, highlighting the practical implications and limitations of monetary policy in achieving economic stability and growth. This integration not only enriches the theoretical discussion but also provides concrete observations into the practical implications of monetary policy, enhancing the overall coherence and depth of the article.

Econometric Model

The estimation of the impact of monetary policy on production was carried out using a Vector Autoregressive (VAR) model, in which the interest rate (txi), money supply (m1), and industrial production (prodind) are treated as endogenous variables, as discussed in Lütkepohl (2005), Enders (2014), and Stock & Watson (2015). The exogenous variables included in the model are the exchange rate (txcam), employment rate (empr), and the 10-year treasury note (tnote10). The data was obtained from the Central Bank of Brazil (Bacen).

This model is chosen because the VAR describes the dynamic relationship between the interest rate, money supply, and industrial production, allowing for the analysis of the impact of monetary policy shocks. The use of the VAR model is particularly suitable for this analysis because it treats all variables as endogenous, thus encompassing the complex interrelationships among them without imposing a priori theoretical restrictions on the direction of causality. Furthermore, the VAR is an efficient tool for examining temporal dynamics and the response of variables to shocks in a multivariate system. Including exogenous variables such as the exchange rate, employment rate, and 10-year treasury note enhances the model by accounting for external influences on the endogenous variables.

The application of the VAR model followed the procedures recommended by the literature. The appropriate lag length for the VAR model was determined using information criteria such as the Akaike Information Criterion (AIC), the Hannan-Quinn Criterion (HQ), the Schwarz Criterion (SC), and the Final Prediction Error (FPE) criterion. This approach ensures that the model adequately captures the temporal structure of the data, minimizing problems of autocorrelation and heteroscedasticity in the residuals.

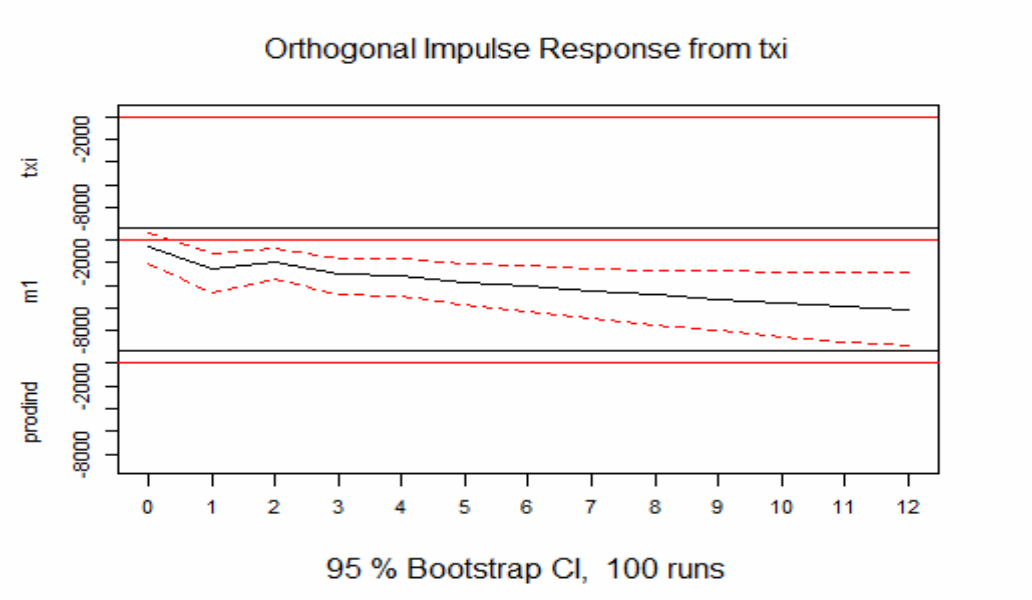
GARCH Modelling

GARCH models were fitted for each variable (txi, m1, prodind) to capture the conditional volatility present in the data. This modelling allowed for a more precise analysis of the time series' variability, considering fluctuations in volatility over time. The exogenous variables (txcam, empr, tnote10) were also considered in the model. The application of GARCH models resulted in the extraction of standardised residuals from each series, which were subsequently used in the re-estimation of the VAR model, ensuring that the effects of heteroscedasticity were adequately accounted for in the subsequent analysis.

Next, the model was re-estimated using the standardised residuals of the economic variables. The study also calculated the orthogonal impulse response functions to analyse the impact of shocks in the interest rate on industrial production and money supply.

Impulse Response Analysis (IRF)

The IRF results indicate that a positive shock to the interest rate leads to an initial decrease in industrial production, reaching its lowest point around the second month after the shock. Subsequently, industrial production begins to recover gradually but does not reach positive levels during the analysed period. This result suggests that the effects of interest rate shocks are transitory and not sustainable in the long term.



Results of the VAR Model Estimation

Estimation Results of the VAR Model	
Description	**Results**
Impact of Previous Interest Rate (txi.l1) on Current Interest Rate (txi)	Coefficient: 0.4162, p-value: 2.21e-11
Impact of Previous Interest Rate (txi.l1) on Money Supply (m1)	Coefficient: 0.1888, p-value: 0.6971
Impact of Previous Industrial Production (prodind.l1) on Current Money Supply (m1)	Coefficient: -0.1189, p-value: 0.1409
Relationship between Money Supply and Interest Rate (txi on m1)	Coefficient: 0.0544, p-value: < 2e-16
Relationship between Industrial Production and Interest Rate (prodind on txi)	Coefficient: -2.4749, p-value: 0.0994
Collinearity between Exogenous Variables	txcam ~ empr: -0.5868, txcam ~ tnote10: -0.3783, empr ~ tnote10: -0.1476
Impulse Response Functions (IRF)	See graph
Variance Decomposition of txi	txi: 0.7913 (period 12), igp: 0.2032 (period 12), prodind: 0.0055 (period 12)
Variance Decomposition of igp	txi: 0.0060 (period 12), igp: 0.9597 (period 12), prodind: 0.0342 (period 12)
Variance Decomposition of prodind	txi: 0.2242 (period 12), igp: 0.0557 (period 12), prodind: 0.7202 (period 12)
Granger Causality Test (txi causing igp and prodind)	F-Test: 5.7268, p-value: 4.311e-07 (Rejects H0)
Granger Causality Test (igp causing txi and prodind)	F-Test: 3.1965, p-value: 0.001413 (Rejects H0)
Granger Causality Test (prodind not causing txi and igp)	F-Test: 0.5824, p-value: 0.7929 (Does not reject H0)
Instantaneous Causality (txi and igp, prodind)	Chi-squared: 0.23243, p-value: 0.8903 (Does not reject H0)
Instantaneous Causality (igp and txi, prodind)	Chi-squared: 0.88778, p-value: 0.6415 (Does not reject H0)
Instantaneous Causality (prodind and txi, igp)	Chi-squared: 0.83816, p-value: 0.6577 (Does not reject H0)

The impact of the previous interest rate (txi.l1) on the current interest rate (txi) is positive and significant, with a coefficient of 0.4162 and a p-value of 2.21e-11. This indicates that the previous period's interest rate has a persistent and significant impact on the current interest rate, suggesting that monetary policy decisions regarding the interest rate have continuous effects over time.

The impact of the previous interest rate (txi.l1) on the money supply (m1) is also positive but not statistically significant, with a coefficient of 0.1888 and a p-value of 0.6971. This suggests that the previous period's interest rate does not have a significant impact on the current money supply, indicating that other variables or factors may be more directly influencing the money supply.

The impact of previous industrial production (prodind.l1) on the current money supply (m1) is negative, though not significant, with a coefficient of -0.1189 and a p-value of 0.1409. This result suggests that an increase in industrial production in the previous period could lead to a reduction in the current money supply, possibly due to adjustments in monetary policy to curb inflation resulting from increased economic activity.

The relationship between money supply and interest rate (txi on m1) is positive and highly significant, with a coefficient of 0.0544 and a p-value of < 2e-16. This indicates that increases in the money supply are associated with increases in interest rates. Although this result may seem counterintuitive, it could reflect future inflation expectations leading to adjustments in monetary policy.

The relationship between industrial production and interest rate (prodind on txi) is negative and marginally significant, with a coefficient of -2.4749 and a p-value of 0.0994. This suggests that increases in industrial production are associated with reductions in interest rates, possibly reflecting a monetary policy response to stimulate the economy.

The collinearity between exogenous variables shows the following correlations: txcam ~ empr: -0.5868, txcam ~ tnote10: -0.3783, and empr ~ tnote10: -0.1476. These correlations indicate some degree of collinearity between the exogenous variables, particularly between txcam and empr.

Impulse response functions (IRF) provide a visual representation of the response of the endogenous variables to a shock in txi. The graph should be consulted for a detailed analysis of the response dynamics.

Variance decomposition of txi reveals that the majority of the variance in the interest rate is explained by the interest rate itself (0.7913 for period 12), with smaller contributions from igp (0.2032 for period 12) and prodind (0.0055 for period 12). This indicates that the interest rate's variance is largely self-explanatory.

Variance decomposition of igp shows that its variance is primarily explained by itself (0.9597 for period 12), with very small contributions from txi (0.0060 for period 12) and prodind (0.0342 for period 12). This suggests that igp's variance is predominantly self-explanatory.

Variance decomposition of prodind indicates that the variance in industrial production is mainly explained by itself (0.7202 for period 12), with significant contributions from txi (0.2242 for period 12) and igp (0.0557 for period 12). This highlights the influence of the interest rate on industrial production's variance.

The Granger causality test results indicate that txi causes igp and prodind, with an F-test value of 5.7268 and a p-value of 4.311e-07, rejecting the null hypothesis. This suggests a short-term causal relationship from txi to igp and prodind. The Granger causality test results also show that igp causes txi and prodind, with an F-test value of 3.1965 and a p-value of 0.001413, rejecting the null hypothesis. This indicates a short-term causal relationship from igp to txi and prodind. However, the Granger causality test results for prodind do not indicate causality to txi and igp, with an F-test value of 0.5824 and a p-value of 0.7929, failing to reject the null hypothesis. This suggests no significant short-term causal relationship from prodind to txi and igp.

The instantaneous causality tests do not reject the null hypothesis for any pairs, indicating no significant instantaneous causal relationships. Specifically, the chi-squared values and p-values are as follows: txi and igp, prodind (Chi-squared: 0.23243, p-value: 0.8903); igp and txi, prodind (Chi-squared: 0.88778, p-value: 0.6415); and prodind and txi, igp (Chi-squared: 0.83816, p-value: 0.6577).

These results provide an understanding of the dynamic relationships between the variables analysed in the VAR model, highlighting the significant impacts and causal relationships that inform the broader economic interactions under study. The overall analysis suggests that while monetary policy, as represented by adjustments in the interest rate, can have significant short-term effects, its long-term efficacy appears limited. The transient nature of the impacts observed in the impulse response functions and the variance decomposition further supports the conclusion that monetary policy is inefficient in the long term.

VII. Conclusion

Friedman revisits Ricardo's theoretical framework. The author accepts the hypothesis that money is a common commodity, that the essence of the economy is consumption, and makes some refinements to support his analytical scheme. As the author himself stated: the quantity theory does not apply to short-term facts. The description of the self-adjustment process is more complex than Ricardo's, but it allows for the validity of Say's Law in the long term and of the quantity theory, as well as a barter economy.

Therefore, Friedman rejects Say's Law in the short term, since demand is generated from credit. For Friedman, money is a common commodity whose main function is to serve as a medium of exchange. He argues that money, in its essence, facilitates transactions and is not necessarily desired for itself, but for its utility in facilitating the exchange of goods and services.

Furthermore, Friedman observes that money has suitable substitutes in its function as a store of value. Assets such as real estate, stocks, gold, and other durable goods can be used to store wealth. Due to this substitutability, he does not see money as unique or irreplaceable for preserving value. In periods of economic instability or inflation, people may prefer to keep their wealth in other more stable assets, reducing the need for hoarding.

For these reasons, Friedman does not consider hoarding as a significant factor affecting aggregate demand or long-term economic stability. He believes that most people will use money for transactions rather than keeping it inactive and that large changes in hoarding are uncommon. The absence of hoarding, coupled with the fact that the logic of society is consumption, makes it possible to assert that savings will be converted into investment.

Since savings and investment are functions of the natural interest rate, the proposition of long-term equilibrium is restored. For Friedman, in the long term, only real forces, such as the capacity of the population, its industry, and its natural resources, can explain the growth of output. Since the interest rate is a real phenomenon, Friedman advises against using monetary policy as an economic policy tool. The use of monetary policy would result in errors that would inevitably lead to crises, as it is not possible to know the natural interest rate.

Keynesian economists, on the other hand, argue that money is not neutral even in the long term. They contend that money plays a significant role in influencing aggregate demand and investment decisions. Keynes believed that active government intervention, including monetary policy, is necessary to manage economic cycles and address issues such as unemployment and inflation.

The empirical analysis using VAR-GARCH modelling confirms these theoretical perspectives by showing that while monetary policy, as represented by adjustments in the interest rate, can have short-term

effects, its long-term efficacy appears limited. The transient nature of the impacts observed in the impulse response functions and the variance decomposition further supports the conclusion that monetary policy is inefficient in the long term. This aligns with the broader understanding that monetary policy may influence economic variables in the short term but does not provide sustainable long-term solutions for economic stability and growth. The results indicate that previous interest rates significantly impact current rates and there is a significant relationship between money supply and interest rates. However, the impact on the money supply is not significant, and Granger causality tests show no long-term effects.

The idea of monetary neutrality, as discussed by Ricardo (1821), Friedman (1984), and Lucas & Sargent (1981), and expounded by Nunes & Nunes (2000), suggests that economic policy can only temporarily deviate output and employment from equilibrium positions, which ultimately converge to the natural rate of unemployment. This theoretical foundation underscores the transient nature of monetary interventions, supporting the argument that real economic forces such as resource availability, industry capacity, and organisational structures primarily drive long-term economic growth and stability. Additionally, Milton Friedman proposed that the Federal Reserve be abolished and its functions integrated into the Treasury Department, arguing that monetary control does not require an independent central bank and should be legally established within the Treasury (Nunes & Nunes, 1999).

Overall, these findings suggest that a nuanced understanding of the role of money is essential for developing effective monetary strategies, reinforcing the argument that monetary policy should not be relied upon as a primary tool for long-term economic management. Future studies should explore these relationships over longer periods and across different economic contexts to further validate the findings and refine the understanding of the long-term impacts of monetary policy.

Reflecting on the function of money and its influence on economic growth is relevant for understanding the complexity of modern economies. The exchange of ideas and the constant search for evidence are fundamental for advancing economic knowledge, allowing us to question and test current and future theories. Thus, it is vital to recognise that money is not neutral; its functions and impacts vary depending on the economic context and the perceptions of economic agents, directly influencing investment, consumption, and savings decisions. This dynamic and context-dependent understanding highlights the complex and multifaceted nature of money in contemporary economies.

The application of Karl Popper's scientific methodology in the analysis of money, emphasising the observation of products and the falsifiability of propositions, reveals the importance of critically examining the function of money in economies. The proposition that 'money is neutral in the long run' can be tested by identifying scenarios where changes in the money supply have lasting impacts on real economic variables such as output and employment. However, controversy persists, especially due to the hypothesis that, in times of crisis, economic agents tend to hoard money, developing a preference for absolute liquidity. This controversial issue can potentially refute the neutrality of money, showing that its functions are widely debated in economic theories.

The persistence of this controversy can be understood through Thomas Kuhn's framework of scientific paradigms. Competing paradigms, such as Keynesianism and Monetarism, are often incommensurable, based on different assumptions, methodologies, and standards of evidence. This incommensurability makes it challenging for proponents of each paradigm to communicate and reconcile their differences. Moreover, sociocultural factors within the economics profession, including institutional affiliations and professional investments in particular theories, contribute to resistance to paradigm shifts. As a result, even with empirical evidence, the debate over the neutrality of money remains unresolved, highlighting the complex interplay between theoretical perspectives and real-world economic phenomena.

In a similar manner, the controversy between Keynes and Friedman on the neutrality of money highlights differing views on its role during economic fluctuations. Keynes argued that money is not neutral, neither in the short nor long term, as it can influence real variables such as output and employment. He emphasised the importance of active monetary and fiscal policies to manage demand and stabilise the economy, especially in times of crisis when there is a preference for liquidity. In contrast, Friedman contended that money is neutral in the long term, asserting that changes in the money supply affect only price levels without lasting impact on real economic variables. He argued that attempts to use monetary policy for economic stabilisation could be ineffective due to time lags and adjustments in expectations. This fundamental disagreement underscores the complexity of monetary theory and its implications for economic policy.

Additionally, Keynes highlighted that waiting for the market to adjust itself in the long run is not practical for addressing immediate economic problems, since "in the long run, we are all dead" (Keynes, 1923). He argued that effective economic policies are necessary to mitigate crises and improve economic conditions in the present.

References

[1]. Antonopoulos, A. M. (2014). Mastering Bitcoin: Unlocking digital cryptocurrencies. O'Reilly Media.
[2]. Chick, Victoria (1970 Macroeconomics After Keynes, Philip Alan, Oxford.
[3]. Enders, W. (2014). Applied Econometric Time Series (4ª ed.). Wiley.
[4]. Ferguson, N. (2008). The ascent of money: A financial history of the world. Penguin Press.
[5]. Friedman, M. (1991). Money Mischief: Episodes in Monetary History. Houghton Mifflin Harcourt.
[6]. Friedman, M., & Schwartz, A. J. (1963). A Monetary History of the United States, 1867-1960. Princeton University Press.
[7]. Galí, Jordi, 1992, "How Well Does the IS-LM Model Fit Postwar U.S. Data?" The Quarterly Journal of Economics, vol. 107, no. 2, pp. 709-738.
[8]. Graeber, D. (2011). Debt: The First 5,000 Years. New York: Melville House.
[9]. Hayek, F. A. (1976). Denationalisation of money: The argument refined. Institute of Economic Affairs.
[10]. Herscovici, A. Historicidade, Entropia e Não Linearidade: Algumas Aplicações na Ciência Econômica. In: XXXI Encontro Nacional de Economia (ANPEC). Porto Seguro. Anais ANPEC 2003, 2003.
[11]. Kaldor, N. (1964). A Model of Economic Growth. Economic Journal, 74(294), 591-624. DOI: 10.2307/2228298.
[12]. Kaldor, N. (1982). The scourge of monetarism. Oxford University Press.
[13]. Keynes, J. M. (1923). A Tract on Monetary Reform. Londres: Macmillan.
[14]. Keynes, J. M. (1936). The general theory of employment, interest and money. In E. Johnson, D. Moggridge, and A. Robinson (Eds.), The collected writings of John Maynard Keynes (Vol. 7). Cambridge: Cambridge University Press.
[15]. Keynes, J. M. (1973). The Collected Writings of John Maynard Keynes (CWJMK), Volume XXIX, p. 81/2n. Londres: Macmillan.Keynes, J. M. Collected writings of John Maynard Keynes. London: Macmillan, 1979, v. 29.
[16]. King, R. G., & Plosser, C. I. (1994). Real business cycles and the test of the Adelmans. Journal of Monetary Economics, 33(2), 405-438.
[17]. Kuhn, T. S. (1962). The Structure of Scientific Revolutions. University of Chicago Press.
[18]. Lucas Jr., R. E., & Sargent, T. J. (1981). After Keynesian macroeconomics. In R. E. Lucas Jr. & T. J. Sargent (Eds.), Rational expectations and econometric practice. University of Minnesota Press.
[19]. Lucas, R. E., & Nicolini, J. P. (2015). On the stability of money demand. Journal of Monetary Economics, 73, 48-65. https://doi.org/10.1016/j.jmoneco.2015.03.005
[20]. Lütkepohl, H. (2005). New Introduction to Multiple Time Series Analysis. Springer-Verlag.
[21]. Mill, J. Stuart (1929) Principles of political economy, Ed. Ashey, New York.
[22]. Minsky, H. P. (1986). Stabilizing an Unstable Economy.
[23]. Mises, L. v. (1953). The Theory of Money and Credit. Yale University Press.
[24]. Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. Retrieved from https://bitcoin.org/bitcoin.pdf
[25]. Nunes, R. C., & Nunes, S. P. P. (2018). Uma breve discussão sobre a fragilidade teórica nos campos da Administração Pública. Revista Estudos e Pesquisas em Administração, 2(1). https://doi.org/10.30781/repad.v2i1.5996.
[26]. Nunes, R., & Nunes, S. (2000). União Monetária Europeia - UME: Evolução Recente e Perspectivas. Brazilian Journal of Political Economy, 20(4), 3-23. https://doi.org/10.1590/0101-31572000-1064
[27]. Nunes, S. P., & Nunes, R. (1999). Relacionamento entre Tesouro Nacional e Banco Central: aspectos da coordenação entre as políticas fiscal e monetária no Brasil. Brasília: ESAF. Available via the Internet: http://www.tesouro.fazenda.gov.br/Premio_TN/ivpremio/divida/2afdpIVPTN/NUNES_Selene_NUNES_Ricardo.pdf.
[28]. Polanyi, K. (1944). The Great Transformation: The Political and Economic Origins of Our Time. New York: Farrar & Rinehart.
[29]. Popper, K. (1959). The Logic of Scientific Discovery. Routledge.
[30]. Ricardo, D. (1951). Principles of political economy and taxation. In P. Sraffa (Ed.), The works and correspondence of David Ricardo (Vol. 1, pp. 290-292). Cambridge University Press.
[31]. Sagan, C. (1980). Cosmos. Random House.
[32]. Samuelson, P. A., & Nordhaus, W. D. (2010). Economics (19th ed., p. 4). McGraw-Hill Education.
[33]. Say, J.-B. Tratado de economia política. São Paulo: Abril Cultural, 1983. v. I.
[34]. Schultz, F. (2005). The changing role of the Federal Reserve. Canadian Parliamentary Review, 87, 343-348. https://doi.org/10.20955/R.87.343-348.
[35]. Schumpeter, J. A. (1954). History of Economic Analysis. Oxford University Press.
[36]. Smith, A. (1776). An Inquiry into the Nature and Causes of the Wealth of Nations. Londres: W. Strahan and T. Cadell.
[37]. Stock, J. H., & Watson, M. W. (2015). Introduction to Econometrics (3ª ed.). Pearson.
[38]. Tapscott, D., & Tapscott, A. (2016). Blockchain revolution: How the technology behind bitcoin and other cryptocurrencies is changing the world. Penguin.
[39]. Taylor, J. B. (1979). Estimation and control of a macroeconomic model with rational expectations. Econometrica, 47(September), 1267-1286.