



Department of Economics and Finance

Chair of Money and Banking

The Evolution of Monetary Policy: from Friedman to
Quantitative Easing and Its Impact on Inflation

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Introduction

In recent years, the field of monetary economics has experienced an important shift, marked by the emergence of unconventional monetary policy instruments designed to address the complexities of a globalized, dynamic financial landscape.

The global financial crisis of 2008 marked a pivotal moment in economic history, shaking the very foundations of established monetary theories and policy conventions. As economies teetered on the brink of collapse, policymakers were compelled to rethink their arsenal of tools, and in doing so, they found themselves at the crossroads of tradition and innovation.

Among these developments, Quantitative Easing (QE) stands out as a monetary experiment. QE has rewritten the strategies of central banking. The policy was introduced in the aftermath of the 2008 financial crisis and later utilized as a response to the unprecedented challenges brought about by the COVID-19 pandemic. Yet, at its root, QE compels individuals to revisit the ageless doctrines of monetary theory, with a focus on Milton Friedman's Quantity Theory of Money (QTM). The relationship between these two apparently distinct realms—Friedman's theoretical constructs and the actual applications of QE—substantially shapes the monetary policy landscape of the twenty-first century.

The famously straightforward yet sophisticated QTM of Milton Friedman postulates a direct relationship between money supply, price levels, and economic activity. It has been a cornerstone of monetary thought for decades, providing the foundation for our understanding of inflation and the macroeconomic environment as a whole. The implications of the QTM have had an impact throughout the course of economic history, influencing policymakers and economists. In contrast, QE represents an interventionist, multifaceted approach to monetary policy, as it involves an intentional expansion of central bank balance sheets through acquiring financial assets and injecting liquidity into financial markets.

This thesis aims to examine the evolution of the QTM and analyze the impact of the monetarist framework introduced by Friedman on various institutions, including the European Central Bank (ECB). Furthermore, it will explore the subsequent shift away from the monetarist approach as these institutions adopted QE, which contradicts the traditional concept of monetary targeting, associated with both Friedman and monetarism.

Our primary query is whether QE actually leads to inflation and whether its effects are still being felt in the economy; that is, whether Friedman was correct to advocate for monetary targeting.

Specifically, the first chapter reexamines the QTM and Milton Friedman's contributions to monetary economics. The QTM offers a framework for comprehending the connection between money, transactions, pricing, and circulation. It will discuss the historical development of the QTM, including its classical and Cambridge versions, as well as its applicability to real-world situations, while acknowledging the deviations from its predictions caused by behavioral and psychological factors.

Moving on to Milton Friedman, we must emphasize his huge impact on economic theory and policy. Friedman, a prominent member of the Chicago School of Economics, challenged dominant economic theories of his time, including Keynesianism, resulting in a decisive impact on the formation of global economic policies.

"The Quantity Theory of Money: A Restatement" by Friedman was a seminal work that sought to restore the significance of the quantity theory and monetary forces in economic analysis. The attempts to refute Keynesian arguments and promote money demand stability will be revisited. Additionally, the intellectual controversies surrounding Friedman's work, including disagreements with economists like Don Patinkin, will be discussed.

Furthermore, the implications of Friedman's constant money growth rule for monetary policy will be investigated. By advocating for a steady increase in the money supply, this rule intended to eliminate policy ambiguity and promote economic stability.

Additionally, the examination will be conducted on how Friedman's ideas influenced the monetary policy of central banks, such as the ECB. Many central banks were indeed affected by Friedman's insights. The examination will focus on how central banks incorporated elements of monetarist thinking into their frameworks, aiming to strike the balance between inflation control and fostering economic growth.

There will then be focus on empirical insights into Friedman's concept of money demand. The specific focus will be on the role of uncertainty in determining preferences for holding money. This will highlight the importance of a reliable money demand function and its role in predicting price fluctuations.

The second chapter investigates first of all how the ECB's monetary policy has changed over time, and the effectiveness of QE as a monetary policy instrument, examining various aspects of its impact on the economy, supported by academic research and empirical evidence, highlighting the objectives of QE and emphasizing its role in promoting economic expansion. The path of the ECB indeed diverged from the monetarist roadmaps that had guided central banks for decades. A pivotal moment arrived with the recognition that the strict application of QTM principles had limitations, and central to this transformation was the introduction of QE. In the wake of economic crises, the ECB embarked on a bold experiment—one with the primary objective to stimulate economic recovery and prevent the looming specter of deflation. However, as the examination continues, it is done so with a critical eye. While QE represented a radical departure from traditional monetarism, there are frequently questions and doubts regarding its actual efficiency.

Therefore, did unconventional monetary tools deliver on their promises?

While considering this brand new unconventional monetary policy tool, an investigation of collateral effects and unintended consequences of QE is carried out. This includes examining its potential role in worsening income inequalities and impacting asset valuations. A rigorous evaluation, based on empirical evidence and academic research, is conducted on the actual effectiveness of QE in achieving its intended goals of promoting economic stability, stimulating growth, and controlling inflation.

The following sections will explore this intellectual terrain in an effort to reconcile the gap between monetary theory and policy practice. The analysis aims to achieve a deeper understanding of the complex relationship between Milton Friedman's theories and the dynamic world of QE.

CH. 1: THE QUANTITY THEORY OF MONEY AND ITS EVOLUTION

1.1 The Quantity Theory of Money: An Introduction

Approaching the Classical Quantity Theory of Money: Insights and Perspectives

The quantity theory of money (QTM) is a key concept in economics, that focuses on the relationship between money, transactions, price, and circulation. It is predicated on the hypothesis that the total amount of money in circulation is directly proportional to that held by the general public. This idea originates from the textbook representation of the equation of exchange, which is often attributed to Irving Fisher. Although he cannot be credited with its original invention, his book "The Purchasing Power of Money," published in 1911, made substantial contributions to the advancement and comprehension of the equation of exchange. Throughout the years, the QTM has been subject to various approaches and interpretations. One of the first versions can be traced back to David Hume, in 1752. There are three primary versions that are commonly discussed in the economic writing: the classical, or transactions, version (also known as the Fisher approach), the GDP version, and the Cambridge approach. The equation presented below illustrates the "transaction" version of the exchange equation, which must be distinguished from the GDP version, because the variables involved and, consequently, their meanings, are different:

$MV = PT$, where M denotes the money supply, V the velocity of money in terms of transactions, P the price level and T the total number of transactions. The right side, given by PT , represents the total monetary value of all transactions. This perspective gives an impression of money as a medium that facilitates trade, emphasizing the number of times money changes hands in the economy.

When discussing the classical QTM, it is essential to bear in mind its fundamental tenets, starting from the concept of the long-run neutrality of money, which indicates that real output is totally unaffected by the existing stock of money or any changes to it. Only the quantity of money in circulation may change the price level.

According to the textbook definition, $M1$ consists of legal currency (notes and coins) in addition to demand deposits held by banks and by the general public. Aggregates with higher ordinal numbers successively incorporate bank liabilities of lesser liquidity. This suggests that the primary role of money as a means of payment is modified by the fact that it can also serve as a mechanism for the storing of wealth and for financial investment. In the equation of

exchange, this brings M1 into the closest possible alignment with M. On the other hand, the same cannot be true about T, which encompasses all of the items and services that act as intermediaries.

The GDP version of the equation of exchange takes into account the distinction between two kinds of means of payments (store of value and means of payment), each of which has the capability of moving at a different velocity: $MV = PY$, where V is the velocity of money in terms of income and PY, the right side of the equation, stands for the nominal GDP of the economy. This version draws a direct link between the quantity of money and the monetary value of final goods and services produced in the economy, focusing only on transactions that contribute directly to GDP, thus highlighting the productive side of the economy.

$$MV = PY \Leftrightarrow P = (V/Y)M$$

In order to construct a theory of the price level from the equation of exchange, grounded in empirical evidence, the following conditions need to be satisfied: M (not influenced by P, Y, or V) is an exogenous variable, V is an exogenous variable, and Y is independent of M, indicating that the neutrality of money holds.

The distinction between the transaction version and the GDP version may appear to be insignificant; however, it is essential to be aware that in the transaction version, money is strictly referred to as a means of conducting transactions, whereas in the GDP version, V cannot readily be understood as the velocity of money.

It is important to mention the Proportionality Theorem and its importance, since it is a fundamental concept derived from the QTM, asserting that changes in the money supply and the overall price level are directly and proportionally related, assuming all other factors remain constant. To invalidate mercantilism, which held that economic prosperity depends on the money supply (bullion stock within state borders), this theorem was necessary. It was a key tool in fighting this doctrine.

Not only David Hume and Irving Fisher, but several economists as well have made significant contributions to the development of the QTM. It is noteworthy to acknowledge the influential role played by John Stuart Mill in this regard. John Stuart Mill, a prominent British philosopher and economist of the 19th century, is in fact widely recognized as one of the key proponents of the classical formulation of the QTM. In his seminal work "Principles of

Political Economy," Mill elaborated on the notion that, over time, an increase in the money supply would result in a proportional increase in the price level, while having no effect on actual output. Mill's formulation of the QTM exhibited a higher degree of refinement compared to certain earlier proponents of the theory.

Although Irving Fisher's Equation of Exchange, $MV = PT$, effectively illustrates the connection between the money supply, its velocity, the average price level, and the total number of transactions, it lacks a comprehensive analysis of the underlying motivations for individuals to hold money.

Recognizing the aforementioned void, Cambridge economists, such as Marshall, Keynes, and Pigou, opted to adopt an alternative standpoint in their examination of the subject matter, focusing on the concept of money demand. The Cambridge economists sought to dig beyond a superficial examination of the frequency of monetary transactions (velocity) and instead aimed to comprehend the underlying reasons behind individuals' inclination to hold onto money. The authors posited that individuals retain a portion of their income in the form of money in order to facilitate routine transactions and as a store of value.

Consequently, the formulation $M = kPY$ was derived, where M denotes the money supply, k signifies the proportion of the national income that individuals desire to retain in the form of money, P represents the average price level, and Y denotes the real output. The Cambridge equation enables economists to examine the behavioral dimensions of money demand, namely the determinants (such as interest rates, inflation expectations, and financial innovations) that might impact individuals' propensity to hold a portion of their income as money.

Furthermore, when a central bank possesses a comprehensive understanding of the various elements that influence the variable denoted as k , it is able to more accurately assess the repercussions of its policies on the overall economy.

In situations characterized by uncertainty, it is important to note that a mere expansion of the money supply may not necessarily result in the anticipated rise in expenditures or investments, if individuals desire to retain greater financial resources.

If M , Y , and k change over time at the rates shown by the lowercase letters m , y , and k , then the price level P changes at the rate $p = m - k - y$.

Marshall, already mentioned among other Cambridge economists, believed that income growth and financial innovation, such as the development of credit arrangements and money substitutes, dominated money growth in determining the long-term path of the price level.

He stated that alterations in expectations regarding the future value of the currency and the strength or weakness of real economic activity impact the cash-balance ratio and consequently the price level, even if the money supply remains constant.

According to Marshall, when it comes to the long run, changes in the amount of money in circulation don't have a lasting impact on real economic activity. That's because real activity is determined by factors such as production skills, business organization, labor, land, capital, and social and political stability. However, money and the amount of bank-credit substitutes can actually have a temporary impact on real activity. This idea, known as the classical proposition, suggests that money isn't always neutral in the short run. Marshall's theory of the business cycle says that non-neutrality happens because nominal wage and interest rates are sticky and take a while to change. This causes real wages and interest rates to fluctuate and make the cycle worse.

Lastly, it is crucial to bear in mind the validity of Say's Law within the framework of the classical QTM. This principle asserts that supply is always absorbed by demand, implying that all produced goods are always purchased. Consequently, it precludes the occurrence of a situation where goods' supply exceeds goods' demand. In a nutshell, the idea of quantity theory is an essential component of economics, and it can be interpreted and applied in a number of different ways. It is vital to have a solid understanding of the relationship that exists between money, transactions, and circulation in order to comprehend the intricate workings of economic expansion and development.

1.2 Friedman and the Quantity Theory of Money

"The Quantity Theory of Money: A Restatement"

Milton Friedman was one of the 20th century's most influential economists, leaving a lasting mark on economic theory and policy. His intellectual journey led him to challenge many of the prevalent economic theories of his time.

Friedman was a prominent member of the Chicago School of Economics, where he advocated for free markets, individual choice, and minimal government intervention. His work was based on a belief in the efficacy of market forces and the rationality of consumers and producers. Friedman's theories were not merely theoretical; they had a significant impact on economic policy, and contributed to a global movement toward neoliberal economic policies. His ideas prompted heated debate and controversy in academic and political circles.

Nevertheless, his contributions were widely acknowledged, and in 1976 he was awarded the Nobel Prize in Economic Sciences.

Friedman's writing was accessible to both academics and the general public, and he became a prominent public intellectual as a result. He played an essential role in determining public opinion and policy through his popular writings, television appearances, and lectures.

In 1956, he wrote "The Quantity Theory of Money: A Restatement", as the introduction to a collection of doctoral essays written by his students in the University of Chicago's Workshop in Money and Banking and published as "Studies in the Quantity Theory of Money"(1956). Both the essay's title and its publication date were audacious. After starting to teach at the University of Chicago in 1946, Friedman started a research program on monetary factors in the US economy. During the period from the mid-1940s to the mid-1960s, the field of economics was largely influenced by Keynesian ideology¹. Both academics and policy-makers shared the belief that fiscal policies were the sole practical choice. He felt that the University of Chicago was one of the few places where the quantity theory still had credibility, and he regarded it as a substitute for Keynesian income-expenditure theory. Friedman challenged Keynesian assumptions about money demand's unpredictability and the liquidity trap using quantity theory. These arguments were used by Keynesians to reject the usefulness of monetary analysis in studying business cycles. The QTM was discarded in favor of the notion that monetary forces are, at most, of secondary importance.

The purpose of Friedman's "Restatement" and the accompanying essays, written in 1956, was to restore the importance of quantity theory and the role of monetary forces to academic and policy discourse. After Friedman's essay came out, a significant amount of real-world data, much of it made by Friedman and his colleagues, showed how important monetary factors to

¹ The 1936 publication "The General Theory of Employment, Interest, and Money" by John Maynard Keynes greatly influenced the Keynesian ideology, which dominated the field of economics from the mid-1940s to the mid-1960s before being influenced by Milton Friedman and other economists. Keynesian economics emphasized the necessity of active government intervention, especially during economic downturns. Another central concept of Keynesianism was the notion of aggregate demand, which is the sum of all economic expenditure. Keynes argued that aggregate demand fluctuations were the fundamental cause of business cycles. During economic downturns, he advocated for increased government spending to stimulate aggregate demand and economic activity. Keynesians also believed that fiscal policy instruments, such as government spending and taxation, could be used to counteract the natural fluctuations of the business cycle, and they emphasized the significance of aggregate income (the the sum of all incomes in an economy) as the primary driver of consumption and investment. Keynes lastly introduced the idea of a liquidity trap, in which nominal interest rates are so low that people hoard money instead of investing it. In such circumstances, conventional monetary policy may become ineffective, and fiscal policy becomes more important. In conclusion, mid-20th-century Keynesian doctrine stressed the government's role in controlling the economy, notably via fiscal policy, to smooth economic fluctuations, battle unemployment, and boost growth.

the economy. As a result, his "Restatement" of 1956 came to be regarded as the counterrevolution's opening strike, which is why it sparked a heated debate that continues today, involving various scholars and commentators.

According to Friedman, his paper and the other four articles in *Studies in the Quantity Theory of Money* belonged to a specific oral tradition of quantity theory at the University of Chicago. The controversy involved Friedman's colleague Don Patinkin, his colleague Harry Johnson, former student David Laidler, Thomas Humphrey, and George Tavlas, all associated with the University of Chicago. The debate has focused on whether Friedman's decision to use the term "quantity theory" for his monetary economics is suitable and if it truly aligns with the Chicago "oral tradition."

This debate provides insight into the growth of monetary economics at Chicago and Harvard during the late 1920s to the Keynesian era. Yet, the historical context of Friedman's 1956 article remains ambiguous, as none of the writers, including Friedman himself, have adequately addressed the circumstances that led to the creation of his work. Determining the foundation of Friedman's monetary economics circa 1956 requires the recovery of these circumstances to identify the most closely matching labels.

"Labels and Substance: Friedman's Restatement of the Quantity Theory" by J. Daniel Hammond (1999) provides a general context, explaining how Friedman's ideas evolved and established over time, examining his background and illustrating the factors that influenced his theories.

Friedman's economic methodological papers, especially outside of monetary economics, show his interests and preferences that formed his monetary thought. His approach to monetary economics was shaped by his Marshallian methodology, and his involvement in monetary economics came after he began examining consumption studies in the mid-1930s. *A Theory of the Consumption Function* (1957), Friedman's substantial contribution in this field, was published the year after his restatement of the quantity theory.

There is another evidence source available, which is the records of courses that were taught at Chicago before 1956. Friedman taught a course about business cycles at the University of Wisconsin from 1940 to 1941 and proposed one while he was at the University of Minnesota from 1945 to 1946. Writings reveal his theoretical leanings when he started the National Bureau's "money in business cycles" project.

In the beginning part of his Restatement (1956), Friedman began by giving a set of statements, particularly stating that "the Chicago tradition was not a strict system or unchangeable belief, but rather a perspective". He stressed the importance of money and the need to consider monetary changes and their consequences when interpreting short-term fluctuations in economic activity. His introduction aimed to explain a specific "model" of a quantity theory. He began by presenting a detailed list of important concepts, which are briefly summarized below:

1. Quantity theory emphasizes money demand, not production, income, or prices. Quantity theory and money supply and other variables are needed to comprehend these variables.
2. Money serves as an asset for wealth-owning units within the economic system, whereas it functions as a capital good for productive firms. One subfield of capital theory that integrates the supply and demand for capital is the theory of the demand for money. This distinctive characteristic renders it an essential element of capital theory.
3. A society's desire for money is analogous to its demand for a consumer service. According to the conventional theory of consumer choice, the price and return of wealth and its alternative forms, the preferences of wealth-owning units, and budget constraints are the primary variables that determine demand for money (or any other asset). In contrast to studying consumer service demand, wealth forms' preferences, prices, and returns should be considered for intertemporal substitution rates and the budget constraint should be expressed in terms of wealth.
4. Wealth encompasses every form of income or consumable items. Humans' ability to produce is a key factor in generating wealth. From this view, the interest rate conveys the relationship between wealth stock and income flow, so if Y is the total income flow and r is the interest rate, total wealth is $W = Y/r$. Ordinary income is different from broad income. Ordinary income is referred to as "gross" since it does not include in the expenses of sustaining human productivity. Additionally, it is affected by ephemeral circumstances that depart from the theoretical idea of steady-state service consumption.
5. Wealth can be held in various forms. This involves considering flows, stocks, and their substitution rates. To completely define an individual's wealth options, we must examine both their market prices and their revenue sources. Money (M), bonds (B), equities (E), physical non-human goods (G), and human capital (H) are the five types of wealth that may be owned. Understanding a wealth structure's value depends on each form's yield.

6. Wealthy people tend to choose the same services over time. However, objective conditions may influence preferences. When people move to a new place or are unsure about the future, they might want to keep more of their money as cash. One reason why people tend to hold more cash during wartime is because it is a common occurrence. Objective indices, like migration indices and railroad travel miles, have the ability to portray the extent of geographic mobility and uncertainty.
7. The demand for money was seen as a predictable consequence of the following variable: M , the nominal quantity of money; P , the price level; r_b , the interest rate on bonds; r_e , the rate of return on equities; $(1/P) (dP/dt)$, the inflation rate—and, hence, the negative of the rate of return on money balances; w , the ratio of nonhuman-to-human wealth; Y , nominal income; and u , a vector of residual influences—variables that can be expected to affect tastes and preferences (Tavlas, 2023). It is given by the following function:

$$(1) \quad M = f \left(P, r_b - \frac{1}{r_b} \frac{d r_b}{dt}, r_e + \frac{1}{P} \frac{dP}{dt} - \frac{1}{r_e} \frac{d r_e}{dt}, \frac{1}{P} \frac{dP}{dt}; w; \frac{Y}{r}; u \right)$$

A few notes concerning this function are necessary:

- (i) Assuming prices and interest rates stay the same, the function includes three interest rates: r_b and r_e for specific asset classes and r for all assets. The rate, r , is a combination of the two special rates, along with the rates for human wealth and physical goods. Given that the latter two cannot be directly perceived, they have the potential to change, together with r_b and r_e . Since the latter two cannot be directly observed, they may fluctuate with r_b and r_e in a systematic way.
- (ii) If the range of assets were expanded to include commitments to pay specified sums for a finite number of time units—“short-term” securities and “consols”—the difference between long and short interest rates would reflect rates of change of r_b and r_e . We may simplify the current explanation by assuming r_b and r_e are constant over time as securities of varied time lengths will likely be offered. Since the rate of price change is needed individually, we may replace bond and equity nominal return variables with r_b and r_e .
- (iii) Y/r can estimate total wealth if Y includes imputed income from money and directly owned physical capital goods.
8. The demand equation is independent of the nominal units used to measure money variables, much like other utility function maximization equations in "real" magnitudes.

Money demand should change with price and income. The equation technically assumes first-degree homogeneity in P and Y, resulting in :

(2)

$$f\left(\lambda P, r_b, r_e, \frac{1}{P} \frac{dP}{dt}; w; \lambda Y; u\right)$$

If we assume that $\lambda = 1/P$:

(3)

$$\frac{M}{P} = f\left(r_b, r_e, \frac{1}{P} \frac{dP}{dt}; w; \frac{Y}{P}; u\right)$$

If we assume that $\lambda = 1/Y$:

(4)

$$Y = v\left(r_b, r_e, \frac{1}{P} \frac{dP}{dt}, w, \frac{Y}{P}, u\right) \cdot M$$

Here, v stands for income velocity, and the equation is expressed in the standard quantity theory form². It sets nominal money supply demand, but it does not determine money income. Although interest rates are determined independently, this equation only determines a unique equilibrium level of money income, not a time path for initial values. A full income determination model requires high inelastic demand or rigid variables. The fourth equation introduces money income, which is connected to nominal money amount. However, it does not discuss how Y changes affect real output and prices. To establish this, one requires external information like maximum output.

In his concluding remarks, Friedman addresses the issue of the meaning of being a quantity theorist and its implications. He asserts that while most economists are likely to concur with the preceding analysis in a formal and abstract manner, they may articulate it in varying ways. Nevertheless, some disparities exist concerning the applicability of this analysis in comprehending both short and long term economic fluctuations. The difference arises from three issues: the stability and importance of the money demand function, the independence of demand and supply factors, and the form of the demand function or related functions.

² In contrast to the conventional QTM, which primarily emphasized a direct correlation between the money supply and price levels, Friedman's interpretation incorporated the notion that money influences real economic activity by affecting income, by arguing that an expansion in the money supply results in an increase in income, which subsequently leads to a rise in the price level.

The quantity theorist acknowledges the stable demand for money as a key factor in economic analysis, but does not assume a constant amount of money per unit of output or velocity of money circulation over time. Hyperinflations increase money circulation, which he does not think threatens money demand. The functional relationship between money demand and its determinants is where Cagan's essay³ shows expected stability. Hyperinflations increase money circulation, supporting this relationship. However, the quantity theorist must limit and specify the function's empirically significant variables. More significant variables reduce a hypothesis' empirical validity. Accepting that money demand is highly unstable is like stating that it is a stable function of infinite variables.

The quantity theorist claims that factors affect money supply but not demand. These may be technical, political, or psychological issues affecting banks and monetary authorities. Only if supply is influenced by other factors can a stable demand function track supply changes. The traditional real-bills doctrine holds that money demand affects supply and that supply cannot change under certain institutional arrangements.

Another theory suggests that the quantity theory cannot explain large price increases due to increased demand for nominal money and money supply.

Money demand is infinitely elastic at "small" positive interest rates. At this interest rate, which is expected to prevail under underemployment, price or nominal money supply changes have no effect on the real supply of money. This is "liquidity trap." The interest rate is determined by this equation, although other economic factors affect the money demand function. Thus, money supply and demand only impact interest rates.

According to Friedman, while considering money as a means of payment, it is also necessary to consider it as something considered valuable. His definition of money was always broader than the norm. He believed that there is no definite difference between 'money' and 'near-moneys' or between 'near-moneys' and 'securities proper.' Economic cycles will affect the nature of the cyclical movement by changing the asset value of the circulating medium.

The QTM was seen as a framework for understanding how nominal income is determined.

Short-term changes in the money supply have an impact on nominal GDP, which is calculated

³ In his 1956 essay "The Monetary Dynamics of Hyperinflation," Philip Cagan examined the behavior of prices during hyperinflationary episodes. Cagan's research established the groundwork for comprehending the effects of swiftly rising inflation rates on the behavior of individuals and institutions. In the context of Friedman's theory, Cagan's work provides support for the notion that hyperinflation can cause significant distortions in economic decision-making. As inflation grows substantially, consumers lose trust in their currency's future worth, causing a "runaway" effect as they spend it fast, worsening inflation. This is consistent with Friedman's view that high inflation is predominantly a monetary phenomenon caused by excessive growth in the money supply. Milton Friedman's monetarist view that inflation is essentially related to monetary considerations, notably the money supply, is supported by Cagan's article on hyperinflation, which shows how excessive inflation may alter economic activity.

by multiplying the price level (P) by real output (Y). Changes in the money supply have an immediate effect primarily on nominal GDP as the actual outcome is unpredictable. Yet, as time passes, the main outcome of fluctuations in the quantity of money accessible becomes evident in changes to the overall price level.

Starting here, we come to the commonly accepted and previously mentioned idea that "inflation is always and everywhere a monetary phenomenon." The primary utilization of this concept, concerning monetary policy, is that the adjustment of the amount of money can be employed to achieve a specific inflation objective, relying on estimations of the economic growth rate and changes in velocity. However, we will look more closely at this later.

Patinkin's Critique and Alternative Perspectives on Friedman's Economic Theories

Even though Friedman's monetarist ideas were innovative and brilliant, this does not imply that there were no obstacles. The intellectual debate between Don Patinkin and Milton Friedman was a turning point in the evolution of monetary theory. Patinkin and Friedman held opposing viewpoints, which resulted in significant disagreements and reshaped the understanding of monetary economics during that period. The subsequent insights are taken from "The Monetarists: The Making of the Chicago Monetary Tradition, 1927–1960", by G. S. Tavlas (2023). The content of this book, specifically the first chapter, offers an in-depth summary of the prevailing circumstances following the publication of Friedman's "The Quantity Theory of Money: A Restatement" and the critiques he had to face.

The prominent economist Don Patinkin, who spent the majority of his academic career at the Hebrew University of Jerusalem, advocated for the concept of the "real balance effect", which he firstly presented and explained in his work "Money, Interest and Prices", published in 1956, to fill the gap in classical economic theory. Within the framework of general equilibrium models, this concept emphasized the significance of money as a component of an individual's total wealth. Despite spending his academic career outside the United States, he was influenced by the ideas of the Chicago School. On the other hand, Milton Friedman, a prominent member of the Chicago School of economics, emphasized the influence of money supply on economic activity.

The effectiveness of monetary policy in affecting the real economy was also a major topic of discussion. Considering the influence of monetary policy on real variables, Patinkin favored a

nuanced perspective. Friedman, on the other hand, believed that controlling the money supply was essential in order to maintain economic stability.

The role of money within the framework of general equilibrium models was yet another contentious issue. The approach of Patinkin incorporated money into the equilibrium framework, emphasizing its influence on individual wealth and economic equilibrium as a whole. The perspective of Milton Friedman placed a greater emphasis on money as a determinant of aggregate demand. This intellectual conflict had significant repercussions for the field of monetary economics. Patinkin's works also contributed to a broader discussion about the Chicago monetary tradition and Friedman's ideas' origins, as Patinkin's influential paper "The Chicago Tradition, the Quantity Theory and Friedman", published in 1969 in the inaugural issue of the *Journal of Money, Credit and Banking (JMCB)*, challenged the intellectual integrity of Friedman's 1956 "Restatement" of the quantity theory, influencing other economists as well. The paper attempted to explain the real essence of the Chicago monetary tradition and prove that Friedman's assertion about his "reformulation of the quantity theory" representing this tradition is incorrect. In addition to Patinkin's contributions, the discourse was strengthened by Harry Johnson and other economists' exchange of ideas. Particularly, Johnson questioned Friedman's work's actual veracity, sparking public debates and discussions within the economics community.

Despite the fact that these disagreements may have initially caused tensions, they ultimately contributed to the development and refinement of monetary theory. These debates shaped the landscape of monetary economics in that era and had a lasting impact on the discipline.

Nonetheless, Friedman's efforts and influence were acknowledged, particularly by Ben Bernanke and David Laidler. Indeed, in contrast to the association between Patinkin and Friedman, the relationship between David Laidler and Friedman was distinguished by a greater degree of intellectual congruity. However, it is worth noting that Laidler introduced his distinctive perspectives to the monetarist framework. Laidler's contribution to monetary economics will be discussed subsequently.

On the other hand, Ben Bernanke, the former Chairman of the Federal Reserve, is a distinguished economist, whose leadership during the 2008 financial crisis was notably shaped by the teachings of Milton Friedman, particularly Friedman's perspectives on monetary policy and the critical imperative of averting major disruptions in the financial system. In his publication "Friedman's Monetary Framework: Some Lessons" (2003), Bernanke emphatically emphasizes the profound impact of Milton Friedman's monetary

framework on both the theoretical underpinnings and practical implementations within the realm of monetary policy.

According to him, Friedman's seminal work, especially his collaboration with Anna Schwartz in their study "A Monetary History of the United States" (1963), served to illuminate the pivotal role played by monetary forces in shaping the dynamics of the economy, all while providing invaluable historical context. Bernanke places particular emphasis on Friedman's formulation of eleven monetarist propositions, which systematically elucidate the intricate ways in which money exerts its influence upon the economic landscape, including the precise timing of its effects on output and inflation. Crucial aspects of Friedman's ideas, such as the principle of long-run neutrality and the concept of inflation as a fundamentally monetary phenomenon, have since been widely embraced and integrated into contemporary economic thinking. Furthermore, Friedman's unwavering focus on the importance of nominal stability has significantly influenced central banks worldwide, compelling them to prioritize the attainment of price stability and thereby achieve the objectives of low and stable inflation.

Friedman's Money Growth Rule: A Guiding Principle for Monetary Policy

One of the significant contributions attributed to Friedman is the constant money growth rule, first suggested in 1958. He expressed his intention to provide a concise overview of the results from his work with Schwartz. He needed to differentiate between short-term and long-term relationships, with the latter exhibiting a considerable amount of stability and the former resulting in uncertainty. The money growth rule was derived based on long-term associations. Friedman observed that the high correlation between changes in money stock per unit of output and changes in prices fails to indicate the direction of influence.

He stated that the most advantageous conceptualization or definition of the money supply involved currency held by the general public, plus demand deposits and time deposits within commercial banks, as it exhibited a stronger empirical correlation with income and other economic aspects. Based on historical evidence, it is clear that there exists no clear correlation between alterations in prices and variations in output.

Given the assumption of relatively stable and moderate price changes, the only viable deduction is that both increasing and decreasing prices are consistent with rapid economic growth. Friedman's primary objective with the money growth rule was to eliminate policy

ambiguity and he believed that his constant money growth approach would offer a straightforward solution and ensure the accountability of authorities (Friedman, 1960).

In his 1958 work "The Supply of Money and Changes in Prices and Output," he suggests that the money supply, consisting of currency held by the public and demand and time deposits in commercial banks (referred to as M2), should experience a growth rate of 3 to 5 percent. The choice of M2 is based on its significant empirical correlation with "income and other economic magnitudes" as mentioned by Friedman in 1960. Additionally, he noted that from 1867 to 1957, output increased by approximately 3% annually, while velocity decreased by around 1% each year.

The evidence suggests that a 3%–5% annual growth rate for M2 may lead to a stable price level for this monetary concept. Friedman and Schwartz's short-term policy work found that discretion disqualifies policymakers from performance evaluation and exposes them to political pressure, causing "continual and unpredictable shifts [...] in the content of policy as the persons and attitudes dominating the authorities had changed" (Friedman, 1960). A rule would reduce "the danger of instability and uncertainty of policy" (Friedman, 1960). A money growth rule would have prevented 1929-1933's "excessive" mistakes, 1931's discount rate increases, and the depression. Friedman claimed his money supply idea would "largely separate the monetary problem from the fiscal [problem]" (Friedman, 1960). Later, we will examine how monetary targeting and Friedman concepts in general affected actual monetary policy throughout time.

Comparing Approaches to Monetary Policy: Laidler's Aggregates vs. Friedman's Base

Although both Laidler and Friedman have made significant contributions to the field of economics, particularly within the monetarist framework, it has been already noted that their perspectives differ on various subjects. Despite their discrepancies, Laidler has correctly acknowledged Friedman's influence on his writing and has carefully examined monetarist notions. Selecting a work regarded as "most significant" or that provides the best articulation of Laidler's ideas is a challenge, however his 1999 article "The Quantity of Money and Monetary Policy" is often credited. Before analyzing more closely the differences between the two, it is wise to provide some information on Laidler's economic framework.

Firstly, one should bear in mind the importance of the Quarterly Projection Model (QPM), which offers an analytical framework for the development of monetary policy. However, it

lacks a variable for M1, and this is the point from which Laidler begins his investigation in "The Quantity of Money and Monetary Policy" (1999), since, according to him, M1 is of vital importance to the economy. He then focuses on the significance of the active money view, as opposed to the passive one, starting from an examination of the Bank of Canada's gradualist policy.

The gradualist policy, based on a passive money view, was adopted between 1975 and 1982. It was an experimental policy, primarily centered around the monetary aggregate M1, as it was a prominent moment for the adoption of money growth targeting. The policy demonstrated efficacy, as shown by a decline in the inflation rate.

During 1981, though, there were indications that the policy might be changed. This happened when the rate of money growth suddenly dropped below its intended range. The reason for this was the difficulties faced in understanding how the M1 aggregate was behaving. The passive money view considered money an endogenous variable, and the money supply's growth rate was used to predict the effects of other variables on inflation. Thus, the interest rate was the policy's instrument, allowing it to achieve the desired results. This suggests that the underlying assumption is that the money supply passively adapts to changes in the demand for money, influenced by the interest rate and its fluctuations. Some passive money advocates believe that lowering interest rates will increase money demand and supply, which could lead to depreciation in an open economy and affect output and employment.

The focus on the total M1 money supply was too much, and it was wrong to handle its growth in that way. Laidler suggests that it is important to manage the growth rates of one or more aggregates or any related variables, but this should not be the main goal of monetary policy. Instead, the main goal should be to keep inflation low. Controlling the growth rates of aggregates should be an intermediate objective, in order to achieve the primary goal. Hence, it is advisable to use other aggregates alongside M1. This is because relying solely on M1 can lead to distorted measurements of output and inflation. M1 fails to consider the rise in demand for money when nominal interest rates decrease, particularly during periods of declining actual and expected inflation. In addition, it is too difficult to predict aggregate movements using the corresponding demand function, and because of this obstacle, it may be unreliable.

In order for a monetary aggregate to assist in achieving an intermediate target variable, it must be manageable and regularly impact demand. The M1 expansion during the late 1970s posed

challenges, as it is hard to justify any intermediate policy objective that relies on a monetary aggregate until we understand the connections between the overnight rate, market interest rates, bank lending, and money growth.

Considering these introductory facts on Laidler's theories, the first evident difference is that Laidler emphasized the importance of specific monetary aggregates, such as M1 and M2, in understanding money demand and monetary policy, while Friedman's monetarist framework, as recently discussed, mainly prioritized the control of the monetary base as a mechanism for managing the wider money supply and achieving economic stability.

Secondly, Friedman advocated for a rule-based approach, such as the constant money growth rule, in which the central bank expands the money supply at a constant rate to achieve price stability. On the other hand, Laidler promoted a proactive stance for central banks, advocating their intervention in order to stabilize the economy through the manipulation of monetary aggregates, therefore he emphasized a more flexible approach to monetary policy, and his research frequently addressed the significance of information in the monetary policy process. In this context, a proactive stance would involve the central bank actively collecting data, analyzing it, and adjusting its policies based on new insights.

Unlike Friedman, he was in favor of discretion, since it allows central banks to respond to unanticipated economic shocks or altering conditions.

Lastly, he acknowledged that, while stable money growth could be a useful intermediate target for central banks, there may be instances where other strategies, such as inflation targeting, could be more effective.

1.3 The influence of Friedman on Monetary Policy and Inflation

The Monetarist Influence on the German Bundesbank Through Economic Transformation

Since we discussed the money growth rule, it is essential to emphasize the impact it had on monetary policy, beginning with the Bundesbank, which appeared to be strongly influenced by monetarism. In fact, the monetary policies of the German Bundesbank during the latter half of the 20th century provide an interesting case study in the application of monetary theory, particularly the tenets promoted by Friedman and his monetarist school of thought. During this time, Germany's economy underwent significant transformations, passing through

the Bretton Woods system, the Great Inflation, and ultimately the Great Moderation. The Bundesbank's commitment to stability and its ability to navigate complex economic scenarios were strikingly similar to the central tenets of monetarism, emphasizing the significance of money supply control and the pursuit of price stability.

In December 1958, the Bretton Woods monetary regime began with a transition to a convertibility regime. This system also permitted capital controls, though their effectiveness diminished over time. Germany had the lowest and most stable inflation rate between 1960 and 1998, followed by Switzerland. However, in the context of the Bretton Woods system, the percentage was 0.1% higher than in the United States. Then, from 1974 to 1982, prices in Germany increased by 46%, and from 1974 to 1989, they increased by a total of 72%, which is a significant increase but less than the 181% price increase in the United States.

Subsequently, there was a period of high inflation, which, according to the accepted view, was caused by oil price shocks, as supply shocks served as the initial impetus, followed by private sector and government adjustments. This oil shock crisis impacted all nations, but Germany fared better than the rest. As a result of joining the European monetary union, the German central bank's influence diminished. However, this central bank's stability influenced many others, due to its adherence to its plans and its ability to avoid the 1970s inflation crisis. The institution was founded in 1948, but Germany did not exist as a nation-state at that time; nevertheless, the bank was already independent of political authorities. The exchange rate regime was crucial, but a fixed exchange rate prevented the conduct of monetary policy in pursuit of price stability. Between the 1960s and 1970s, there was excessive money growth when purchasing US dollars.

In October 1973, the oil crisis began. The Bundesbank focused primarily on influencing the behavior of market participants, and there was greater adherence in adopting a quantitative target for money growth. Thus, this echoes the theory of monetarists, such as Friedman's. In fact, the strategy was discussed, and a monetary target was adopted in 1975. However, it differed from the original monetarist ideas in that, to begin with, the Bundesbank defined its target in terms of the central bank's money stock without taking into account specific monetary aggregates. In addition, it attempted to affect money demand by modifying money market rates and bank reserves. Finally, it was stated from the start that there was no specific and precise objective.

Then, between 1975 and 1978, these targets were exceeded, and the increase in interest rates driven by the Bretton Woods system was reversed as a result of these policies. Still, they were able to reduce inflation to 2.7% in 1978, demonstrating that monetary targeting can be successful. However, between 1978 and 1985, fiscal policy was expansionary and monetary growth exceeded its target, resulting in an acceleration of inflation. This, combined with the second oil price shock, resulted in a current account deficit in 1979. The Bundesbank decided to act by incrementally increasing the discount rate. At the end of 1981, growth rates began to decline, proving the strategy's effectiveness. The years that followed were a period of normalization as the Bundesbank's policy was focused on lowering inflation.

Tracing the Echoes of Friedman in ECB's Monetary Policy

The monetary policy strategy of the ECB has been significantly shaped by the research conducted by Milton Friedman during the 1950s and 1960s, with a particular emphasis on the stability of money demand. The findings of Friedman in the United States provided support for this conclusion, resulting in the adoption of a stable money demand function by the staff of the ECB.

Moreover, when the ECB was established, it set a "reference value" for monetary growth (ECB, 2001). Friedman's rule about money growth was similar to the reference value, which described the long-term relationship between money and prices. The ECB chose M3 because it closely corresponds to prices, as stated by Issing (2008). M3 encompasses currency in circulation, overnight deposits (M1), deposits with agreed maturity of up to two years (M2), repurchase agreements, money market fund shares, and debt securities of up to two years. The ECB subsequently sought a benchmark for the expansion of M3, taking into account the GDP. The growth of real GDP was estimated to be around 2 to 2.5 percent each year, while the velocity decline was approximately 0.5 to 1.0 percent annually. The ECB made a decision to establish M3 growth at a rate of 4.5 percent annually. This decision takes into account the provided estimates and the definition of price stability, which aims for annual inflation to be near, but below, 2 percent.

Additional instances of Friedman's impact on the ECB can be observed in the fact that first of all, Friedman believes it is crucial to differentiate between monetary and fiscal policies. Indeed, the ECB is responsible for determining monetary policy based on Article 123 of the

Treaty on the Functioning of the European Union, which specifically prohibits the use of monetary financing for fiscal activities.(ECB, "The Monetary Policy of the ECB", 2011). Moreover, The ECB places emphasis on the price level, denoted in nominal terms. This approach aligns with the ideas put forth by Friedman, who argues that the monetary authority has the ability to influence nominal variables but lacks control over real variables.

As stated previously, the ECB took into account Friedman's research on money demand and its stability. In 2003, however, the majority of money demand functions in the euro area began to exhibit instability, which led to the perception that the ECB's monetary policy strategy had diminished the significance of money, marking a departure from the once-dominant influence of Friedman's monetarist ideas. However, this will be discussed more thoroughly subsequently.

1.4 Inflation and Empirical Assessments

An Introduction to Inflation

The primary objective of the ECB is to maintain price stability through the implementation of monetary policy. This entails ensuring that the inflation rate, which reflects the rate of change in prices over time, remains at a low, stable, and predictable level. This is done through establishing inflation expectations and managing economic "temperature". It is widely held that maintaining a moderate inflation rate of 2% in the medium term is ideal to price stability. Inflation occurs when there is a widespread rise in the prices of goods and services, rather than isolated instances, which leads to a decrease in the value of the currency over a period of time.

Within the euro area, the "Harmonised Index of Consumer Prices" (frequently shortened to "HICP") serves as an index for assessing inflation in consumer prices. The HICP is determined by collecting multiple prices every month, organizing them into around 295 product categories, and assigning them weights based on their value in average household budgets. However, households experiencing higher inflation might be more aware of this than those with lower inflation.

For instance, if gasoline prices rise faster than other goods and services, frequent drivers may "feel" inflation above the HICP since their fuel spending is greater than normal. The HICP is adjusted by country, with each country's adjustment based on its proportionate share of total

euro area consumption expenditure. After the 2021 Strategy Review, the Governing Council has decided to support including home-ownership costs in the HICP. The purpose of this decision is to accurately reflect the increasing costs experienced by everyone. Consumer surveys frequently indicate that individuals "perceive" inflation to be greater than what is reflected in price indices.

Lastly, the HICP examines the rise in prices in relation to changes in quality, as we typically associate price changes with inflation, yet quality can also vary. If the costs of cars increased by 5% but the quality also improved by 1%, the Harmonized Index of Consumer Prices (HICP) would indicate a 4% increase in car prices.

Academic research indicates that price increases are more memorable than stable or dropping prices, capturing our attention more. When considering inflation, we pay disproportionate attention to fluctuations in prices, making us more aware of our regular out-of-pocket purchases. Because a large percentage of our household budget goes to infrequent purchases and direct debits, we notice them less. Inflation rates are usually expressed as annual growth rates, which compare the current price level in a given period to the same period a year prior. Even with a low annual inflation rate, prices climb significantly in the long run.

As previously stated, inflation is the increase in the price level, but it can be described as a fall in purchasing power as well. Besides the HICP, it can be monitored also by the consumer price index (CPI), which is calculated by dividing the cost of a basket in a given period by the cost of a basket in a base period and multiplying by 100. It may overestimate inflation by approximately 1 percentage point per year. It includes housing, transportation, food, education, health, recreation, and other categories. Inflation can be classified into three types:

- Demand-pull inflation: Inflation that arises when the whole demand for goods and services in an economy exceeds the total supply, resulting in a rise in the overall price level. In brief, this occurs when the aggregate demand for goods and services surpasses the productive capacity of the economy. This type of inflation is frequently linked to periods characterized by economic expansion, higher levels of consumer spending, and low unemployment.
- Cost-push inflation: Inflation characterized by an increase of prices for products and services as a result of heightened manufacturing costs. In contrast to demand-pull inflation, which arises from an excess of demand, cost-push inflation is primarily influenced by

supply-side elements that result in an increase of production costs. Consequently, businesses respond to these high costs by transferring them to consumers through increased prices.

- **Built-in inflation:** It is a self-perpetuating loop that occurs when salary increases raise manufacturing costs, leading to a rise in prices for goods and services. It is often linked to internal inflationary pressures in the economy, not exogenous demand or supply shocks. Inflation can create a self-reinforcing cycle where greater wages increase costs, prices, and wage demands. This can cause an economy's price level to climb steadily. Breaking the built-in inflation loop is challenging. Policymakers must address supply- and demand-side factors.

If the rate of inflation increases drastically, hyperinflation takes place, leading to the collapse of the monetary economy as money loses its value. Hyperinflation occurs when the inflation rate reaches triple digits, and governments sometimes induce it when they are unable to raise taxes or sell bonds.

Deflation, on the other hand, happens when prices drop and purchasing power rises. This may seem favorable, but it actually indicates no economic growth. African, South American, and Middle Eastern economies are the poorest in the world, with low prices. This may be the consequence of dysfunctional governments failing to provide sufficient incentives to work or produce more. When inflation is negative, an excess supply of goods or insufficient money can produce deflation. Governments oppose deflation because it results in reduced expenditure, high real interest rates, and debt burden.

Inflation has several distribution effects. First, inflation affects savers and debtors. Savers lose value as inflation lowers currency's purchasing power. This reduces the goods and services they can buy with their savings. Borrowers' debt increases owing to inflation. The real worth of debtors' loans grows as the value of money drops, making repayment harder. Investors also experience inflation, but the extent depends on their holdings. During inflationary circumstances, stocks increase in value while fixed income assets fall. Lastly, it will have an international impact because if the price level increases, resulting in an appreciation of the currency, products will become more expensive compared to foreign countries, thereby reducing exports.

The inflation of commodities' prices must be distinguished from the inflation of asset prices and, by extension, deflation of asset prices. The former arises when an asset's price exceeds its value. In an asset price bubble, society may perceive greater wealth than its underlying economic status. The term "bubble" refers to the initial phase of a financial crisis characterized by a rapid increase in the value of certain assets. Due to extrapolative expectations, that will be explored deeply afterwards, buyers may buy more assets before prices rise, expecting price increases. Low interest rates, speculative demand, and other reasons can cause asset price inflation to rise. Consumer spending and debt rise when people think they're wealthier.

On the other hand, asset price deflation is the reduction in asset values, like in real estate, equities, and bonds. It causes an economic downturn, a rise in interest rates, and a fall in asset demand. The main effects are the rise in wealth of individuals and the financial impact on businesses. For instance, corporations may struggle to raise financing and view employee salaries as excessive.

Asset price inflation increases housing prices, impediments to investment, economic instability, wealth disparity (primarily benefiting the rich), and asset owners' wealth.

In asset and goods price inflation, expectations are continuously significant. When there are expectations of high inflation, individuals tend to raise prices, assuming that the overall price level will inevitably rise; this behavior contributes to the actual occurrence of inflation.

There are three distinct types of expectations: extrapolative, rational, and adaptive. The first type is characterized by the belief that a given trend will persist over time. The second type pertains to models, whereas the last one is grounded in historical analysis and past events.

Evolution and Assessment of the Quantity Theory of Money in Relation to Inflation

The correlation between inflation in the United States and the rise in money supply sparked heated debates between monetarists and Keynesians from the 1960s to the early 1980s. The monetarists stressed the inflationary impacts of money supply increase, whereas Keynesians saw it as demand-induced. During the late 1990s, the monetary policy in the United States and United Kingdom shifted away from solely relying on the QTM. Nevertheless, it is still in use in the eurozone, where economic analysis—which concentrates on shorter-term real and financial conditions—and monetary analysis—which looks at longer-term trends in monetary aggregates—are used to determine monetary policy.

As previously discussed, according to the quantity theory, the price level multiplied by the available output quantity should equal the money supply multiplied by the velocity.

$$MV = PQ \iff PQ = MV$$

The percentage change in the money supply is the total of the percentage changes in real output and inflation, assuming velocity remains constant.

$$P + Q = M$$

Since the real growth rate is equal to the proportional change in output, it follows that inflation is equal to the rise in the money supply over the real growth rate.

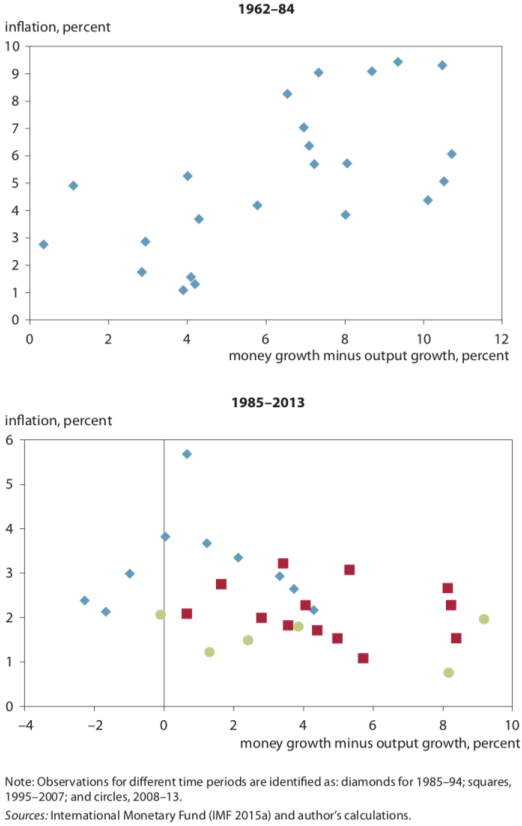
$$P = M - g$$

The debate over which measure of money supply is best for evaluating inflation has been ongoing for a while. Despite the first recommendation of M1, larger measurements are possible.

The Federal Reserve (Fed) published data for five monetary aggregates in the beginning of the 1970s, and the FOMC established M1 and M2 tolerance limits between 1974 and 1987. Goal ranges for monetary aggregates were abandoned by the FOMC in 2000, as financial innovation undermined the stability of M2-dependent economic relationships. When the Fed, led by Chairman Volcker, shifted its emphasis from the federal funds rate to the money supply, to control inflation in 1979, the significance of the quantity theory peaked. By 1980, inflation had reached 13.5%. The federal funds rate increased from 8% to 18% before the Federal Reserve began to focus on interest rates in 1982.

The graph below depicts the behavior of US inflation, as measured by the GDP deflator, between 1962 and 1984. It corresponded to the average excess increase in broad money

supply over GDP growth in that and the preceding years. This era includes the late 1960s – early 1980s Great Inflation.



Source: Cline (2015)

The linear regression for this era demonstrates a substantial correlation of 0.54 between inflation and the excess of money growth over real GDP growth. But the level of explanation is only moderate, and the coefficient is only around half of what the quantity theory requires, i.e., one. Between 1985 and 2013, the average surplus money growth and inflation have a negative connection, as seen in the bottom panel. Regression coefficient (-0.12) was in fact negative.

Sargent and Surico (2011) created a dynamic stochastic general equilibrium (DSGE) model to understand the phenomenon. The technique uses a Taylor rule for monetary policy and a New Keynesian Phillips curve to simulate inflation. The researchers find that stricter monetary policy causes volatility in the link between inflation and money supply. The graphs illustrate a transition from the predominance of money supply, in the upper panel, to the predominance of money demand in the lower panel, suggesting that an outward shift in money demand is predicted during a time in which disinflation decreases the opportunity cost of holding money.

Hence, inflation is reduced by an increase in the money supply. During the period from the mid-1980s to the mid-1990s, there was a decrease in the rate of inflation. Therefore, it can be inferred that there was a rise in the demand for money.

The decline of the QTM after the mid-1980s is important to note because other countries did not experience a similar change like the United States. Nevertheless, there exists a certain level of backing for the concept in Australia, France, and Japan post-1985, as evidenced by coefficients ranging from 0.4 to 0.5. There is additional evidence from Canada and the United Kingdom, as their coefficients are approximately 0.2 during this specific period.

Despite the presence of direct evidence, a theoretical analysis of the equation of exchange reveals a clear link to inflation.

In summary, it can be seen that a relationship may be created by taking into account the two fundamental assumptions of the Quantity Theory, namely the constancy of velocity and the independence of output from the monetary base. Nevertheless, the QTM has seen a decrease in its level of acceptance in recent times, mostly attributable to two key factors. The premise of a constant velocity of money is called into question by empirical data, especially in times of economic downturns when people tend to exhibit a preference for holding cash, leading to a reduction in the velocity of money. Furthermore, the identification of demand variables, including consumer confidence and uncertainty, as key predictors of economic outcomes has been acknowledged, as previously examined in the theories proposed by Friedman.

Regarding the examinations on the validity of the QTM, one should also consider the case of Greece. Within the economic theory, the QTM seems to present a coherent framework: all else being equal, an increase in the money supply should result in an equal increase in prices. However, empirical evidence and historical contexts reveal deviations from this predicted outcome. Moreover, the transmission mechanism linking money supply and inflation is influenced by behavioral and psychological factors. Expectations, which influence economic behavior, might contradict the QTM's assumptions. If people expect price changes due to monetary policy, their spending and saving may not match the theory. The simple link between money supply increase and price level fluctuations becomes questionable. This disparity has raised questions about the theory's usefulness in the contemporary economy.

One example of these recent assessments is the scholarly article "The Case of Greece and the Quantity Theory of Money" by Ongan and Gocer (2022).

This work analyzes the QTM for Greece from asymmetric (nonlinear) relations. It uses the nonlinear ARDL (Auto Regressive Distributed Lag) model for the first time, unlike earlier empirical research that tested the QTM on linear (symmetric) relations for Greece or other countries. The study examines Greece's QTM using new monetary aggregates, called "Greek contribution" to euro area aggregates. The Greek contribution is calculated by adding up deposits held by Greek and other euro area countries' residents in Greek banks, banknotes moved by the Bank of Greece, and debt securities issued by Greek banks, minus debt securities issued by all euro area banks. To begin exposing this paper, it is necessary to illustrate the original exchange equation by Fisher: $MV = PR = Y$, where Y denotes nominal income, given by multiplying P and R (real income).

By expressing it in logarithmic form, we establish the initial reference for our research, where the lowercase letters represent the logarithmic variables:

$$m_t + v_t = p_t + r_t = y_t$$

Based on the QTM, it is thought that the linear mixture of factors with a coefficient vector of (-1, 1, 1) is stationary. Thus, v must be stable for cointegrated 1-to-1 (or unitary) proportionality relations of m and y or p and r. This is required but inadequate to prove QTM validity. Consequently, it is essential to prove the money supply's exogeneity, or that y and m and p and m do not have cointegrated relations.

By using the assumption that the variables v and r remain constant, we proceed by creating alternative directional models:

$$p_t = \alpha_0 + \alpha_1 m_t + \varepsilon_t$$

$$y_t = \beta_0 + \beta_1 m_t + e_t$$

In these equations, we look for significantly co-integrated one to one proportional relations from m_t to p_t and from m_t to y_t .

In the context of directional relations, specifically referring to the relationship from y_t to m_t and from p_t to m_t , we get:

$$m_t = \theta_0 + \theta_1 y_t + \epsilon_t$$

$$m_t = \delta_0 + \delta_1 p_t + \varepsilon_t$$

Since we must establish the exogeneity of the money stock, we are not expecting cointegrated relationships. The method used is based on the nonlinear ARDL model developed by Shin et al. (2014). The model being discussed is the nonlinear version of the linear ARDL model suggested by Pesaran et al. (2001). Therefore, we first provide the linear model for the proposed equations in the following sample form model:

$$\Delta x_{1t} = a + b_1 x_{1t-1} + b_2 x_{2t-1} + \sum c_i \Delta x_{1t-i} + \sum d_j \Delta x_{2t-j} + \varepsilon_t$$

The equation presented involves the use of the difference operator Δ . The variables x_{1t} and x_{2t} correspond to the dependent and independent variables, respectively, in the preceding equations for the linear model.

The next procedure entails the utilization of the non-linear ARDL model. This requires decomposing the series of independent variables into its increases (x_{2t}^+) and decreases (x_{2t}^-), therefore facilitating the examination of the impacts of these changes on the dependent variables. We will examine whether the impacts of increases and decreases in independent variables exhibit symmetry or asymmetry. By symmetric, we mean that the effects of an increase or decrease of an independent variable on a dependent variable have the same size and sign of the decomposed coefficient.

The decomposition is constructed using the partial sum procedure outlined below:

$$x_{2t}^+ = \sum_{j=1}^T \Delta x_{2j}^+ = \sum_{j=1}^T \max(\Delta(x_{2j}), 0)$$

$$x_{2t}^- = \sum_{j=1}^T \Delta x_{2j}^- = \sum_{j=1}^T \min(\Delta(x_{2j}), 0)$$

However, before applying the non-linear ARDL model, we must first determine whether the model's series are stationary. There is a need to employ the unit root test with multiple structural breaks by Carrion-i-Silvestre et al. (2009), because it may be helpful in endogenously determining the former main break dates in the Greek economy.

Carrion-i- Silvestre et al. (2009) developed the following test statistics:

$$P_T(\lambda^0) = \{S(\bar{\alpha}, \lambda^0) - \bar{\alpha}S(1, \lambda^0)\}/s^2(\lambda^0)$$

$$MP_T(\lambda^0) = [c^{-2}T^{-2}\sum_{t=1}^T y_{t-1}^2 + (1 - \bar{c})T^{-1}y_T^2]/s(\lambda^0)^2$$

$$MZ_\alpha(\lambda^0) = (T^{-1}y_T^2 - s(\lambda^0)^2)(2T^{-2}\sum_{t=1}^T y_{t-1}^2)^{-1}$$

$$MSB(\lambda^0) = (s(\lambda^0)^{-2}T^{-2}\sum_{t=1}^T y_{t-1}^2)^{-1/2}$$

$$MZ_t(\lambda^0) = (T^{-1}y_T^2 - s(\lambda^0)^2)(4s(\lambda^0)T^{-2}\sum_{t=1}^T y_{t-1}^2)^{-1/2}$$

The null hypotheses for these test statistics of " MZ_α, MZ_t " and of " PT, MSB, MPT " are "have a unit root" and "be stationary", respectively. The Gauss 10 program was used to come up with the unit root test for multiple structure breaks. The test results are displayed in the table below.

Table 1: Results of Unit Root Test with Multiple Structural Breaks

Variable	P_T	MP_T	MZ_α	MSB	MZ_t	Structural Break Dates
M	40.30 (9.24)	34.62 (9.24)	-12.82 (-47.88)	0.18 (0.10)	-2.42 (-4.87)	2003:M11; 2007:M05; 2009:M06; 2012:M06; 2014:M12
p	7.28** (9.33)	6.85** (9.33)	-66.98** (-47.68)	0.08** (0.10)	-5.77** (-4.85)	2004:M05; 2007:M08; 2009:M08; 2011:M08; 2015:M02
Y	5.51** (9.47)	5.32** (9.47)	-86.55** (-47.42)	0.07** (0.10)	-6.57** (-4.84)	2004:M07; 2008:M01; 2011:M09; 2013:M06; 2015:M04
Δm	4.84** (9.39)	4.69** (9.39)	-97.78** (-47.79)	0.07** (0.10)	-6.98** (-4.86)	2004:M07; 2006:M11; 2012:M05; 2015:M05

Note: (**) denotes statistical significances at 5% level. The critical values in parentheses were obtained by bootstrap with 1000 replications.

Source: Ongan et al., 2022

The cointegration relations for the first three models are shown in the following table, since their F-statistics are higher than the upper bonds. As a result, no more step analyses were carried out for the final model, $m = f(p+, p-)$.

Table 2: Test Results of Bounds Testing and Structural Break Dates

Model	F stat.	Critical Values						Structural Break Dates
		I0 Bound			I1 Bound			
		10%	5%	1%	10%	5%	1%	
$y = f(m^+, m^-)$	3.66*	2.71	3.23	4.35	3.45	4.05	5.39	2008:M07; 2011:M10; 2015:M05
$p = f(m^+, m^-)$	4.90**	2.71	3.23	4.35	3.45	4.05	5.39	2008:M03; 2011:M06; 2014:M11
$m = f(y^+, y^-)$	4.42**	2.71	3.23	4.35	3.45	4.05	5.39	2005:M10; 2009:M08; 2012:M03; 2015:M04
$m = f(p^+, p^-)$	1.90	2.71	3.23	4.35	3.45	4.05	5.39	2009:M09; 2015:M04

Note: (*) and (**) denote statistical significances at 10% and 5% levels. The break dates were obtained by the method of Bai and Perron (2003).

Source: Ongan et al., 2022

The subsequent table, provided below, illustrates estimates of the nonlinear ARDL model and diagnostic statistics for the model:

Table 3: Nonlinear ARDL Model Estimation Results

Variables	$p = f(m^+, m^-)$	Variables	$y = f(m^+, m^-)$	Variables	$m = f(y^+, y^-)$
Short-Run Coefficients					
Δp_{t-6}	0.38*** (0.00)	Δy_{t-1}	-0.69*** (0.00)	Δm_{t-1}	0.14** (0.02)
Δp_{t-7}	0.05 (0.11)	Δy_{t-2}	-0.33*** (0.00)	Δm_{t-3}	0.11* (0.09)
Δp_{t-12}	0.64*** (0.00)	Δy_{t-3}	-0.56*** (0.00)	Δm_{t-4}	0.15** (0.01)
Δm_{t-5}^+	-0.11** (0.01)	Δy_{t-4}	-0.39*** (0.00)	Δm_{t-6}	0.13** (0.03)
Δm_{t-9}^+	0.05** (0.01)	Δy_{t-6}	-0.27*** (0.00)	Δm_{t-7}	-0.15** (0.01)
Δm_{t-}^-	-0.15*** (0.00)	Δy_{t-7}	-0.29*** (0.00)	Δm_{t-10}	0.10* (0.06)
Δm_{t-8}^-	-0.04 (0.12)	Δy_{t-11}	0.34*** (0.00)	Δm_{t-12}	0.26*** (0.00)
Δm_{t-12}^-	0.10*** (0.00)	Δm_{t-5}^+	-0.94*** (0.00)	Δy_{t-1}^+	-0.09 (0.10)
Δm_{t-2}^-	-0.10*** (0.00)	Δm_{t-8}^+	-0.56*** (0.00)	Δy_{t-8}^+	-0.18*** (0.00)
Δd_{2011}	0.006* (0.05)	Δm_{t-4}^-	-0.85*** (0.00)	Δy_{t-10}^+	0.10* (0.06)
Δd_{2014}	0.01 (0.11)	Δm_{t-5}^-	1.01*** (0.00)	Δy_{t-3}^-	-0.08* (0.09)
-	-	-	-	Δd_{2012}	0.02 (0.12)
ECT_{t-1}	-0.07*** (0.00)	ECT_{t-1}	-0.02*** (0.00)	ECT_{t-1}	-0.008*** (0.00)
Normalized Long-Run Coefficients					
m_t^+	0.53*** (0.00)	m_t^+	0.79 (0.19)	y_t^+	3.57 (0.10)
m_t^-	0.37** (0.04)	m_t^-	1.06* (0.05)	y_t^-	3.07 (0.10)
D_{2008t}	-0.06 (0.48)	D_{2008t}	-0.84 (0.16)	D_{2005t}	1.10 (0.34)
D_{2011t}	-0.47 (0.63)	D_{2011t}	1.12 (0.13)	D_{2009t}	0.81 (0.45)
D_{2014t}	-0.48 (0.36)	D_{2015t}	1.09 (0.46)	D_{2012t}	-2.03 (0.27)
-	-	-	-	D_{2015t}	-1.72 (0.18)
Diagnostic Tests					
R^2	0.95	R^2	0.80	R^2	0.45
$Adj. R^2$	0.95	$Adj. R^2$	0.78	$Adj. R^2$	0.39
F	241.04*** (0.00)	F	39.38*** (0.00)	F	7.54*** (0.00)
DW	2.08***	DW	1.85*	DW	1.90**
χ_{SC}^2	0.25*** (0.78)	χ_{SC}^2	1.80*** (0.24)	χ_{SC}^2	1.85*** (0.17)
χ_{FF}^2	2.54*** (0.11)	χ_{FF}^2	0.005*** (0.99)	χ_{FF}^2	0.30*** (0.58)
χ_{NOR}^2	47.65*** (0.41)	χ_{NOR}^2	17.60*** (0.15)	χ_{NOR}^2	18.02*** (0.12)
χ_{HET}^2	194.21*** (0.11)	χ_{HET}^2	39.98*** (0.21)	χ_{HET}^2	31.87*** (0.32)
W_{LR}	-0.15*** (0.00)	W_{LR}	0.26* (0.08)	W_{LR}	-0.49 (0.13)
W_{SR}	0.03 (0.58)	W_{SR}	-1.66*** (0.00)	W_{SR}	-0.08 (0.45)

Source: Ongan et al., 2022

In Table 3, coefficient estimates for the original model [$p = f(m^+, m^-)$] show that money stock changes (m^+ , m^-) somewhat positively impact price level (p). The movements of m^+ , m^- , and p align upwards when the sign is positive. More money (m^+) means more inflation (p). There is less money (m^-) when there is less inflation. Consequently, the effects of m^+ and m^- on p will validate the partial QTM. The size of these consequences, however, imply that the QTM is not very credible when it comes to Greece, since the values for m^+ and m^- (0.53 and 0.37), respectively, are lower than 1.

For the second model, normalized estimates of coefficients [$y = f(m^+, m^-)$] show that although drops in money stock (m^-) have a partial influence on income (y), rises in money stock (m^+) have no long-term effect on the latter (1.06). This shows that the QTM is only partly sustained by declines in the money supply (m^-). Greek economic authorities note that decreases in money stock (m^-) lead to a greater than one-to-one proportionate effect on income (y). This may disadvantage the Bank of Greece (BoG), which cannot independently expand money stock.

In the long term, both positive and negative increases in income (y^+ , y^-) are not statistically significant, according to the results of the third model [$m = f(y^+, y^-)$]. This suggests that income fluctuations do not impact money stock (m). Since the goal was not to demonstrate cointegrated correlations between both y^+ and y^- with m for the validity of the QTM, this finding offers some support for the validity of the QTM via income gains and losses.

Based on the collective assessment of these three alternative models, it can be inferred that the QTM shows partial validity for Greece in the long-term. This conclusion is drawn from the following observations: (i) the partially proportional effects of both increases and decreases in the money stock (m^+ , m^-) on inflation are less than one-to-one, indicating weak validation; (ii) changes in income (y^+ , y^-) have no partial influence on the money stock (m); (iii) reductions in the money stock (m^-) have partial effects on income.

In brief, the QTM exhibits weak validity in the context of Greece in the long run, perhaps due to the specific features of the Greek economy, financial inclinations, the monetary policies of the Bank of Greece and the ECB.

Money Growth and Monetary Dynamics Throughout Modern History

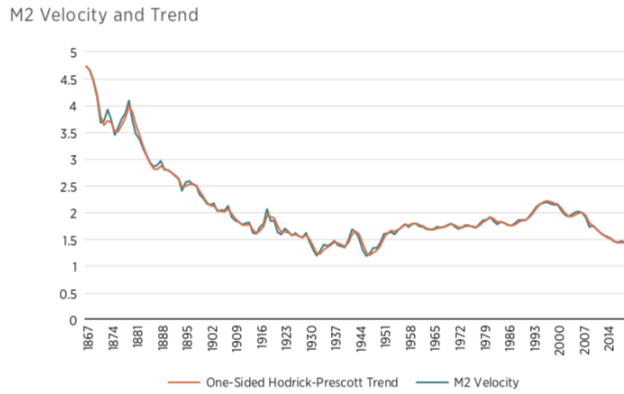
Milton Friedman's influential collaboration with Anna Schwartz remains widely recognized among economists. However, contemporary monetary policy has shifted its primary focus to interest rates, largely sidelining the consideration of money growth. In the extensive research conducted by Friedman and Schwartz, spanning from 1867 to 1960, they unearthed compelling evidence linking fluctuations in the money supply to economic cycles.

A pronounced emphasis within their research lies in the post-World War II era, during which the Fed maintained low interest rates to facilitate borrowing for wartime efforts. This period notably witnessed subdued inflation, attributed to the imposition of wage and price controls, increased household savings, and cautious economic policies., then resulting, subsequently to the war, in two years of high inflation.

Friedman criticized this phenomenon, contending in a 1977 article for Newsweek that inflation could be attributed to rapid money growth. In a lecture published by the Bank of Japan, he further expounded on his critique by asserting that the Fed erred in its persistent focus on targeting the federal funds rate. This fixation on interest rates led to an expansion in monetary aggregates, and the Federal Reserve's tardiness in adjusting them consequently contributed to economic recessions.

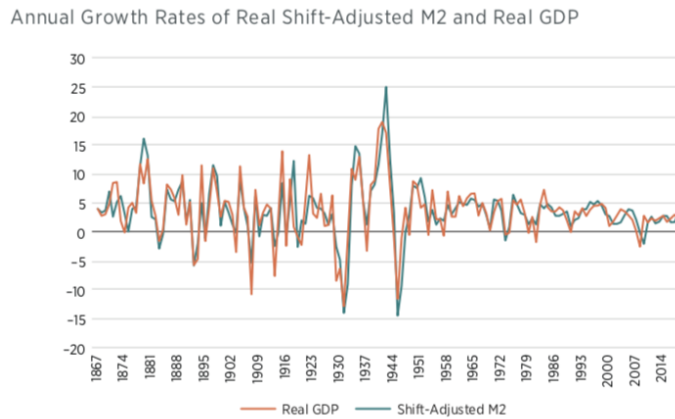
Indeed, history may provide useful insights, but it is important to remember that previous events do not prohibit their repetition, as illustrated by the current situation. The United States saw an exceptional spike in its M2 money supply in 2020, with yearly growth rates above 20%. While money supply expansion has eased in 2021, yearly growth rates remain well over 10%. As a consequence, M2 is currently more than 36 percent greater than it was at the end of 2019. This recent surge has led Ireland (2022) to reconsider what lessons we can learn from the past, particularly the work of Friedman and Schwartz.

Given the premises, a technique for estimating the long run velocity was created and a study was conducted, based on comparing the real M2 growth to the shift adjusted M2 growth (meaning M2 adjusted for trend velocity shifts). Indeed, one must bear in mind that, according to Friedman, velocity was a function of a number of factors, hence it could not be constant. The graph below depicts the drop in M2 velocity from 1867 to World War II, emphasizing that the period of constant M2 velocity, from the 60's to the 90's, is an exception, rather than the norm.



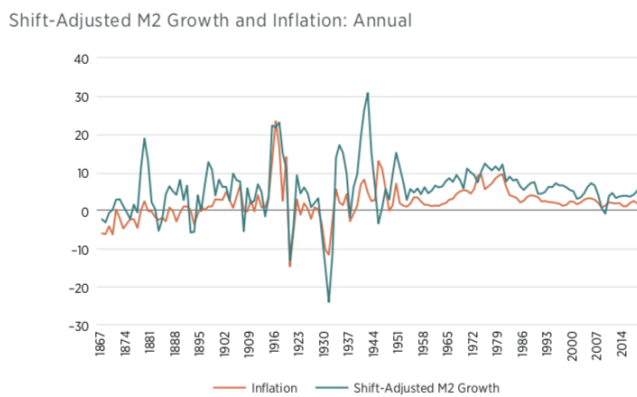
Source: Ireland (2022)

From 1867 to the present, the following graph shows a close link between real shift adjusted M2 growth and real GDP growth.



Source: Ireland (2022)

The last figure indicates that periods of inflation, such as during World War II, are associated with fast expansion in the shift adjusted M2 growth. In addition, the graph depicts instances of disinflation, for instance after WWI and the subprime crisis.



Source: Ireland (2022)

The main message is that the recent considerable rise in M2 is expected to contribute to future inflation, reflecting Friedman's previous remarks about the role of money supply growth in determining economic outcomes. This result emphasizes the need of carefully considering money supply dynamics in current monetary policy talks.

Uncertainty and Money Demand: A Modern Perspective with Insights from Friedman

As previously noted, Friedman's examination of money demand acknowledged the role of uncertainty in shaping individuals' propensity to hold money.

The study "Milton Friedman, the Demand for Money, and the ECB's Monetary Policy Strategy" by Hall, Swamy, and Tavlas (2012) considers a theoretical framework that incorporates the influence of uncertainty on the demand for money. This concept was initially introduced by Friedman and is important because it shows, through empirical evidence, how uncertainty has affected the demand for money over time. This is of particular significance during periods of economic fluctuations, emphasizing the importance of a reliable money demand function and the role of monetary analysis in predicting future price movements. The study also presents new empirical findings on the stability of money demand in the euro area, using two different approaches.

The initial approach employed is the Vector Error Correction (VEC) method, which serves the purpose of testing cointegration and constructing a dynamic system of cointegrated equations. The purpose of this method is to ascertain the variables that collectively establish a consistent long-term relationship, and if such a relationship exists, the variables are said to be cointegrated. The presence or absence of cointegration is a determining factor in establishing the viability of money demand functions. Cointegration is formulated within a linear framework, thereby limiting its ability to accommodate non-linear functional forms.

The second method includes two techniques, specifically generalized integration and TVC (Time Varying Coefficient) estimation. The underlying theory for both of these concepts is that every non-linear functional form may be represented by a linear model with TVCs.

Two underlying presumptions form the foundation of the TVC. Initially, we assume a system of stochastic linear equations provides driver variables. Additionally, certain drivers show misspecification correlation, while others show temporal fluctuation due to nonlinear functional forms.

The following variables are used in the study: Real money balances are represented by M3 (broad money) divided by the GDP deflator; real income is represented by real GDP; and the opportunity cost of holding money is represented by the difference between the long-term interest rate and the rate of return on M3. The rate on German national bonds with a 10-year maturity is known as the long-term interest rate.

The ECB staff calculated the rate of return on M3. The time periods for estimation are the pre-crisis sample, which spans from 1980:Q1 to 2006:Q4, and the complete sample, which spans from 1980:Q1 to 2009:Q4. There are two types of wealth series: financial wealth and housing wealth. These series have been included and are provided annually. There are several similarities between Friedman's research on money demand and the research being discussed:

- (i) Friedman stressed uncertainty, which could extend money demand equilibrium deviations. Measuring uncertainty using a confidence time series, it has been confirmed that it affects the money demand function.
- (ii) Cointegration implies long-term relationships. Since Friedman didn't use a lagged dependent variable to capture adjustment costs, which became common in the 1960s, his money demand empirical work was long-run. The time series he discusses spans over extended durations and incorporates the utilization of average variable values to remove the influence of the business cycle.
- (iii) Friedman highlighted the relevance of wealth in the money demand function, using permanent income as a proxy for wealth since there was no long-run wealth series at the time. The findings of the study demonstrate that wealth plays a crucial role in the money demand function.

To summarize, these findings suggest that the economic downturn from 2007 to 2008 caused a notable decline in confidence, causing a transition towards keeping money on hand. The rise in the euro area's real M3 during the mentioned period may be attributed to decreased confidence levels, which caused a greater demand for money, rather than being a consequence of an expansionary monetary policy. Due to the tendency of confidence to revert to its mean, the significant increase in confidence seen in 2009 led to a decrease in real M3 balances. Hence, the findings underline the importance of employing money demand research within a medium- to long-term framework.

CH. 2: Monetary Policy, Inflation, and Quantitative Easing: Interactions and Implications

2.1 The Evolving Monetary Policy of the ECB and the Introduction of Unconventional Tools

The Evolution of the ECB Policy Over Time

Before discussing the evolution of the ECB over the past decades, it is necessary to introduce the two-pillar approach, which consists of the economic pillar and the monetary pillar. The short- to medium-term price developments are examined by the economic analysis, with an emphasis on the influence of real activity and cost factors on prices in these time frames. On the other hand, monetary analysis investigates the long-term linkages between money and prices, providing an additional evaluation of the results reached from economic analysis in the short term.

The ECB first established its monetary policy framework based on two primary pillars: the monetary pillar and the economic pillar. Over the course of time, there has been a transformation in the significance attributed to these fundamental principles, and in recent times, the ECB has embraced a more comprehensive perspective. The subject matter may be divided into three distinct stages.

The first phase, spanning from 1999 to 2003, is characterized by a notable focus on the monetary pillar. Upon its establishment in 1999, the ECB put considerable emphasis on the monetary pillar within its policy framework.

The monetary pillar mostly depended on monetary aggregates, namely the growth rate of the broad money supply (M3), as significant indications of inflationary pressures.

The primary objective of the ECB was to maintain price stability via the diligent monitoring of money supply growth and using it as a key indicator for making informed choices on monetary policy. Nevertheless, throughout this timeframe, several scholars contended that placing exclusive emphasis on the monetary aspect was too limited and failed to provide a holistic understanding of the multifaceted elements that shape the economy.

The second phase, spanning from 2003 to 2011, is characterized by a notable focus on the economic pillar, marking a departure from the principles of Friedman monetarism. Over the

course of time, the ECB gradually redirected its focus from the monetary pillar to the economic pillar. The economic pillar encompasses a wider range of economic data, such as GDP growth, employment levels, and different inflation measures, in order to evaluate the overall economic condition. The change in focus may be attributed, in part, to the acknowledgement that monetary aggregates were losing their reliability as indicators within a dynamic financial environment. The ECB sought to modify its policy framework in order to effectively tackle economic difficulties that extend outside the scope of inflation targeting.

The beginning of the third phase occurred in 2011, signifying a discernibly more equitable approach. In recent years, the ECB has implemented a more comprehensive and cohesive strategy that incorporates aspects from both the monetary and economic dimensions.

The ECB now incorporates a diverse array of economic and financial considerations into its decision-making process regarding monetary policy. This includes the analysis of monetary aggregates, economic indicators, and movements within financial markets. This method enables the ECB to exhibit more adaptability in addressing dynamic economic circumstances and complexities. The ECB has enhanced its communication strategy by adopting a more open approach in conveying its policy choices and the underlying logic. This increased transparency allows for a deeper understanding of the comprehensive analysis that informs the ECB's actions.

In brief, the ECB has undergone a progression in its monetary policy approach, transitioning from an early concentration on the monetary pillar to a subsequent phase of heightened attention to the economic pillar, and finally arriving at a more balanced and complete approach. The history described above might be seen as the ECB's acknowledgment of the need to take into account a wider range of variables while pursuing its fundamental objectives.

Unconventional Monetary Policy Tools and Quantitative Easing

Quantitative Easing (QE) is an unconventional monetary policy instrument employed by central banks to boost the economy when conventional measures, such as interest rate reductions, exhibit diminished efficacy. The process, introduced in the aftermath of the 2008 financial crisis, entails the acquisition of financial assets by the central bank. The objective of QE is to augment the monetary base, reduce long-term interest rates, and stimulate borrowing and spending with the intention of enhancing economic activity.

Besides QE, there are numerous ways to increase the money supply in the economy, as well as a wide variety of unconventional methods, such as the ones listed below.

- (i) Credit easing: The Fed purchases long-term government bonds and securities from private financial organizations to shift its holdings towards riskier assets. Credit easing enhances the Fed's holdings of long-term non government securities like mortgage-backed securities. As a result, it purchases mortgage-backed securities instead of short-term government bonds. It is known as credit easing because it aims to transfer credit into markets, bypassing banks. It is also known as qualitative easing because the Fed changes the quality of its assets. Credit easing, unlike QE, aims to change the purchases of assets. The purpose is to eliminate difficult-to-trade assets from financial businesses, lowering the quantity of risky assets owned by financial firms.

- (ii) Operation twists: They entail the purchase of long-term Treasury bonds and short-term Treasury bills without the creation of new money. Operation twist adjusts the Fed's portfolio like credit easing, but without buying private securities. It lowers long-term interest rates, not private banks' risk. The goal is to "twist" the yield curve. The instrument was created to address fears that QE would increase inflation by expanding the monetary base. The Fed offset its long-term bond purchases with an equal quantity of short-term bonds under operation twist. Short-term bond sales raise interest rates and flatten the yield curve.

- (iii) Pre-commitment policy: Another unconventional monetary policy followed by the Fed was the pre-commitment policy, which consisted of a commitment to continue a policy for an extended period of time. In 2011, the Fed pledged to maintain a Fed funds rate close to zero through 2014. For bond and stock investors, this was of utmost importance.

For instance, when considering the case of England, in March 2009 the Monetary Policy Committee (MPC) decided to lower the federal funds rate by 0.5% and to implement QE. With the Bank Rate near to zero, asset purchases should stimulate nominal spending further and help achieve the inflation target. In order to meet the inflation target, this entails purchasing assets from the public and private sectors with central bank funds to infuse money into the economy and stimulate nominal spending further. Typically, the MPC implements monetary policy through the establishment of the bank rate. However, the introduction of asset

purchases shifted the emphasis of monetary policy. Because a restrictive monetary policy will be implemented if inflation is anticipated to exceed the goal level and vice versa, the inflation target is symmetrical.

The bank rate, when set by the MPC, has an impact on the price of borrowing. Banks keep central bank money as reserves balances at the Bank of England (BoE) and earn bank rate interest on these reserves. The banks can decide whether to lend or keep them. The obtaining of possessions is basically an extension of conventional financial policy actions. Usually, the Bank of England (BoE) supplies reserves when banks request them. The bank aims to impact the amount of money in the economy by adding more reserves while buying assets. Next, the interest rates in the market will be affected by both the bank rate level and the amount of reserves that the bank adds to the economy.

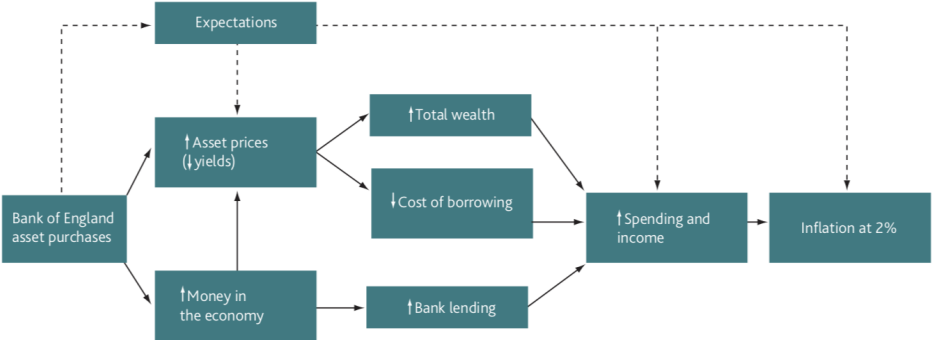
QE's purpose is to infuse money into the economy in order to boost spending. The bank obtains financial assets from individuals and businesses. When the bank buys these assets using new bank money, it increases the amount of bank money held by banks and the amount of deposits held by households and companies. To facilitate transactions between financial institutions, these balances are utilized. Banks credit each other's reserve accounts with the extra funds they make electronically when they buy an asset from another bank. This leads to an increase in the central bank's money supply.

Commercial banks utilize customer deposits to obtain services or assets, thereby categorizing these deposits as broad money. When the BoE purchases an asset from a non-banking firm, it does so by paying the seller's bank via the seller's bank, which then deposits the money into the seller's bank's reserve account. This means that non-bank asset purchases grow both the monetary base (narrow money) and broad money, while bank purchases boost narrow money. The QE transmission mechanism uses broad money expansion. It should boost asset prices and expenditure to target inflation.

Rapid capital injection needs assets for purchase. Examples include corporate bonds and commercial paper. By willingly buying corporate credit securities, these purchases aim to enhance the market. Money injection for other assets boosts private sector balance sheet liquidity. This is the major effect of expansionary monetary policy on inflation and spending. Money is liquid because it may be swapped for goods and services.

Increased liquidity in the private sector is reliant on the liquidity of the assets that are traded for cash. There are numerous channels through which high liquidity can have an effect.

Expectations, asset prices, and bank lending are the three primary channels, as shown below:



Source: Benford et al. (2009)

- (i) Asset prices: Acquisitions of assets supported by the central bank's money supply should raise asset values, cutting yields and lowering borrowing costs for households and companies, resulting in higher spending. Easy working capital access should assist firms retain production and jobs. Increased asset prices boost asset owners' wealth and spending. Financial companies gain cash reserves and deposits when they sell assets to banks. Companies and households may be incentivized to switch to higher-return assets when prices increase and the bank's assets' yields decline. The bank encourages people and businesses to hold illiquid assets by increasing liquidity.
- (ii) Bank lending: As stated previously, asset purchases lead to increased reserve balances at the BoE. These reserve injections make it simpler for banks to finance more liquid assets, so when they buy assets from non-banks, they get new reserves and customer deposits. Additional liquid assets attract additional lending. Increased bank lending to both companies and households should boost consumption. Even if banks do not expand lending, the additional reserves help to reduce the interest rate they pay to borrow from one another. Bank lending creates deposits that are transferred to other households and businesses, as they are spent. If their money balances rise over their targeted level, they may buy additional products, raising nominal spending and inflation.
- (iii) Expectations: Theoretically, asset purchases have a significant impact on expectations. Higher inflation expectations could have an impact on how businesses set prices, which would have a more immediate effect on inflation. A perceivable improvement in economic prospects is likely to increase confidence in general.

As a result, how households and businesses react to changes in their cash holdings and asset prices will ultimately determine how asset purchases affect spending overall. Reduced interest rates may encourage companies to spend more since borrowing money would be more affordable. The level of demand for their items will, however, also have an influence. Household spending may change as asset values increase, based on how durable they are. Spending will be more significantly affected if households believe asset prices will stay high.

2.2 The implementation of QE during the 2008 Financial Crisis and the Pandemic

To begin discussing the practical application of QE and its actual impacts, I will consider three scenarios: mainly the Euro area, then the United States and the United Kingdom for a brief comparison. These examples pertain to the period of global financial crisis of 2008, with the exception of the Euro area, where the actual implementation of QE occurred later, despite the presence of already existing asset purchasing programs.

Considering the three previously listed scenarios, it will also be discussed QE within the framework of the pandemic and the subsequent circumstances. However, the current section will not address this particular matter.

ECB's Response to 2008 Financial Crisis and the Following Implementation of QE

The ECB's response to the financial crisis can be divided into four periods: financial turmoil, intensification, temporary improvements, and sovereign debt crisis.

The first phase started in August 2007. August 9, 2007 witnessed the manifestation of global interbank market tensions, which reflected the financial uncertainty experienced by market participants. The ECB allowed banks in the euro area to take out as much liquidity as they needed on the same day to avoid any disruptions in the euro money market. The ECB modified intra-maintenance liquidity supply pattern to help banks front-load reserves in the first half. Activities focused on fine-tuning were put in place to make sure that short-term money market rates remained in close proximity to the primary refinancing rate set by the ECB. The ECB responded to the volatility in the foreign currency market by offering US dollar liquidity in exchange for collateral denominated in euros. The ECB increased its benchmark interest rate by 25 basis points to 4.25% in July 2008 due to risks of price stability in the medium term caused by shocks.

The global financial crisis began on September 15, 2008, when Lehman Brothers collapsed. The second phase began when several financial markets collapsed due to uncertainty, generating the real sector crisis. The ECB cut rates and took non-standard measures. On October 8, the policy interest rate was reduced by 50 basis points in collaboration with other institutions, including the Bank of Canada, the Fed, the Bank of England, the Swiss National Bank, and Sveriges Riskbank. After a couple of months, the ECB made a decision to lower the interest rate on its primary refinancing operations by 325 basis points, bringing it down to 1%.

The Governing Council adopted the "enhanced credit support" measures in order to guarantee that the monetary policy stance was reflected in actual money and credit market conditions. These measures included fixed rate full allotment tender procedures, in all refinancing operations, which guaranteed the provision of unlimited central bank liquidity to eligible financial institutions in the euro area at the main refinancing rate, as well as supporting banks' short-term funding requirements in an effort to increase the availability of credit at affordable rates to households and businesses. Six-month refinancing operations were also announced by the ECB. Maturities were raised to a year in May 2009 in an effort to improve bank liquidity.

In addition to these steps, the Euro System provided foreign currency liquidity, primarily in the form of US dollars. In May 2009, the ECB planned a 60€ billion attempt to revive the eurozone covered bond market by June 2010.

In 2009, signs of stability were observed during the third phase. Although loans to non-financial corporations continued to decline, the policy measures effectively aided in maintaining the availability of credit for the real economy. In December 2009, the Governing Council made an announcement stating that they would gradually eliminate nonstandard measures. Most operations consisted of repurchase agreements, which have the option to be terminated by not extending their duration. The Euro System also decided that the LTRO for that month would be the final one with a twelve-month maturity. They also mentioned that there will only be one more six-month LTRO and that three-month LTROs will no longer be conducted.

Eurozone government bond market concerns started phase four in 2010. Euro area governments took action on May 9 and 10 after spreads accelerated in April 2010.

On 10 May, the ECB intervened in public and private debt securities markets to stabilize volatile markets. Fixed-rate tender with full allocation was reinstated by the ECB. Tensions lessened until spreads widened after these May 2010 statements.

The ECB developed several initiatives for the purchase of securities: the Covered Bond Purchase Programme (CBPP), introduced in June 2009, followed by the CBPP2 in 2011; the Securities Market Programme (SMP), launched in May 2010 as a response to pressure on sovereign debt markets (this is not considered QE since the balance sheet of the ECB has not seen any increase); the OMT (Outright Monetary Transactions) program, announced in September 2012, designed for purchasing sovereign bonds; ABSPP (Asset-Backed Securities Purchase Program) and CBPP3, both announced in 2014.

In 2014, unconventional measures were taken to increase liquidity, reduce the inflation gap, and improve monetary policy transmission. To address monetary policy transmission mechanism deterioration, TLTROs, ABS, and CBPP3 were deployed. The inflation gap between the ECB's objective and rising inflation was addressed via broad asset purchases. Since June 2014, unconventional measures focused on corporate securities acquisition, bypassing banks. However, QE was not yet announced. Since the crisis began, the governing council prioritized lowering the marginal lending rate, deposit facility rate, and main refinancing operations rate in order to stimulate the economy and fight slow growth and disinflation. While the other two interest rates were held close to zero during this period, the deposit facility rate was set below zero.

Since changing interest rates didn't help the economy grow, the ECB put in place a program similar to those used in the US and UK.

In January 2015, the ECB expanded the program to include sovereign, supranational, and agency bonds and changed the pricing of the remaining six TLTROs. The program was compared to the Fed's 2012 third QE phase, due to its scope. On January 22, 2015, the ECB launched its Expanded Asset Purchase Program (EAPP), or QE, to boost the economy.

It is essential to remember that the ECB's monetary policy framework has historically been influenced by a monetarist approach, with an emphasis on money supply growth and a focus on price stability. This approach initially made the ECB hesitant to embrace unconventional measures such as QE, and it is likely for this reason that the ECB was one of the most recent central banks to adopt it, years after the U.S. and the U.K.

The ECB planned to acquire euro-denominated investment grade securities from euro area governments and institutions as part of its EAPP buying programs. According to the information, the 18-month project was scheduled to begin in March 2015.

The acquisition was subject to the distribution of shares among national central banks in the ECB's capital key, denominated in euros. The acquisitions were to be made through secondary market transactions, and the amounts acquired were not to exceed one-third of the total debt issuance of a particular nation.

As mentioned before, in response to the 2008 financial crisis and subsequent economic downturn in the United States, the Federal Reserve implemented a succession of QE programs. These programs, known as QE1, QE2, and QE3, involved substantial asset purchases aggregating \$4.5 trillion, or 25 percent of the GDP. Despite initial optimism regarding their impact, subsequent phases of QE exhibited diminishing returns. QE effectiveness was influenced by QE fatigue, inflation expectations, and its impact on risk premia. In addition, QE initially resulted in a depreciation of the exchange rate, which benefited exports but could have led to declines in asset prices.

On the other hand, the Bank of England (BoE) implemented QE in the United Kingdom from 2009 to 2014, purchasing assets aggregating £375 billion. The estimated impact on GDP growth was 3%, while the impact on inflation was minimal. Studies indicated a delay in QE's effects on the economy, emphasizing the need for perseverance when implementing such policies. While QE indirectly increased economic inequality by benefiting the wealthy, it helped stabilize financial markets and prevent abrupt declines in asset prices.

Central banks' asset purchases in response to the Covid-19 crisis

At the beginning of 2020, the worldwide spread of the COVID-19 virus, along with the introduction of containment measures, triggered a decline in economic conditions and a surge in economic uncertainty.

In response to the impact of the COVID-19 pandemic, the ECB launched the Pandemic Emergency Purchase Program (PEPP) in March 2020. The ECB continued its asset buying program. The initiative aimed to reduce monetary policy transmission risks and boost financing conditions by injecting more monetary policy accommodation.

To achieve these goals, the scheme allowed for flexible changes in purchasing speed and mix as the pandemic progressed. A public sector acquisition program was also implemented. The PEPP application was discontinued in March 2022, and net purchases made through the APP were canceled on July 1, 2022. Since then, the interest rate has emerged as the primary tool for conducting monetary policy.

As for the other mentioned countries, both the United States and the United Kingdom implemented significant monetary policy measures. The Federal Open Market Committee (FOMC) in the U.S. reduced the federal funds rate target range by 1.5 percentage points to address the financial crisis and it expanded its securities and agency mortgage-backed securities (MBS) portfolio to support Treasury and MBS markets. The announcement was made regarding the plan to maintain Treasury securities purchases at market-efficient levels. The Fed's asset holdings increased from \$4,312 billion in March 2020 to \$8,965 billion in April 2022 due to acquisitions of agency MBS and Treasury securities. In May 2022, the Fed announced a plan to gradually reduce its balance sheet, changing the amounts reinvested from principal payments received from securities held in the System Open Market Account.

The Bank of England (BoE) responded quickly as well, by announcing in March 2020 that they would increase the stock of acquired assets by £200 billion. Indeed, it increased the envelope of its asset purchase facility three times, with a total of £895 billion.

It also stated its commitment to increasing its corporate bond holdings to at least £20 billion. The BoE then outlined its strategy for unwinding asset purchases in August 2021.

In September 2022, a financial stability operation was initiated. It involved the purchase of long-term UK government bonds. Additional actions were announced in October 2022, reflecting ongoing efforts to address economic challenges.

2.3 The actual Efficacy of QE after the 2008 Financial Crisis

The efficacy of QE continues to be a subject of scholarly debate. Advocates contend that it has had favorable outcomes across several facets of the economy. QE aims to foster economic expansion, stabilize financial circumstances, and mitigate the risks associated with deflation by means of injecting liquidity while promoting financial markets.

Comparison with the United States and the United Kingdom

As previously stated, the ECB initiated QE in the Eurozone in March 2015. In the meantime, the United States began its QE journey in response to the global financial crisis of 2008. The Federal Reserve conducted three QE phases, totaling more than \$4.5 trillion in asset purchases. The United Kingdom also instituted QE in 2009, when the BoE purchased assets worth £375 billion.

QE initiatives had a significant impact on financial markets in all regions. QE reduced long-term interest rates and bond yields in the Eurozone. The positive reaction of stock markets to QE announcements contributed to the overall financial stability. Similarly, in the United States, QE significantly reduced long-term interest rates and fueled stock market rallies, playing a crucial role in stabilizing financial markets following the crisis. Similar effects were observed on the financial markets of the United Kingdom, with QE driving down long-term interest rates and enhancing market stability.

The effects of QE on economic expansion varied by region. It contributed to economic expansion in the Eurozone, albeit to varying degrees across member states. During the QE period, GDP growth indicators improved.

In the United States, it had been crucial in fostering economic recovery after the financial crisis, with GDP rising again. Similarly, in the United Kingdom, QE boosted economic growth, as evidenced by a 22 percent increase in GDP during the QE period.

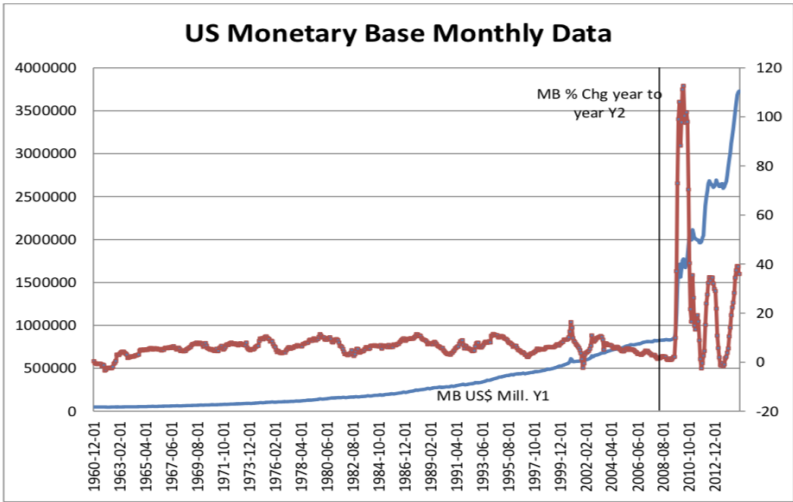
The effect of QE on inflation and inflation expectations was significant. During the QE period, inflation in the Euro area frequently remained below the ECB's target. Nonetheless, QE was instrumental in preventing deflation and stabilizing inflation expectations. In the United States, QE had conflicting effects on inflation, but it helped anchor inflation expectations. The United Kingdom experienced minimal inflation effects attributable to QE, similar to the United States and the Eurozone.

In all regions, QE had an indirect impact on the distribution of income, with some benefits going to the wealthiest segments of the population. As a result, income inequality concerns arose. However, the significance of QE was highlighted by its role in stabilizing financial markets and preventing sharp declines in asset prices.

The stabilization of financial markets was one of the consistent achievements of QE across regions. QE played a significant role in sustaining financial stability in the Eurozone, especially during periods of economic uncertainty and market volatility. Similarly, QE in the United States and the United Kingdom contributed to financial market stability and increased liquidity. In the following section, we will examine the actual impact through the lens of data.

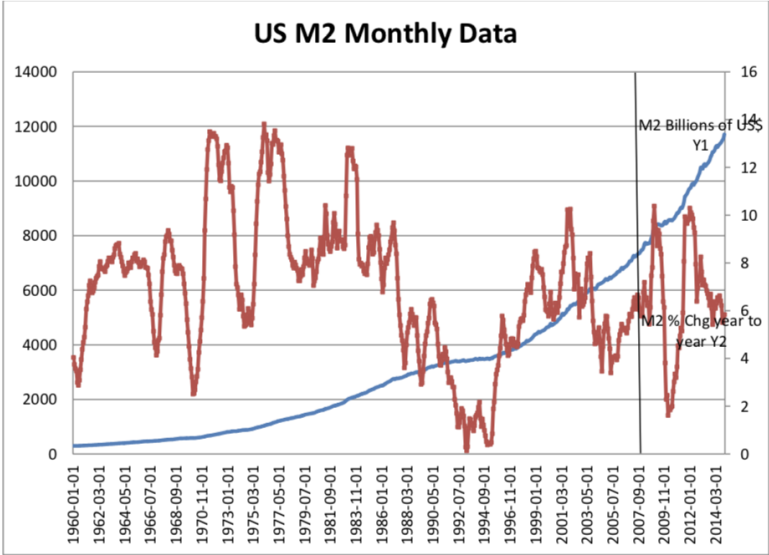
More precisely, Olivo (2015)'s research gives key insights for all three mentioned regions (the US, the UK, and the Eurozone) in terms of the effects of QE on M2 growth rate and volatility, as his work attempts to analyze QE from a monetarist, and close to Friedman's, perspective, since Friedman's economic theories, particularly his framework for expansive monetary policy during times of financial crises, have garnered attention in the context of QE. This evaluation is based on monthly data of the monetary base and M2, both in levels and year-to-year percentage changes.

In the United States, after the collapse of Lehman Brothers, the Federal Reserve initially concentrated on lowering the federal funds rate. The figure below shows an increase in the monetary base in 2008, followed by fluctuations. QE2 was announced in November 2010, but the actual increase in the monetary base began in March 2011, followed by a decline in December of the same year, reaching negative values by June 2012. Following the announcement of QE3 in September 2012, the rate of growth of the monetary base gradually accelerated, only to fall in the last two months of 2014.



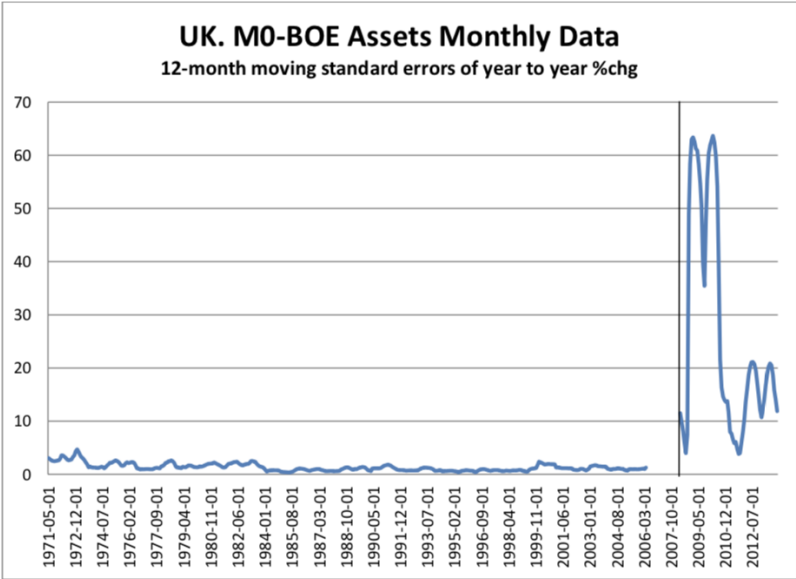
Source: Olivo (2015)

The second graph presents M2 data, indicating that before 2008, M2 grew steadily between 5.5% and 7%. After 2008, it exceeded 7% but slowed down in July 2009, reaching values below 2%. The Fed's QE programs prevented a significant decline in M2 after 2008. However, they did not maintain its rate of growth, which declined during QE implementation and increased afterward, affecting its volatility.



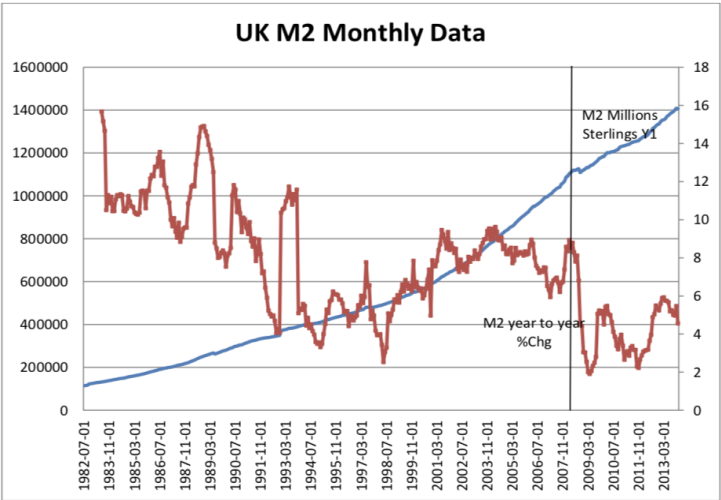
Source: Olivo (2015)

As for the United Kingdom, the increase in total assets resulted in volatility, which decreased in 2010 but started rising again.



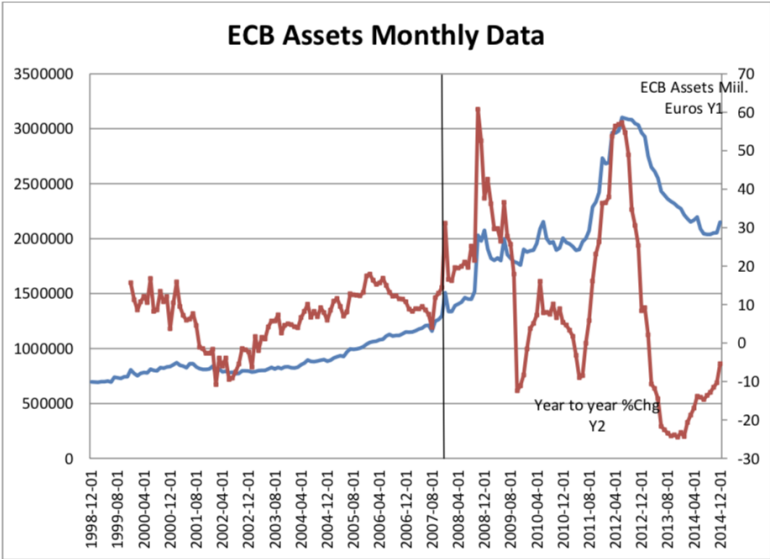
Source: Olivo (2015)

The graph below displays the evolution of growth rates for M2, which grew steadily between 2001 and 2006, slowed down in the early months of 2007, and accelerated at the end of that year. After September 2008, M2 decreased, recovered but at lower rates compared to pre-2008 levels. In 2013, it fell again, failing to regain its previous year-to-year growth rate of above 7%. Therefore, QE in the United Kingdom did not maintain the growth rate of M2 and influenced its volatility.



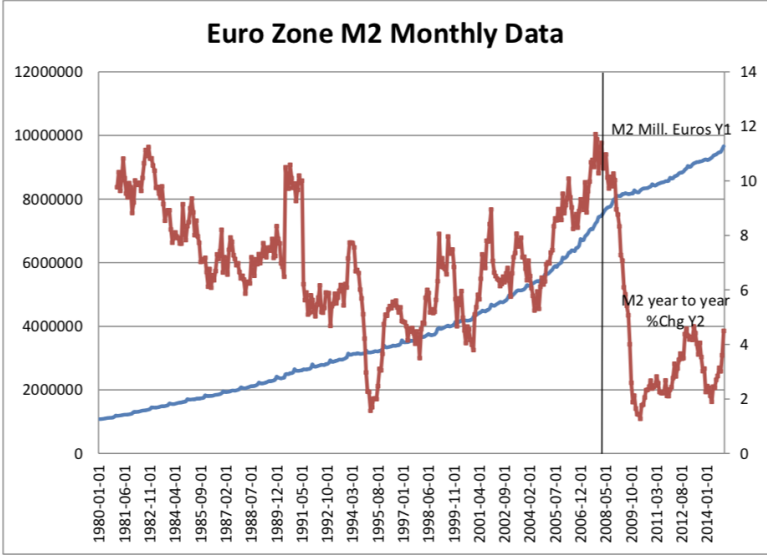
Source: Olivo (2015)

For the Euro area, there was pre-existing instability in the balance sheet of the ECB before QE. As shown below, this instability worsened, particularly in 2008 after the ECB's first asset purchase measures were announced, resulting in a sharp rise in the year-to-year rate.



Source: Olivo (2015)

Moreover, in the subsequent graph, it is evident how M2 grew above 5% until August 2009 but started decreasing in September of the same year, reaching values under 2% in 2010. Although it began increasing in mid-2010, it did not reach the previous growth levels, and the volatility of the M2 series worsened. Hence, QE in the Eurozone led to an increase in volatility rather than stabilizing the rate of M2 growth.



Source: Olivo (2015)

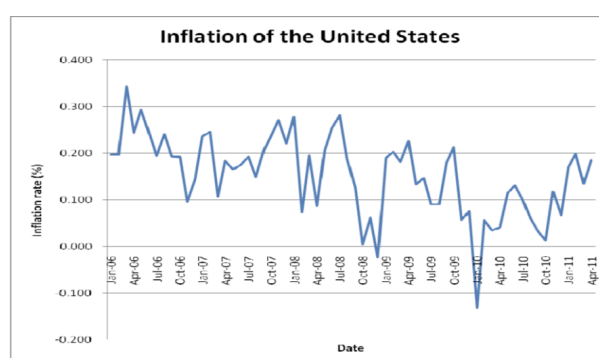
From this analysis one can conclude that in the United States, QE programs, initiated after the 2008 financial crisis, prevented a significant decline in the monetary base and M2 but did not maintain the steady rate of M2 growth. Instead, it influenced volatility in the money supply. The United Kingdom's experience with QE also showed a similar trend, with QE not preserving the growth rate of M2 and impacting its volatility. In the Eurozone, the introduction of QE exacerbated pre-existing instability in the ECB's balance sheet, leading to increased volatility in monetary variables like M2. Therefore, in this case the impact of QE appears to vary across different regions, and its ability to stabilize the rate of money supply growth is questionable.

Evaluating the Efficacy of Quantitative Easing: Additional Insights

According to numerous studies, even though it was a hazardous decision, QE was beneficial. Balatti et al. (2017), a study analyzing the efficacy of QE in both the United States and the United Kingdom, demonstrated that it did have a positive effect on the economy by analyzing both macroeconomic and financial variables, and that the Fed's program had a greater impact than the one in the United Kingdom.

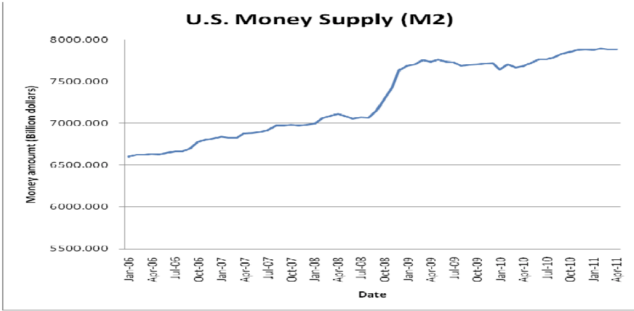
In a study conducted by researchers affiliated with the BoE in 2014, it was observed that asset purchases had a positive impact on real GDP in both the United States and the United Kingdom. Specifically, the findings indicated that asset purchases equivalent to one percent of GDP in the United States resulted in a 0.36% increase in GDP and a 0.38% increase in the Consumer Price Index (CPI). Similarly, in the United Kingdom, the study revealed a 0.18% rise in real GDP and a 0.3% increase in the CPI as a result of asset purchases.

Another important study is the one by Yue et al. (2011), which shows that, despite an increase in money, QE did not contribute to inflation. The chart below demonstrates that inflation is lower after the implementation of QE, as opposed to the period preceding it. The drop in inflation has been attributed to the reduced lending by the banking system to the private sector, which is evident from the decrease in bank loans to the private sector after the crisis. However, a more detailed explanation will be provided later.



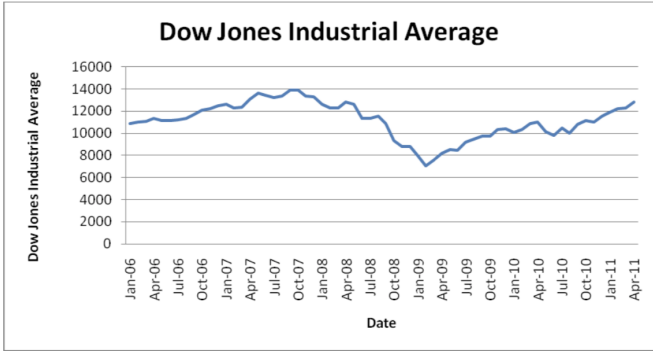
Source: Yue et al. (2011)

This finding holds true, despite the fact that monthly data for M2 in the United States show a 17.3% rise in money supply following QE1, as shown in the following graph:



Source: Yue et al. (2011)

In contrast to the QTM, this research demonstrates that an augmentation in the money supply does not inevitably lead to a corresponding increase in the price level. The study also demonstrates how the increased money supply had no effect on the real economy, as it appears to have helped to the improvement of the investment market, reflected by the Dow Jones Industrial Average, shown below:



Source: Yue et al. (2011)

However, while current research has shown beneficial outcomes associated with the implementation of QE, it is crucial to acknowledge the existence of other studies and arguments that cast doubt on its efficacy and potential constraints.

Firstly based on theory, and subsequently on empirical evidence as well, QE is associated with an increase in housing prices, and more generally, in asset prices. QE should

lower long-term interest rates and stimulate spending, but it influences housing prices through lower interest rates and stimulated demand, because with QE, asset prices rise and interest rates fall. Additionally, financing, including mortgages, becomes more affordable. Therefore, as the cost of borrowing decreases and borrowing increases, the demand for housing increases. At the same time that government bonds offer a lower rate of return, investors turn to the real estate market, thereby increasing investment demand and property prices. As stated previously, as asset prices increase, people become more confident and spend more. This will then result in a wealth effect; however this will be further explained afterwards, based on empirical evidence.

Moreover, QE is associated with wealth inequality because it leads to asset price inflation, wealth accumulation, and income inequalities, as wealthy individuals are more likely to pursue policies that serve their own interests. In addition to these theoretical assertions and potential outcomes, a number of criticisms have been raised over time; nevertheless, they can be challenged.

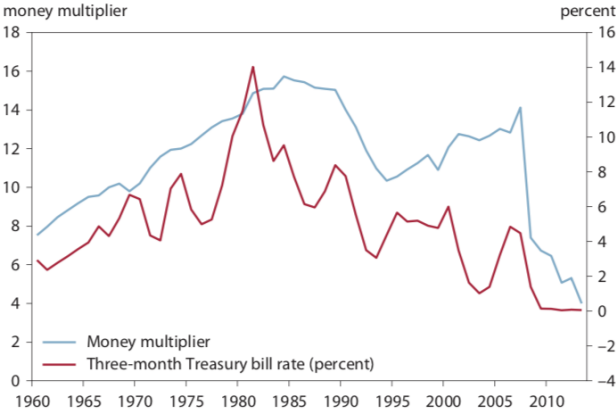
First, QE does not involve 'creating money,' although it may increase the money supply if managed properly. Since they cannot be utilized for spending, the reserves held by financial institutions at the Fed—which rose rapidly as a result of QE—are not regarded as money in the traditional sense. By the process of creating credit, banks are able to turn reserves and public deposits into money. They decide to maintain larger reserves, nevertheless, in order to strengthen their balance sheets.

Another common misconception regarding QE, as mentioned above, is that it promotes inequality. The income inequality is blamed on QE. QE boosts asset prices by increasing GDP and inflation. However, evidence implies that contractionary rather than expansionary monetary policy shocks enhance inequality. Furthermore, the ECB's QE did decrease eurozone inequality by rising wages and decreasing unemployment. The BoE found that "the majority of [UK] households have benefited from the accommodative stance of monetary policy" during QE. Across the economy, QE decreases inequality. The real economy and structural characteristics like income distribution are neutral to monetary policy over time.

The essay by Cline published in 2015, which investigates the characteristics of QE and the impacts it had on the theoretical level and the money multiplier, lends support to the unwanted

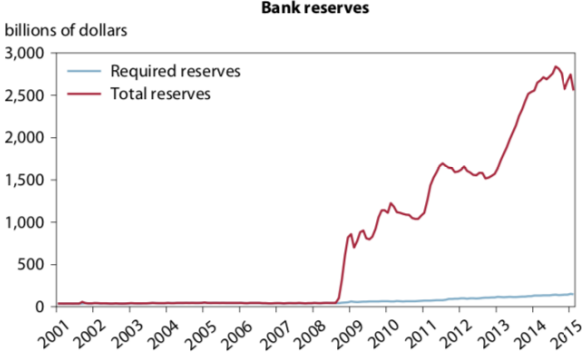
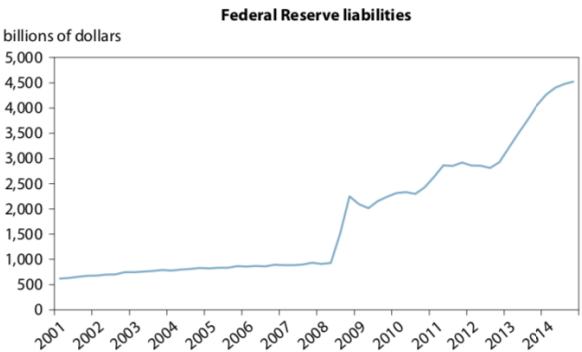
consequences of QE, as it demonstrates, via a theoretical explanation from the QTM, how QE caused the money multiplier to decline.

However, as big inflation has not occurred since the mid-1980s, QE poses minimal inflationary risk, observing that currency demand has declined as inflation rates have fallen, unlike the QTM, which connected rapid money growth to lower inflation. Due to a declining money multiplier, inflation has remained low, despite Fed balance sheet expansion.



Source: Cline (2015)

More specifically, as a result of QE, the money base (made up by central bank currency and reserves) increased. The Fed purchased longer-term Treasury bonds while banks accumulated excess reserves. In particular, the Fed began paying interest on reserves contributing to excess reserves in October 2008. Due to the financial crisis, this reform was expedited. The risk-free nature of excess reserves made them advantageous. Since 2007, the Fed's balance sheet increased by a total of \$4.35 trillion, while excess reserves increased by \$2.5 trillion, accounting for 70% of the balance sheet's growth.



Source: Cline (2015)

As previously stated, this rise in excess reserves restricted bank lending, as banks rarely used them. Clearly, this rise in excess reserves was not intended and has become the result of QE's unintended consequences. The sources of money creation and money expansion are deposits and non-reserves lending. Theoretically, the money multiplier, which is expected to connect money supply and money base, is on the order of $1/R$ and is influenced by interest rates, specifically the opportunity cost of holding money. Consequently, high interest rates discourage individuals from holding currency, thereby increasing the multiplier.

Due to QE and the increase in excess reserves, the multiplier experienced a shift. During the 1960s and 1970s, when interest rates and inflation rates were low, the multiplier was also low. During the period from 2007 to 2008, there was an increase in the money base multiplier due to QE and a significant amount of excess reserves. At the same time, the money multiplier was reduced by half, going from 14 to 7. This can be discussed further on a theoretical level. Broad money, M , can be represented by the product of money base, MB , and money multiplier, mm ; as previously pointed out, V is considered constant, therefore:

$$(MB \times mm)V = PQ$$

Due to monetary policy and the financial crisis, there were significant repercussions between 2007 and 2013. The money multiplier declined by 71%, from 14 to 4, while the velocity decreased by 10%, from 1.26 to 1.13. Therefore, dividing broad money into the product of the money base and the money multiplier indicates that the decrease in the multiplier, and not the velocity, was responsible for the lack of monetary inflation forces. During the same period, 2007-2013, however, broad money increased by 30% to \$1.49 trillion. Without banks' huge reserves, the multiplier would not have decreased, and money expansion would have been quickened.

When the economy returns to normal, the Fed is likely to boost interest rates, with the rate of interest paid on reserves being the key driver. Lending rates would be linked to the rising reserve rate, representing lending opportunity cost for banks. However, banks might reduce excess reserves in order to expand loan portfolios. The money multiplier and reserve requirement ratio no longer match due to the Fed's asset growth. By 2014, broad money was four times the money base, down from fourteen in 2007.

To reconnect to the criticism and widespread myth mentioned previously, namely that QE increases housing prices and generally equity prices, the research by Huston et al. (2017) provided support for some of the already mentioned critiques, not theoretically but based on empirical evidence on the United States economy through two techniques: the Campbell and Schiller (1998; 2005) model, to estimate asset price overvaluation, and the GSADF (Generalized Supremum Augmented Dickey Fuller) technique by Phillips, Shi and Yu (2016), to identify increases featuring bubbles or potentially explosive.

The study entails a deep analysis on equity, housing and bond markets. Numerous central banks, such as the Fed, have employed aggressive monetary policies in recent years. The wealth effect from rising asset prices is one of the channels that these policies influence. It is crucial to recognize that these increases in asset prices may result in actual bubbles, causing real economic harm.

The Campbell - Schiller model provided proof of increases in stock prices in recent years, whereas the GSADF model fails to identify explosive patterns of price increases.

There was, in fact, a housing price inflation in the housing market from 2004 to 2008, as negative forecasts are identified. As prices fell sharply at the close of 2011, these pessimistic predictions vanished.

The bond market has also experienced an increase in response to the policies implemented by the Fed. Using a similar Campbell Schiller method gives negative predictions for the majority of the recovery period. The GSADF model detects a bubble in treasury bonds from 2011 to 2013 and once more close to the threshold in June 2016.

Conclusion

Throughout this discussion, it is evident that the QTM continues to exert significant influence in shaping our comprehension of the mechanisms via which monetary policy tools operate, particularly in the context of QE, and this is why it is crucial to explain the QTM when discussing QE, for multiple reasons.

First, QE is an unconventional and complex monetary policy tool. To comprehend its implications and potential effects on the economy, it is useful to have a foundational understanding of monetary economics' broader theories and concepts. QTM offers a theoretical framework for analyzing the relationship between money supply and economic variables such as prices and output. Moreover, despite the fact that QE involves direct central bank interventions in financial markets, it also has implications for the money supply.

Understanding the QTM enables one to comprehend the potential impact of QE on the money supply, and by extension, inflation and economic stability. This information can be beneficial for policymakers and economists evaluating the effectiveness and potential risks of QE.

On top of that, the potential impact of QE on inflation is one of the primary concerns associated with the policy. QTM is a theory that explicitly addresses the relationship between money supply and prices, making it relevant to the question of whether QE could contribute to inflationary pressures. Analysts can more accurately assess the likelihood of inflation resulting from QE measures by taking into account the QTM's assumptions and implications.

In conclusion, understanding the QTM in the context of QE is necessary, as it provides a theoretical framework, historical context, and significant insights for understanding how QE operates and its potential consequences on the economy.

QE is not only closely linked to the QTM, but also to Friedman's approach and his ideas of monetary policy. Indeed, the relationship between QE and Milton Friedman's monetary policy theories reveals both similarities and differences in their approaches to managing the money supply and affecting economic stability. While both emphasize the importance of the money supply, their methods and degrees of central bank discretion are distinct.

The principles of Milton Friedman emphasize the importance of controlling the money supply in order to maintain price stability and prevent inflation. His predilection for a fixed money supply growth rate demonstrates a rules-based and predictable approach to monetary policy. In contrast, QE involves active central bank interventions via the deliberate expansion of the balance sheet, injecting liquidity into the financial system in order to stimulate economic

activity. Although QE lacks the rule-based nature of Friedman's recommendations, the management of the money supply remains a key objective.

Friedman advocated for a systematic and predictable approach to monetary policy. While QE does not adhere to a fixed money supply growth rate, central banks implementing QE communicate their intentions through forward guidance in an effort to provide markets with predictability.

Additionally, Friedman's emphasis on money supply over interest rates is consistent with QE's direct targeting of the money supply. Both approaches acknowledge the influence of the money supply on economic outcomes.

Nevertheless, there are variations in terms of central bank discretion. Friedman favored monetary principles and limited central bank intervention, whereas QE involves active and discretionary actions by central banks in the financial markets.

Hence, while QE and Milton Friedman's monetary policy theories agree on the importance of the money supply, they differ in terms of discretion and rule-based approaches. In contrast to Friedman's recommendations, QE is a more active and discretionary form of monetary policy. Nonetheless, both agree that the money supply is crucial in determining economic conditions and stability.

During the 2008 Financial Crisis and the COVID-19 pandemic, the application of QE had notable and diverse impacts on the economies of the United States, the United Kingdom, and the Euro area. The central banks QE as an unconventional strategy to stabilize financial markets, boost economic growth, and address the threat of deflation.

During and after the 2008 financial crisis, the Fed executed multiple rounds of QE, substantially expanding its balance sheet. These actions assisted in stabilizing the financial markets and supplying liquidity. The effects on long-term interest rates and the economy were significant, resulting in a rise in asset prices. However, the effectiveness of subsequent QE phases became more nuanced, particularly in terms of promoting economic growth.

From 2009 to 2014, the BoE's QE initiatives contributed to economic recovery and increased liquidity on financial markets. The program had both positive and negative effects on income inequality, and its effect on inflation was moderate.

The ECB as well employed a variety of unconventional measures, including the introduction of QE. These measures were intended to resolve the Eurozone's financial turmoil, crisis

escalation, and sovereign debt concerns. The effectiveness of these measures varied, and the ECB's asset purchase programs had a significant impact on financial markets.

In response to the pandemic, central banks in these mentioned areas resorted to QE to support their respective economies. The Fed, the BoE, and the ECB all expanded their balance sheets to combat the crisis's economic repercussions.

However, studies on the effectiveness of QE have yielded contradictory results. While some studies suggest positive effects on the economy and financial markets, others emphasize potential negative consequences, such as asset price inflation and income inequality. The relationship between QE and inflation has been more complex than conventional economic theories would suggest.

There have been unintended consequences of QE, such as a significant increase in banks' excess reserves. This rise in reserves constrained the money multiplier and had repercussions for the broader money supply, confronting conventional theories.

Moreover, additional empirical evidence suggests that QE may have contributed to asset price inflation on the equity and bond markets, although the existence of bubbles is debatable.

In conclusion, the implementation of QE presents a complex paradox in the context of strict monetary targeting advocated by Friedman. While QE may deviate from the fundamental principles of monetary targeting, it has demonstrated short-term effectiveness in stabilizing financial markets and supporting economic recovery. However, it is crucial to recognize that this unconventional monetary tool should not be prolonged indefinitely, as it carries the risk of distorting financial systems and creating imbalances. This is why I hold the view that the implementation of QE is a measure that should not be routinely employed.

Rather, it should be reserved for exceptional circumstances and urgent situations within the realm of monetary policy. History has demonstrated that monetary targeting, as advocated by economists such as Milton Friedman, is an effective method for maintaining price stability and overall economic stability. Therefore, it would be imprudent to entirely give up the principles of monetary targeting in favor of unconventional monetary policies, such as QE, as sound monetary policy decisions should require a balanced approach that considers both the benefits and hazards of QE.

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