Classical Theory of Money

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1 Classical Theory of Money

1.1 Introduction

The classical theory of money is an approach in macroeconomics asserting that money primarily influences nominal variables (prices, wages) and has negligible effect on real economic activity (output, employment) in the long run. Classical economists often say "money is a veil", meaning that the system of money prices may obscure real economic relationships, but in reality the underlying real economy is unchanged by the quantity of money in circulation (Lewis and Mizen, 2000). This theory, rooted in the 19th-century Walrasian general equilibrium framework and the early 20th-century Quantity Theory of Money, underpins the view that sustained changes in the money supply lead to proportional changes in the price level, with real variables determined by real factors like technology and preferences. In this reading, we outline the classical model of a monetary economy and its key implications – the Walrasian system of general equilibrium, the classical dichotomy between real and monetary sectors, the neutrality of money, the Cambridge equation of exchange, and the Quantity Theory of Money (QTM) – and discuss how these ideas hold up with contemporary examples. We also examine

the limitations of the classical view, including situations (such as short-run economic fluctuations or extreme policy environments) where money may not be neutral and why modern economists and central banks have nuanced this theory.

1.2 The Walrasian System of General Equilibrium (Real Economy)

Classical theory builds on the Walrasian general equilibrium model of a barter economy (named after Léon Walras, 1834–1910, a pioneer of mathematical economics). In a Walrasian system, all markets for goods and services simultaneously clear through price adjustment. Formally, it consists of a set of market-clearing conditions (one for each good or factor) and a corresponding set of relative prices that adjust to equate supply and demand in every market (Walras, 1874; Lewis and Mizen, 2000). Importantly, only relative prices matter in this system – prices are expressed in terms of one another (for instance, how many units of good A trade for one unit of good B). One good can be chosen as a numéraire (unit of account) to price all other goods, fixing the scale for relative prices.

Because all prices in Walrasian equilibrium are determined only up to a common scale, the model exhibits homogeneity: if all prices were doubled (or halved), the real allocations of goods would remain the same. This implies that in a purely real economy without money, the absolute price level is indeterminate – there is no unique solution for "the" price level, only for relative prices. In other words, the Walrasian model determines what and how much gets produced and consumed (real output and relative price ratios), but not the overall monetary value of those goods. Walras' Law holds that if all but one markets are in equilibrium, the last market must also clear (excess supply in one market must be matched by excess demand in at least one other), ensuring consistency of the general equilibrium (Walras, 1874; Lewis and Mizen, 2000).

In this frictionless, barter-style economy, real variables – such as real output, the allocation of goods, and relative prices – are determined entirely by real factors (preferences, endowments, technology) without any reference to the money supply. This is the foundation of the classical idea that money is nonessential in determining real economic outcomes. However, to analyze an economy with money (a monetary economy), we need to introduce money into the Walrasian system in a way that pins down the general price level.

1.3 The Classical Dichotomy: Real vs Monetary Sides of the Economy

The introduction of money into the model leads to what is known as the classical dichotomy – a strict separation between the determination of real variables and nominal variables. According to the classical dichotomy, real variables (such as real GDP, real consumption, employment, and relative prices of goods) are determined independently of nominal variables (such as the absolute price level, inflation rate, and nominal money supply) (Lewis and Mizen, 2000). In practical terms, one can first solve for the real equilibrium of the economy (the allocation of

resources and relative prices as if it were a barter economy), and then determine the nominal price level by considering the money market. The presence of money serves only to convert the barter terms of trade into monetary terms; it does not alter the underlying real equilibrium.

This dichotomy reflects the notion that money is neutral in its effect on the real economy, an idea we explore more below. In the classical view, money's sole function in general equilibrium is to determine the units in which prices are quoted – essentially acting as a unit of account and medium of exchange without changing real outcomes. Walras's model extended to include money treats money as an additional "good" for which supply and demand must equilibrate, but crucially, changes in the supply of money do not affect the equilibrium quantities of other goods or relative prices (they only affect absolute nominal prices). The system of equations describing the economy can thus be partitioned into a real subsystem and a monetary subsystem, with minimal feedback from the monetary side to the real side – this is the essence of the classical dichotomy (Lewis and Mizen, 2000).

Historically, classical economists like David Hume illustrated the dichotomy with thought experiments: if overnight every person's stock of money doubled, people would initially feel wealthier and try to spend more, but with no change in the real quantity of goods, prices would soon double as well. Ultimately, the economy would be in the same real state as before, just with all prices (and monetary values) scaled up. The real output, employment, and relative prices would be unchanged – only the monetary values differ. This parable encapsulates the classical dichotomy by showing that real wealth hasn't changed even though nominal money holdings did.

1.4 Neutrality of Money in the Classical Model

From the classical dichotomy stems the principle of the neutrality of money. Money is said to be neutral if changes in the stock of money have no effect on real economic variables (like real output or the real interest rate), affecting only nominal variables (like the price level or nominal incomes). In the classical theory, with flexible prices and wages, money is neutral even in the short run. A change in the money supply – whether through gold discoveries in a classical gold standard economy or open-market operations by a central bank – will proportionally change all money prices but leave real production and consumption decisions unaltered (Lewis and Mizen, 2000).

Long-run monetary neutrality is a core implication: for example, a permanent doubling of the money supply is predicted to eventually lead to a doubling of the price level (a 100% inflation), with real GDP, employment, and real interest rates returning to their original levels (Jahan and Papageorgiou, 2014). In classical thought, this adjustment happens relatively quickly as prices are fully flexible. All agents understand that only nominal values have changed, so there is no lasting effect on output or other real magnitudes.

How does this adjustment occur? We can think in terms of supply and demand for money. Suppose the economy's real output Y and money demand behavior are initially given, and the

central bank unexpectedly doubles the money supply (M). At the old price level P_0, there is now excess supply of money – people have more money than they desire to hold relative to goods. They will try to get rid of the excess money balances by increasing spending on goods and services (or purchasing assets). This creates an excess demand for goods (equivalently, an excess demand for all non-money assets) by Walras' Law (Walras, 1874; Lewis and Mizen, 2000). With more money chasing the same amount of goods, prices begin to rise. Higher prices reduce the real purchasing power of the excess money, thereby reducing the excess money balances. The price level will continue to rise until the real value of the money supply M/P has increased enough that people are willing to hold the entire new money supply. At the new equilibrium, the price level P_1 will be higher (in fact, roughly double P_0 in this scenario), such that the ratio M/P is restored to the original real money demand. Real variables (the quantity of goods produced and consumed) remain the same, but all nominal prices have doubled. Essentially, the equilibrium shifts from (M_0, P_0) to (M_1, P_1), with $M_1 = 2M_0$ and $P_1 \approx 2P_0$, so that the real money supply M_1/P_1 equals the original M_0/P_0.

To visualize money neutrality, consider a simple money market diagram (value of money on the vertical axis and quantity of money on the horizontal axis). The demand for money is downward sloping in terms of the value of money (i.e. $1/P$) – at higher price levels (lower $1/P$), people need to hold more nominal money for transactions, so the demand for nominal balances increases as $1/P$ falls. The supply of money is fixed exogenously by the central bank (a vertical line at the given M). Equilibrium occurs where money supply equals money demand, determining the equilibrium $1/P$. Now, if the money supply increases (the vertical line shifts to the right), the intersection with the demand curve moves downward – the equilibrium value of money $1/P$ falls, which means the price level P rises in proportion to the increase in M. The following figure illustrates this outcome:

```
# Base R textbook-style diagram (no external packages)

# Styling
par(mar = c(4.2, 4.6, 2.4, 2.6))
demand_col <- "#1f4e79"
supply_col <- "#444444"
guide_col <- "#9a9a9a"

# Money demand: (1/P) = a - b*M  (downward sloping)
a <- 10
b <- 1

# Money supplies
M1 <- 4
M2 <- 6

# Range for plotting
```

```r
Mmax <- 10
M <- seq(0, Mmax, length.out = 400)
val_money <- a - b*M

# Equilibria (intersections with Md)
V1 <- a - b*M1   # (1/P)1
V2 <- a - b*M2   # (1/P)2

# Plot demand curve
plot(
  x = M, y = val_money, type = "l",
  xlim = c(0, Mmax), ylim = c(0, a),
  xlab = "Quantity of Money (M)",
  ylab = "Value of Money (1/P)",
  main = "Money Market and Money Neutrality",
  lwd = 2.4,
  col = demand_col,
  xaxs = "i",
  yaxs = "i"
)

# Money supply lines
abline(v = M1, lty = 2, lwd = 2, col = supply_col)
abline(v = M2, lty = 2, lwd = 2, col = supply_col)

# Mark equilibria
points(M1, V1, pch = 19, cex = 1.1)
points(M2, V2, pch = 19, cex = 1.1)

# Labels for equilibria
text(M1, V1, labels = expression(E[1]), pos = 3, xpd = NA)
text(M2, V2, labels = expression(E[2]), pos = 3, xpd = NA)

# Axis annotations for M1, M2
mtext(expression(M[1]), side = 1, at = M1, line = 2, cex = 0.9)
mtext(expression(M[2]), side = 1, at = M2, line = 2, cex = 0.9)

# Optional dashed horizontals to show (1/P)1 and (1/P)2
segments(0, V1, M1, V1, lty = 3, col = guide_col)
segments(0, V2, M2, V2, lty = 3, col = guide_col)
text(Mmax * 1.02, V1, labels = expression((1/P)[1]), pos = 4, xpd = NA, col = guide_col)
text(Mmax * 1.02, V2, labels = expression((1/P)[2]), pos = 4, xpd = NA, col = guide_col)
```

```r
# Curve and line labels
text(8.2, a - b*8.2 + 0.6, labels = expression(M^d), xpd = NA, col = demand_col)
text(M1, a*0.96, labels = expression(M^s[1]), pos = 3, xpd = NA, col = supply_col)
text(M2, a*0.96, labels = expression(M^s[2]), pos = 3, xpd = NA, col = supply_col)

# Legend (simple, top-right)
legend(
  "topright",
  legend = c(expression(M^d), expression(M^s[1]), expression(M^s[2])),
  lty = c(1, 2, 2),
  lwd = c(2.4, 2, 2),
  col = c(demand_col, supply_col, supply_col),
  bty = "n"
)
```

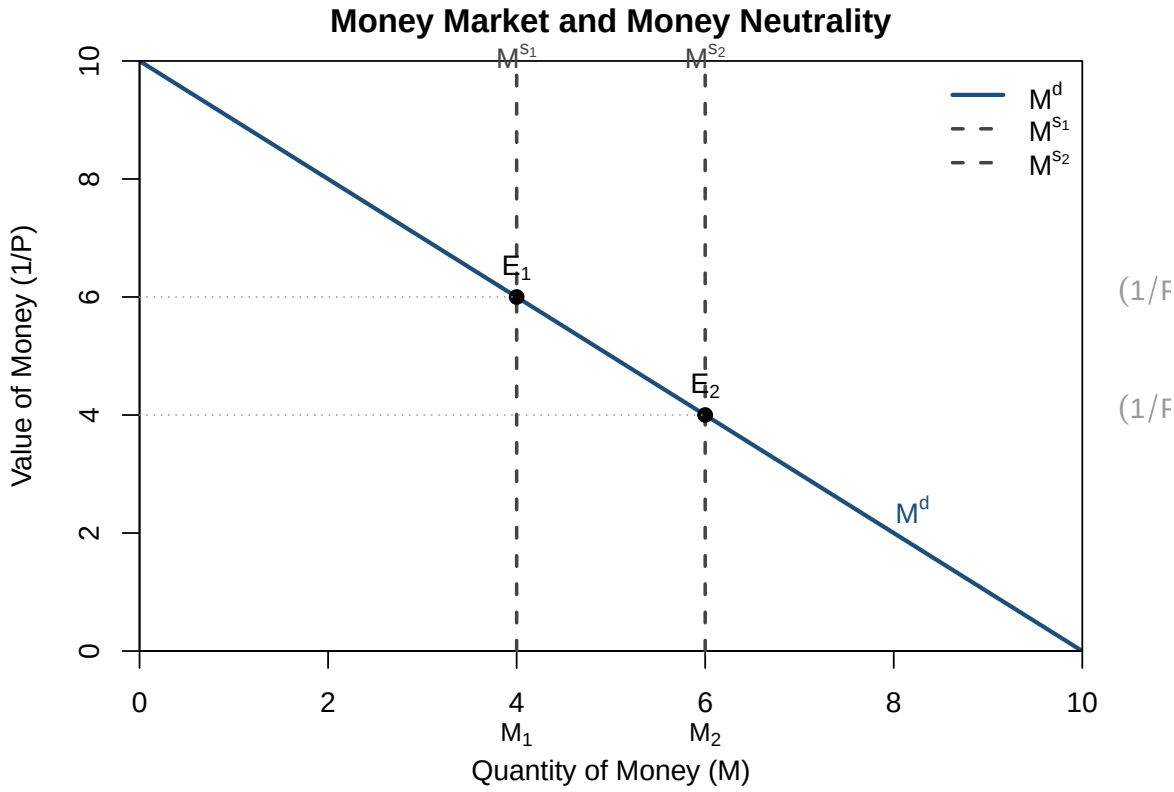

Figure 1: Money market equilibrium determines the value of money (1/P). Money demand (Md) slopes downward in 1/P and money supply (Ms) is fixed exogenously. An increase in money supply from M1 to M2 shifts Ms rightward, lowering the equilibrium value of money from (1/P)1 to (1/P)2 (equivalently, raising P).

Illustration: The diagram shows money demand M^d sloping downward in $1/P$ and two vertical money supplies, M_1 and M_2. When supply shifts right from M_1 to M_2, equilibrium moves from E_1 to E_2, lowering $1/P$ from $(1/P)_1$ to $(1/P)_2$ (equivalently, raising P). This mirrors the text: with real output and money demand behavior unchanged, an increase in M changes only nominal values, not real outcomes (Lewis and Mizen, 2000).

In the classical long-run perspective, empirical evidence does show that countries with persistently higher money growth tend to have higher inflation, consistent with money neutrality in the long term. Cross-country studies find a close one-to-one relationship between the rate of money growth (in excess of real GDP growth) and the inflation rate in the long run (Borio and Hofmann, 2023). For example, during episodes of hyperinflation, excessive money creation clearly leads to soaring prices: Zimbabwe's central bank, by printing money in the 2000s, contributed to one of the worst hyperinflations on record – at its peak in 2008, prices in Zimbabwe were estimated to be rising at an astronomical rate of 500 billion percent per year

(Oner, 2021). Such extreme cases demonstrate that pouring huge amounts of money into an economy with limited output will drastically reduce money's value (raise the price level). In more moderate circumstances too, "if the money supply grows too big relative to the size of an economy, the unit value of the currency diminishes – its purchasing power falls and prices rise" (Oner, 2021), which is precisely the quantity theory prediction.

It should be noted, however, that classical theory abstracts from short-run frictions. In reality, prices and wages may not adjust immediately (they can be sticky in the short run), so a sudden increase in the money supply might temporarily boost real activity – a possibility acknowledged even by later monetarist economists (Jahan and Papageorgiou, 2014). The classical model, though, assumes away these short-run rigidities, focusing on the ultimate outcome after prices have fully adjusted. In that full-adjustment scenario, money is neutral: aside from the price level and other nominal values, nothing real has changed.

1.5 The Cambridge Equation of Exchange (Cash-Balance Approach)

To determine the price level in a monetary economy, classical economists augmented the Walrasian real system with an equation describing money demand – famously formulated by the Cambridge school of economists (Alfred Marshall, A.C. Pigou, and even a young John Maynard Keynes) in the early 1900s. The Cambridge equation (or cash-balance equation) focuses on the demand for money as a proportion of income. It can be expressed as:

where M^d is the desired nominal money holdings (money demand), P is the general price level, Y is real national income (real output), and k is a parameter representing the fraction of nominal income that people wish to hold in the form of money (their cash holding ratio). In equilibrium, we assume the money market clears, so the supply of money M equals money demand M^d. Thus, the Cambridge equilibrium condition is:

This simple equation embodies the idea that people plan to hold a certain proportion k of their income in cash balances for convenience and safety. The value of k reflects factors like payment habits, financial technology, and preferences for liquidity – for example, if people keep one month's worth of income as cash on average, k might be about $1/12 \approx 0.08$. The velocity of money V is the inverse of this cash-balance ratio: . Velocity V measures how many times per period the average unit of currency is spent on final goods and services (i.e. how quickly money circulates). If $k = 0.1$, then $V = 10$, meaning each dollar (or pound, etc.) is used to purchase 10 dollars' worth of output per period on average.

The Cambridge equation can be rewritten to make the price level the subject:

This tells us that for a given real output Y and given money demand parameter k, the price level P adjusts in proportion to the money supply M. In other words, the quantity of money in circulation relative to the economy's output (adjusted by how much money people want to hold) determines the price level. If the money supply doubles, then unless there is a change in Y or k, the price level must double to maintain the equality $M = kPY$. In the classical model,

Y is determined by real factors (and in the long run by things like technology and resources), and k is assumed to be stable (or exogenously given by institutions and preferences). Therefore, any change in M translates to an proportional change in P. This Cambridge equation thus fills the gap in the Walrasian system: whereas the Walrasian real equilibrium couldn't pin down the absolute level of prices, adding the money market equilibrium condition (M supply equals $M^d = kPY$ demand) yields a solution for the nominal price level (Lewis and Mizen, 2000). The classical dichotomy is evident here – the real variable Y is solved elsewhere, and once Y is known, the nominal variable P adjusts to satisfy the money equation given M.

It's worth noting that the Cambridge cash-balance approach is just a different perspective on the quantity theory of money, emphasizing money demand instead of supply. Unlike the "transactions" version of the quantity theory (associated with American economist Irving Fisher, discussed next), which treats velocity as given and focuses on the flow of money spending, the Cambridge equation arises from thinking about how much of their income people wish to hold in monetary form at any time. Both approaches, however, arrive at a similar conclusion: a linkage between the money supply and nominal income. Indeed, if we take the Cambridge equation and multiply both sides by $V = 1/k$, we get $M \cdot V = P \cdot Y$. Thus the Cambridge equation is mathematically equivalent to the more famous equation of exchange, as long as we identify $V = 1/k$ (Lewis and Mizen, 2000). The two formulations differ subtly in interpretation – the classical (Fisherian) view tends to treat V as a constant technical parameter and money as only a medium of exchange, whereas the Cambridge view gives k (hence V) a behavioral interpretation and recognizes money's role as a store of value that people may desire to hold. But in the strict classical theory, k (and hence V) was taken to be fairly stable in the short run, so the distinction did not undermine the overall prediction.

1.6 The Quantity Theory of Money (QTM)

The Quantity Theory of Money is the centerpiece of classical monetary theory. It is often summarized by the equation of exchange:

Here M is the money supply, V is the velocity of money, P is the price level, and Y is real output (often Y is taken to be real GDP for the whole economy). This equation is an identity – it defines velocity V as the ratio of nominal GDP ($P \times Y$) to the money stock M. It says that the total amount of money multiplied by the number of times each unit of money is used to buy goods (velocity) equals the total monetary value of goods purchased ($P \times Y$) in the economy. As an accounting statement, this always holds true by construction in any given period.

The equation of exchange becomes a powerful theory (the QTM) with one key additional assumption: velocity V is constant (or at least predictable), and independent of other variables, and real output Y is determined by non-monetary factors (e.g. resources and technology, as in the Walrasian real system). Under these assumptions, any change in M must be reflected primarily in P. In growth rate form, the quantity theory predicts that the inflation rate

(growth of P) will equal the growth rate of money minus the growth rate of real output (since V is constant) (Atkinson and Mau, 2024). For example, if the money supply grows 5% per year and real GDP grows 2% per year, QTM would predict roughly 3% annual inflation in the long run (5% – 2% = 3%). In short, the Quantity Theory of Money posits a direct, proportional relationship between the money supply and the price level, when other factors are held constant (Atkinson and Mau, 2024). It is "one of the oldest hypotheses in economics," linking excessive money growth to inflation (Oner, 2021).

A classical quantity theorist typically assumes that V is stable due to institutions or habits (for instance, people might get paid monthly and pay bills monthly, implying a regular turnover of money). Empirically, velocity does change over time, but in early 20th century economies it was often sufficiently stable in the short run that treating it as roughly constant was not a bad approximation (Jahan and Papageorgiou, 2014). Meanwhile, Y in the long run is determined by labor, capital, technology, etc., not by the money supply. Therefore, increases in M lead to proportionate increases in P. This formalizes the intuition behind money neutrality. As an IMF explainer succinctly put it, "if the money supply grows too big relative to the size of an economy, the unit value of the currency diminishes – its purchasing power falls and prices rise" (Oner, 2021). The Quantity Theory thus provides a mechanism for how inflation can be controlled by controlling money growth. It underlies the famous maxim by Milton Friedman (a leading 20th-century monetarist) that "inflation is always and everywhere a monetary phenomenon."

Historical example: The QTM was vividly demonstrated during the Great Inflation of the 1970s. In the United States and United Kingdom, rapid growth of the money supply was accompanied by surging prices. Monetarist economists, reviving the classical QTM, argued that to bring down inflation, central banks needed to restrain money growth. Indeed, in 1979 the U.S. Federal Reserve under Paul Volcker dramatically changed policy to target the money supply growth rate. By limiting money growth, the Fed was able to squeeze inflation out of the system by the early 1980s, albeit at the cost of a recession (Jahan and Papageorgiou, 2014). Similarly, the U.K. adopted monetarist policies under Margaret Thatcher. These policy episodes were inspired directly by QTM logic – essentially applying classical theory to practice – and they lend support to the long-run link between money and prices. Many countries thereafter maintained a focus on low money growth to keep inflation low (until the practice of inflation targeting eventually replaced direct money targets, as discussed later).

Another dramatic example is the relationship between money growth and hyperinflation. We mentioned Zimbabwe's hyperinflation; similarly, classic case studies like the Weimar German hyperinflation of 1923 show a clear QTM pattern. In Weimar Germany, the government massively increased the paper money supply to finance expenses, and the price level exploded in proportion, to the point where money became nearly worthless. Such episodes reinforce that, when taken to extremes, money growth and inflation go hand-in-hand.

It's important to realize that the Quantity Theory of Money (QTM), as used in classical theory, is more than just the identity $MV = PY$. It is the hypothesis that causality runs from left to right: the money supply is exogenous (determined by the central bank or gold supply) and is

the primary driver of nominal GDP and the price level in the long run, with velocity and real GDP growth taken as given. The QTM assumes long-run neutrality (money only affects P) and often also assumes dichotomy (that real output Y is determined independently). Under these conditions, controlling inflation is as simple as controlling money supply growth. Monetarist economists in the 20th century extended this classical theory, asserting that a stable money growth rule would lead to stable prices (Jahan and Papageorgiou, 2014). They pointed to statistical correlations between money and prices, and argued, for example, that the Great Depression of the 1930s in the U.S. was largely due to a sharp contraction of the money stock (a thesis advanced by Friedman and Schwartz in A Monetary History of the United States (Friedman and Schwartz, 1963)).

The QTM has seen a resurgence in debate in recent years. After the Global Financial Crisis of 2007–09, central banks injected unprecedented amounts of money into economies (through quantitative easing), yet inflation in many advanced economies remained subdued for a long time in the 2010s. This led some to question whether the classical quantity relation had broken down, as velocity appeared to decline. However, following the COVID-19 pandemic, money growth spiked again (for example, U.S. M2 money supply grew over 25% year-on-year at one point in 2020), and by 2021–2022 inflation jumped to multi-decade highs. Analysts noted that a simple quantity-theoretic linkage between money and inflation seemed to reassert itself during this period (Atkinson and Mau, 2024). In fact, a basic model using money growth did successfully signal the rise of inflation post-2020, even though it had failed to predict inflation in the prior two decades of low inflation (Atkinson and Mau, 2024). This mixed record underscores that the QTM holds well under some circumstances (especially when there are large swings in money growth and when the economy is near full capacity), but can be less reliable in others – a point we now examine as we discuss the limitations of the classical view.

1.7 Limitations of the Classical View

While the classical theory of money provides a useful benchmark and is largely borne out in the long run, economists have long identified several limitations and caveats to its applicability. In practice, the strict classical dichotomy and money neutrality do not always hold, especially in the short run or under certain conditions. Here are some key limitations and challenges to the classical view:

Short-Run Non-Neutrality and Price Stickiness: The classical model assumes fully flexible prices and wages that instantaneously clear markets. In reality, many prices (e.g. wages in contracts, or prices set by firms) adjust slowly. In the presence of such sticky prices, changes in the money supply can have short-term real effects. This was a central insight of John Maynard Keynes and later Keynesian economics: if the money supply increases, in the short run it may lower interest rates and stimulate investment and consumption, thus increasing real output and employment – contrary to neutrality. Only over time, as prices gradually adjust, will the full effect be reflected in the price level. Keynesians argue that during recessions or periods of slack,

output is demand-determined, and an increase in money (and thus demand) can raise output rather than prices. The classical dichotomy is thus violated in the short run: real and nominal variables are intertwined. Modern empirical research confirms that money is not neutral in the short term – for instance, expansionary monetary policy often boosts real GDP for a couple of years before inflation catches up. Even monetarist economists accept the idea of short-run monetary nonneutrality due to lags in price adjustment (Jahan and Papageorgiou, 2014). The long-run neutrality may still hold, but the journey matters for economic fluctuations.

Unstable Velocity and Money Demand: The classical QTM assumes velocity (V) or the Cambridge k is fixed (or at least exogenous and stable). In reality, velocity can and does change due to various factors – interest rates, financial innovation, payment technologies, and economic uncertainty can all affect how much money people want to hold relative to income. Keynes, in his critique of the classical theory, introduced the idea of speculative demand for money (part of his liquidity preference theory), suggesting that k is not a constant but depends on the interest rate: when interest rates are low, people are less incentivized to hold bonds and more content holding money, so money demand rises (velocity falls), and vice versa. He also noted that expectations of deflation or financial turmoil can make people hoard cash (increasing k dramatically). In symbolic form, Keynesians might express money demand as $M^d = k(i)\,PY$, where k is a function of the nominal interest rate i (and perhaps other variables like expectations of inflation) (Keynes, 1936; Lewis and Mizen, 2000). This view implies that velocity is endogenous and can vary widely – which undermines the simple classical QTM prediction. Indeed, Keynesians attach little or no significance to a rigid quantity theory rule precisely because velocity is inherently unstable (Jahan and Papageorgiou, 2014). Empirical history vindicates this concern: for example, in the 1980s, financial deregulation and innovation in banking altered the stability of money demand in the US and UK, causing velocity of traditional aggregates (like $M1$ or $M2$) to shift unpredictably. During the 1990s and 2000s, the rise of credit cards, money market funds, and later digital payment platforms continued to change money holding patterns. Central banks found that targeting a money supply growth rate (as suggested by monetarism) became unreliable because the relationship between money, output, and prices was weakening – the money demand function was shifting. This is one reason why central banks moved away from strict money supply targets to interest rate targets and inflation targeting frameworks by the 1990s: the link between measured money supply and inflation became harder to discern in real time (Jahan and Papageorgiou, 2014).

Empirical Variability in the Money-Inflation Relationship: The long-run correlation between money growth and inflation is strong across broad samples and extreme cases, but over shorter horizons and moderate inflation environments the relationship can be obscured by other factors. Studies have found that when inflation is low and stable, money growth often does not closely predict inflation – velocity may fluctuate or other forces (like supply/demand shocks) dominate short-run inflation dynamics (Borio and Hofmann, 2023). For instance, in the two decades before the 2020s, many advanced economies saw relatively high growth in central bank money (due to quantitative easing) but inflation remained low, as much of the new money was effectively stored in banks as excess reserves or was offset by declines in money velocity. A Dallas Fed analysis noted that a simple money-growth-based model would have badly under-

predicted or over-predicted inflation in those years, reflecting an unstable relationship between money and inflation in environments where inflation expectations are anchored (Atkinson and Mau, 2024). This does not invalidate the QTM in the long run, but it shows that the short-to-medium run link can loosen. When the regime changes – as in 2021 when inflation re-emerged – the link appeared to strengthen again, reminding us that context matters (Atkinson and Mau, 2024). The BIS (Bank for International Settlements) recently reported that money growth tends to be a more reliable indicator of inflation during high-inflation regimes than in low-inflation regimes (Borio and Hofmann, 2023). In summary, the QTM's assumption of a stable velocity is more of a conditional truth; velocity can be volatile, and policy must take that into account.

Definition of Money and Financial Innovation: Classical theory assumes a clear definition of "money" – often implicitly referring to currency or a narrow aggregate. In practice, money comes in different forms (cash, checking deposits, savings accounts, money market funds, etc.), and the boundary between money and other financial assets can shift. If people move funds between money and near-money assets, the effective money supply for transactions might change even if base money doesn't, affecting velocity calculations. Over the years, definitions like $M1$, $M2$, $M3$ were created, and their velocities behaved differently. The classical story is simplified and doesn't fully capture these complexities of a modern credit-based monetary system where commercial banks create money (via lending) and central bank control is mostly indirect. It turned out to be challenging to find a monetary aggregate that has both a stable velocity and strong link to inflation in real time. This is another reason why central banks in practice target interest rates rather than the money supply nowadays – they can more directly influence economic conditions through rates, whereas controlling money growth alone proved insufficient when velocity shifted. The classical theory's implications remain true in the long run (too much broad money growth will eventually cause inflation), but short-run monetary policy must deal with uncertainty in money demand.

Economic Conditions (Liquidity Traps and Confidence): In some extreme situations, changes in the money supply may have little effect on either prices or output – a situation known as a liquidity trap. This occurs, for example, when interest rates are near zero and investors have essentially infinite demand for liquidity (money) at that rate. In a liquidity trap (as during the Great Depression or Japan in the 1990s or globally in the late 2000s), increasing the money supply might simply lead to people holding more cash (an increase in k) with no increase in spending – thus neither output nor prices rise much. This scenario is outside the classical theory, which assumes away such pathological cases. It required Keynesian analysis to explain: when confidence is shattered and interest rates are at the lower bound, the classical dichotomy breaks down completely – money is non-neutral even in potentially long periods because prices may even fall (deflation) despite monetary expansion. Fortunately, such traps are rare, but the possibility highlights that the neutrality of money is not a universal law but a conditional outcome.

Integration with Real Finance and Interest Rates: The classical theory in its pure form abstracts from how money interacts with interest rates and asset markets. In reality, a change

in the money supply can affect interest rates (at least in the short run before prices adjust), which in turn can affect investment and consumption. The classical model assumed the loanable funds market adjusts interest rates based on saving and investment, independent of the money supply. However, if the central bank injects money, it may temporarily lower interest rates (if we hold prices fixed in the very short run), causing real effects – this is essentially the Keynesian transmission mechanism. Modern New Classical and New Keynesian models have incorporated money or monetary policy into a broader framework with interest rate rules and expectations, something the simplistic classical model does not do.

Contemporary challenges – Digital Currencies: A very modern consideration is how digital currencies and fintech innovations affect the classical theory. Cryptocurrencies like Bitcoin, or central bank digital currencies (CBDCs), represent new forms of money (or quasi-money). Do they change the quantity theory? So far, there is no evidence that they overturn basic monetary principles – the classical logic would still apply to an economy's overall money supply broadly defined. For instance, one empirical study found "no change in velocity or the money multiplier after the rise of cryptocurrencies", suggesting that the advent of crypto has not materially altered aggregate money demand or the effectiveness of monetary policy (Mumtaz, Smith and Yoshino, 2025). However, digital innovations can affect k in the Cambridge equation by making transactions easier (potentially raising velocity) or introducing alternative assets that serve some functions of money. Central banks are closely watching these developments. The consensus is that while the forms of money are evolving, the fundamental constraint – that if too much liquidity chases too few goods, the value of money will drop – remains as true as ever. Digital currencies might change how we measure and control the money supply, but they do not negate the classical long-run link between money and prices.

In light of these limitations, modern macroeconomists view the classical theory of money as a long-run benchmark rather than a complete description for all time horizons. It offers a valid intuition for why sustained money growth leads to inflation (and conversely, why controlling money growth can stabilize prices). However, for short-run analysis and policy design, we use more elaborate frameworks that account for price stickiness, expectations, and financial frictions (for example, the IS-LM model in Keynesian tradition or New Keynesian dynamic stochastic general equilibrium models). These frameworks relax the classical dichotomy – allowing monetary policy to have real effects in the short run – while typically still embedding long-run neutrality of money as a special case. Central banks today generally target inflation directly (often through interest-rate policy) rather than the money supply, implicitly acknowledging that velocity is unstable in the short run. Yet, the spirit of the quantity theory survives: central bankers recognize that excessive money creation will ultimately be inflationary (Oner, 2021), and keeping inflation low and stable in the long run requires not letting money grow far out of line with the economy's capacity to produce goods and services.

1.8 Summary

Walrasian Foundations: The classical theory is built on a Walrasian general equilibrium of the real economy, where flexible prices ensure all markets clear. In a barter setting, only relative prices are determined; a purely real model cannot pin down the absolute price level (Walras, 1874; Lewis and Mizen, 2000).

Money as a Veil: Introducing money separates real and nominal variables. The classical dichotomy holds that real economic outcomes (output, relative prices, real interest rates) are determined by real factors, independent of the money supply (Lewis and Mizen, 2000). Money provides a unit of account and medium of exchange but is a "veil" over the real economy – changing the money supply only changes nominal prices, not the real allocation of resources (Lewis and Mizen, 2000).

Neutrality of Money: In the classical view, money is neutral in both the long run and (in the absence of frictions) the short run. A change in the money supply leads to an equal proportional change in the price level and other nominal values, leaving real GDP, employment, and real interest rates unaffected (Lewis and Mizen, 2000). This implies that inflation is fundamentally a monetary phenomenon in the long term. Historical episodes of high inflation underscore this one-to-one link between money growth and prices (Oner, 2021; Borio and Hofmann, 2023).

Cambridge Equation and QTM: The classical theory determines the price level via the Cambridge cash-balance equation $M = kPY$, which is equivalent to the quantity equation $MV = PY$ with $V = 1/k$. This formalizes the Quantity Theory of Money (QTM) – assuming stable velocity (or cash-holding ratio k) and exogenous output, the money supply governs the nominal GDP and price level (Lewis and Mizen, 2000; Atkinson and Mau, 2024). Excess money supply, given output, bids up prices until money market equilibrium is restored.

Contemporary Relevance: The classical theory provides a crucial baseline for thinking about inflation and monetary policy. It correctly predicts that countries with persistently rapid money growth (relative to output) experience high inflation (Oner, 2021). Monetarist policies in the 1970s–80s were inspired by this theory and had success in curbing inflation by restraining money growth (Jahan and Papageorgiou, 2014). Even today, surges in the money supply (e.g. during the COVID-19 crisis) are closely watched for inflationary impact (Atkinson and Mau, 2024).

Limitations: In practice, the strict classical dichotomy breaks down in the short run. Because of sticky prices, variable velocity, and financial complexities, money is not always neutral in the short-to-medium term. Velocity can shift due to changes in interest rates or public confidence, weakening the link between money and prices (Jahan and Papageorgiou, 2014; Atkinson and Mau, 2024). Accordingly, modern central banks target inflation via interest rates and other tools rather than fixing the money supply growth alone. The classical theory is best viewed as a long-run anchor – in the long run, excessive money creation will cause inflation – but with the understanding that short-run dynamics can deviate from the classical predictions.

1.9 References

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