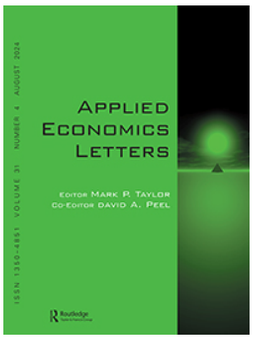

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ARTICLE

Corporate money demand and the missing inflation

Lei Wang

School of Economics, Hangzhou Normal University, Hangzhou, China

ABSTRACT

This article hypothesizes that firms demand more money to maintain low and stable inventory in order to fully exploit the globalization of supply chains. Three test implications derived from the hypothesis are verified with the US data: that the ratio of money held by firms over M1 trends up and becomes more volatile, that the ratio would plunge if there is a tremendous shock to supply chains, and that the ratio positively impacts real money balance in the long run cointegrated equilibrium with real income and short-term interest rate as control variables. Elevated money demand from the firm sector could partially explain the missing inflation in the 2010s.

KEYWORDS

Money demand; missing inflation; quantity theory of money; Monetarism

JEL CLASSIFICATION

E31; E41

I. Introduction

Inflation has surged in developed countries since 2021. However, for over three decades before the pandemic, inflation was dormant across the rich world. Indeed, inflation is deemed as 'missing' after the financial crisis when the central banks eased money supply enormously.[1] The latest data (January 2023) suggested that inflation might be receding, although the Fed has raised interest rate for less than 5% points.

This article posits a simple theory that has the potential to explain the missing inflation in the 2010s, the inflation surge in the 2020s, and the fast cooling down of inflation. The idea is that the demand for money might have been structurally elevated due to certain factors. The elevation in money demand was much larger than the increase in money supply by the QEs after the financial crisis, thus inflation did not rise with money supply. Real factors such as globalization and technology progress further lowers inflation through enriching supply and cutting cost. Therefore, inflation appeared to be missing in the 2010s. However, the elevation of money demand is much outsized by the increase in money supply during the pandemic. Real factors such as supply chain disruptions and oil price spikes add fuel to the fire. Inflation thus surges in the 2020s.

One implication of the theory is that the increase in money supply after the financial crisis is dwarfed in magnitude by the money supply rise during the COVID-19 pandemic. This is true at least for the US, the UK and the Euro area.[2] That inflation is so easily brought down further testifies the appeal of this simple theory.

The key question, then, is what are the factors that have structurally lifted the demand for money. This article investigates one such factor: more demand from the firm sector.[3] It is argued that firms stash more money to maintain low and stable inventory so as to fully exploit the globalization of supply chains. The hypothesis constitutes a small piece of the broader theory proposed above. Three test implications derived from it are verified with the US data, thereby validating the hypothesis and the broader theory indirectly.

II. Inventory management and corporate money demand

For households, money serves as a transaction medium and a store of value. For firms, apart from these two functions, money also provides important productive services, such as facilitating the adjustment of portfolios, or serving as a buffer

CONTACT Lei Wang wangleiruc@gmail.com School of Economics, Hangzhou Normal University, Hangzhou, China

[1]For a brief survey on the missing inflation puzzle, see Bobeica and Jarocinski (2019).

[2]For instance, in the US, the average M2 growth rate was 6.1% from 2009 to 2019, whereas M2 increased 17.7% from 2020 to 2021. The preliminary results of a study I am conducting suggest that for over 10 rich economies, the same pattern holds.

[3]Wang and Zhu (2021) provide evidence that ageing causes higher demand for money.

against unexpected shocks. In this sense, money is not different from other productive assets owned by firms such as inventory or fixed investment.[4]

In the decades since the 1980s, due to better inventory management, firms have held lower and more stable inventory. This is considered one of the major causes for the Great Moderation.[5] Globalization enables firms to outsource supply chains across the world according to comparative advantages so that the benefits of specialization and economies of scales can be fully exploited. To ensure the lengthened supply chains function smoothly, either firms could hold large inventories or they could hoard more cash. If one block of supply chain is disrupted, it could use the cash at hand to procure the parts in shortage from other places. The fact that firms hold low inventory and more cash suggests that a second approach might have been chosen. In addition, firms hold an ever larger share of portfolios in financial assets. The financialization of non-financial firms further suggests that firms might have superseded inventory with money.[6]

For over four decades from 1959 to 2000, as shown in Figure 1, the ratio of money held by firms (currency plus checkable deposits) over total money supply M1 was comparatively stable and varied between 15% and 20%. However, starting from 2001 and before the pandemic, the ratio clearly trended up and became more volatile. It might not be a coincidence that China joined the WTO in 2001 and developed as the linchpin of the sprawling supply chain network in East and South Asia.[7] The hypothesis that firms hold more cash to maintain low and stable inventory is consistent with the raw data. However, more rigorous tests are required to verify it.

III. Tests of implications

Three test implications could be derived from the hypothesis, that is, if the hypothesis is true, some patterns of observable variables would emerge. All three implications are consistent with the US data, thus verifying the hypothesis indirectly.

The first is that the ratio of money held by firms over M1 would become higher and more volatile. As argued in the previous section, firms hold more money to keep inventories low. If the increase in demand for money from firms outpaces that from households, the ratio would rise. And as money is used to offset supply chain shocks in order to maintain a stable inventory, the ratio would be more volatile. Table 1 shows that, consistent with the implication, both the mean and the standard deviation of the ratio in the US have become significantly higher in the first two decades of this century compared to the previous 40 years.

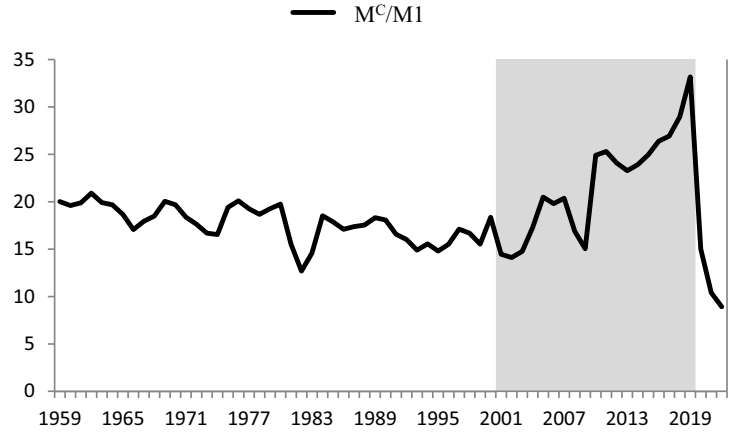

Figure 1. The ratio of money held by firms over M1 in the US. Notes: Here $M^C/M1$ stands for the ratio of money held by firms over M1. The data are annual and range from 1959 to the first quarter of 2022. The shaded area is from 2001 to 2019. Data source: FRED.

[4]For a full elaboration on money's special role to firms, see Friedman (1976, chapter 17).
[5]See Davis and Kahn (2008).
[6]For a comprehensive survey on financialization, see Davis (2017).
[7]The globalization accelerated in the early 1990s. It is an open question that requires further inquiry why the ratio of money held by firms trended up almost 10 years later.

Table 1. The average value and standard deviation of M^C/M1.

Average value		Standard deviation	
1959.Q1–2000.Q4	2001.Q1–2019.Q4	1959Q1–2000.Q4	2001.Q1–2019.Q4
17.76%	21.75%	0.021	0.055

Data frequency: quarterly.

Table 2. Results of ADF test and Johansen cointegration test.

ADF Test		Johansen Test	
ρ_t	$\Delta\ \rho_t$	None	At Most 1
2.98	6.12**	63.87*	42.91
(0.15)	(0.00)	(0.07)	(0.69)

Here Δ stands for differencing, and ρ_t stands for the ratio of money held by firms over M1. The numbers reported in parentheses are p-values. The data are annual and range from 1959-2019.
** stands for significant at 5%, and * stands for significant at 10%.

Table 3. Regression results of the cointegrated equilibrium.

c	ρ_t	$\log(y_t)$	r_t	Adjusted R^2	S.E. of Regression
5.17	1.35	0.34	−0.01	0.86	0.05
(0.39**)	(0.18**)	(0.03**)	(0.00**)		

the dependent variable is $\log(m_t)$, measured by log(M1/CPI). Short-term interest rate is measured by 3-month Treasury bill yields. The numbers reported in parentheses are standard errors. Data range: 1959–2019. Data Source: FRED. ** stands for significant at 5%, and * stands for significant at 10%.

The second is that, if there is a tremendous shock to supply chains, such as the pandemic, the ratio of money held by firms over M1 would plunge, indicating money being depleted as firms try to ease supply chain strains. Though some firms might benefit from the shock, for instance, vaccine makers in the pandemic, but the firm sector as a whole would suffer a severe blow to their money stash. In 2020 and 2021, the ratio fell to 15% and 10%, respectively, a significant drop from 33% in 2019. Indeed, the absolute quantity of money held by firms fell during the period from the third quarter of 2020 to the first quarter of 2021, even when the economy was flooded with money.

Finally, if the demand for money from firms is structurally elevated, other things being equal, the total money demand would be lifted. This implication could be verified in two steps. First, test whether there is cointegration between real money balance, which can be interpreted as the real money demand at equilibrium, and the ratio of money held by firms, as well as real GDP and short-term interest rate. Second, in the cointegrated equilibrium, does the ratio positively impact real money balance controlling for the effects of real income and interest rate? In essential, we are trying to estimate a money demand function of the following specification[8]

$$\log(m_t) = c + \beta_1 \log(y_t) + \beta_2 r_t + \beta_3\ \rho_t$$

in which $\log(m_t)$ is real money balance, $\log(y_t)$ is real GDP, r_t is short-term interest rate, and ρ_t is the ratio of money held by firms over M1. The first three series are all non-stationary and integrated of order one. As reported in Table 2, ρ_t is also integrated of order one. We thus could use the Johansen test to determine whether there is cointegration. The hypothesis that there is no cointegration among the four series is rejected at 10%, as reported in Table 2. We could thus conclude that there is cointegration between real money balance and the ratio.

Table 3 reports the regression results of the cointegrated equilibrium. The ratio ρ_t is positively correlated with $\log(m_t)$, and the result is statistically significant. The signs of the coefficients of real GDP and short-term interest rate are consistent with our expectation as well. The results of the corresponding error correction model, which are not reported, suggest that the long-run equilibrium is stable.[9] The empirical evidence thus is consistent with the third test implication.

[8]The most used technique for estimating money demand function is cointegration test, see Ball (2001).
[9]If the data is extended to 2021, all other results hold up, but the coefficient of the ratio becomes statistically insignificant.

IV. Concluding remarks

This article presents some evidence supporting the hypothesis that the demand for money from the firm sector has been structurally elevated, thus could partially explain the missing inflation puzzle in the 2000s and 2010s. It may also suggest that the key to understanding both the missing inflation in the 2010s and the surging inflation in the 2020s might be the dynamics between money supply and money demand. However, this article might raise more questions than it has answered. Here are some of them that might be worth further investigations.

First, it is merely assumed that firms hold more money to substitute inventory. The evidence presented here is indirect and roundabout. The chance that it might be a coincidence cannot be completely ruled out that firms hold more money while maintain low and stable inventory. More investigations are thus called for.

Second, and more importantly, this hypothesis is a small part of a much broader theory: that the missing inflation is mainly caused by structurally elevated demand for money, whereas the surging inflation is mainly caused by much higher supply of money during the pandemic. This broader theory, if verified, has important implications for monetary policy. For instance, price stability should not be taken for granted and should always be one of the priority goals for monetary authorities. However, systematic examination of money demand and supply of multiple countries is required to test this broader theory. To put it differently, we need to re-examine the relation between money and inflation, but more likely than not, we would reach the good old conclusion, though with fresh evidence supporting it.

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ORCID

Lei Wang http://orcid.org/0000-0001-5908-9116

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