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ABSTRACT

This article develops a simple model of M2/GDP based on the money demand function of Milton Friedman. This model proves that M2/GDP is positively related to the expected wealth and negatively related to the opportunity costs of holding money. China's extremely high monetization ratio as measured by M2/GDP is the result of a decades-long rapid economic growth and a depressed financial system. Fast economic growth leads to high expected wealth. A depressed financial system leads to low opportunity costs of holding money. The combination of those two factors increases money demand and leads to very high M2/GDP. The model is verified indirectly by testing two implied testable hypothesizes. The study of this article raises questions on the accuracy of M2/GDP as a measure of monetization.

I. Introduction

Monetization ratio is one of the most important indicators of financial development. In the literature of financial development, monetization ratio is usually defined as the proportion of transactions conducted by money (Goldsmith 1969, 304). Monetization is extremely difficult to measure directly. Several proxy measures have been employed to measure monetization, among which M2/GDP is the most popular proxy measure since it was first used by McKinnon (1973). The World Bank regularly publishes the statistics of monetization ratios of its member countries with M2/GDP as the measure.

China's monetization ratio measured by M2/GDP has been increasing steadily since its opening up in the late 1970s (see Figure 1). In 2015, China's M2/GDP exceeded 200%. The high monetization ratio has raised great concerns that it may indicate that China is experiencing money over-supply and eventually would end up with high inflation.[1]

This article intends to explain China's high monetization ratio (high M2/GDP) from the perspective of money demand. According to the quantity equation of money (MV = PY), M2/GDP (M/PY) is the reciprocal of the velocity of M2 (1/V). The economic meaning of

1/V is the average duration economic agents hold money. As convincingly argued by Friedman (1959) and Friedman and Schwartz (1982), the velocity of money is determined by the demand for money.

This article develops a simple model of M2/GDP based on the money demand function of Milton Friedman. This model proves that M2/GDP is positively related to the expected wealth and negatively related to the opportunity costs of holding money. China's high M2/GDP is a phenomenon caused mainly by high demand for money. This indicates that China's high monetization ratio measured by M2/GDP is merely a myth due to the inaccuracy of M2/GDP measuring monetization.

The rest of this article proceeds as follows: in the second section, a model of M2/GDP is developed based on a Friedmanian money demand function; in the third section, some testable implications of the model are empirically tested; the fourth section concludes.

II. Money demand and M2/GDP

Equation 1 is the money demand function proposed by Friedman (1956). The positive/negative signs above the variables indicate their positive/negative

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[1]For example, Liu et al. (2015) studies whether high M2/GDP means there is excess liquidity in China.
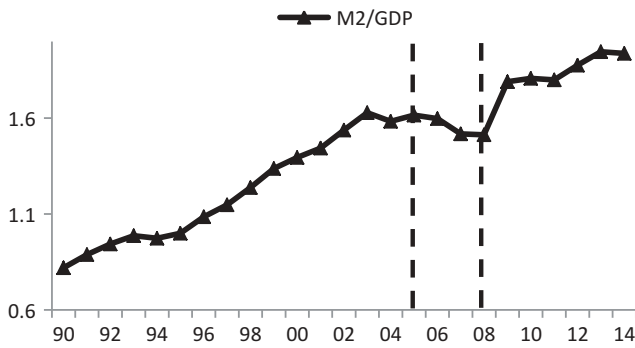
Figure 1. China's M2/GDP (1990–2014).
Source: see Table 1.

relationship with money demand. For the purpose of this study, the wealth is broken down into two parts: the current period income Y and the expected future wealth W^e. The terms P and π^e represent nominal price level and the expected inflation rate, respectively. The term r_X represents a vector of returns on assets other than money, including bond, stock, gold, etc. The term r_m represents the return from holding money, including both the meagre interest earned from deposit accounts and the nonpecuniary convenience from holding money. Therefore, $r_X - r_m$ defines the opportunity costs of holding money. The term u stands for all other variables that could affect money demand, including monetization.

$$M^d = f\left(\overset{+}{PY}, \overset{+}{PW^e}, r_X \overset{-}{=} r_m, \bar{\pi}^e, u\right) \qquad (1)$$

Friedman (1956) argues that economic agents make decisions based on real rather than nominal magnitudes. Mathematically, this means that Equation 1 is homogeneous of degree one with respect to the general price level P:

$$f\left(\lambda \overset{+}{PY}, \lambda \overset{+}{PW^e}, r_X \overset{-}{=} r_m, \bar{\pi}^e, u\right)$$
$$= \lambda f\left(\overset{+}{PY}, \overset{+}{PW^e}, r_X \overset{-}{=} r_m, \bar{\pi}^e, u\right) \qquad (2)$$

Let $\lambda = \dfrac{1}{PY}$, we have

$$\frac{M^d}{PY} = f\left(\overset{+}{\frac{W^e}{Y}}, r_X \overset{-}{=} r_m, \bar{\pi}^e, u\right) \qquad (3)$$

Equation 3 is essentially a model of M2/GDP. It states that the desired level of $\frac{M}{PY}$ (a measure of monetization ratio) is positively related to $\frac{W^e}{Y}$, the ratio of expected future wealth over current period income, and negatively related to the opportunity cost of holding money $(r_X - r_m)$ and the expected inflation rate π^e. Monetization process, included in the item u, is positively related to money demand. Therefore, monetization process could increase $\frac{M}{PY}$. When monetization is the dominating force affecting money demand, $\frac{M}{PY}$ (M2/GDP) could be a good measure of monetization, as evidenced by the study of Yi (1991) on China's monetization before 1991.

As monetization process is complete, like in China or Japan, high M2/GDPs could be caused by two factors: high expected wealth and low opportunity costs of holding money. Both factors contribute to China's high M2/GDP. China's fast economic growth in the last three decades has significantly raised its people's expectation of future wealth. The opportunity costs of holding money are low as China's financial system is depressed. There are limited options of financial assets in China and the interest rate cap was only partially lifted in the end of 2015.

It is helpful to use a metaphor to explain the main points elaborated above. Imagine wealth as commodities to be stored and assets (including money) as warehouses. When commodities increase dramatically but there are limited warehouses and the newly built warehouses (like the stock market) are not as safe as the old ones (China's stock market is frequently referred to as a casino), the old warehouse (money), though leaking (inflation) and old, is preferred to store the new commodities. As a result, the average time commodities are stored in this old warehouse (the average duration of holding money) becomes longer.

It is difficult to test the theory directly for at least three reasons. First, the opportunity costs of holding money in China are difficult to measure. Interest rates in China are controlled and do not represent the true opportunity costs. Second, the nonpecuniary benefits of money (anonymity in particular) are difficult to measure, but they appear to be important. Quite a few corrupted officials were reported to hoard more than 100 million cash ($18 million) in their houses since 2012. Third, Equation 3 is

essentially a money demand function, and it is still controversial whether there exists a stable demand function for money (Bahmani-Oskooee and Rehman (2005)).

However, the theory can be verified indirectly by testing testable implications derived from it. If its testable implications are not falsified, the theory is not refuted. In Section III, two testable implications of this theory are tested.

III. Testable implications

The first testable implication implied by the theory in Section II is that the ratio of money over total financial asset (TFA) should be positively related to M2/GDP. Equation 3 indicates that the demand for money is positively related to M2/GDP. The ratio of money over TFA should be higher when a higher proportion of the wealth is allocated to money (currency + deposit). As a result, M2/GDP should be positively related to the ratio of money over TFA.

This hypothesis is tested with the annual data of China and USA and the cross-sectional data of 2012 of multiple countries. The regression results are reported in Table 1. The correlation between M2/GDP and the ratio of money over TFA is positive and statistically significant in all regressions.

The second test implication is that during a boom of the stock market, M2/GDP should decrease as the opportunity cost of holding money increases significantly, and vice versa.

China experienced a stock market rally between the start of 2005 and the middle of 2008, during which the Shanghai stock index rocketed up from less than 1000 to a historical high of 6124. Figure 1 shows that China's M2/GDP stumbled significantly during 2005–2008. As a result, the trend of a steady increase of M2/GDP over

two decades was interrupted, only to resume after the stock market crashed in 2008.

US experienced two market crashes after 2000: the dot-com bubble burst during 2000–2002 and the global financial crisis between 2007 and 2009, followed by the ongoing Great Recession. Figure 2 shows that America's M2/GDP increased during both periods. The global financial crisis was much more severe than the dot-com bubble burst. Correspondingly, the increase of M2/GDP during the second period is much more significant than during the first period.

Japan's Lost Decades starting from the late 1980s were accompanied with economic recession/stagnation, deflation, crashes in the stock and housing markets and extremely low interest rates. As indicated in Equation 3, economic recession tends to lower M2/GDP, but deflation, low interest rates and crashes in asset markets tend to increase M2/GDP. The latter factors apparently are dominating forces. As shown in Figure 3, Japan's M2/GDP increased steadily since late 1980s and reached almost 200% in 2014.

Table 2 reports the regression result between Japan's M2/GDP and its T-bond yield. The correlation is significantly negative, consistent with the
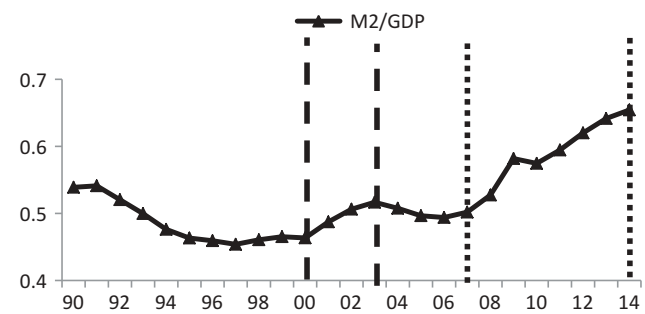

Figure 2. America's M2/GDP (1990–2014).
Source: see Table 1.

Table 1. M2/GDP and (C + D)/TFA.

	$\hat{c}$	(C + D)/ TFA	Adjusted R^2	Regression residual
Multi-countries	0.60*	1.92*	0.16	0.46
	(0.32)	(0.94)		
China	0.65*	0.77**	0.14	0.29
	(0.36)	(0.36)		
USA	0.48**	0.41**	0.07	0.05
	(0.03)	(0.18)		

Notes: The dependent variable is M2/GDP in all three regressions. C, D and TFA stand for currency, deposit and total financial asset of the household sector in the funds flow statement, respectively. Data range: China, 1990–2014; USA, 1959–2015; Multi-countries, 2012. Data source: China, Wind Info; USA: Fred; Multi-countries, OECD financial statistics. ** stands for significant at 5% and * stands for significant at 10%.
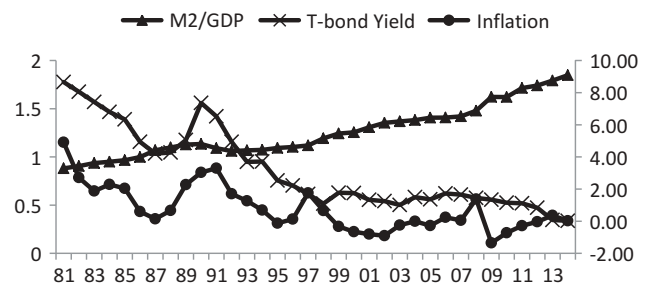

Figure 3. Japan's M2/GDP (left axis), T-bond yield and inflation rate (right axis).
Date source: GDP, Wind Info; Others, Fred. Data range: 1980–2014.

Table 2. Japan's M2/GDP and bond yield.

	$\hat{c}$	T-Bond yield	Adjusted R^2	Regression residual
Japan	1.55** (0.05)	−0.09** (0.01)	0.62	0.96

** stands for significance at 5%. Note: Dependent variable: M2/GDP. Data source: see Figure 3.

prediction of the model in the last section. The adjusted R^2 of this regression is a notable 0.62. This might be due to that Japan's huge amounts of government debts (over 250% of GDP) are mostly held by its private sector, and as a result the T-bond yield contributes a very large part of the opportunity costs of holding money.

IV. Concluding remarks

This article argues that the popular measure of monetization M2/GDP is determined by the same forces determining money demand. M2/GDP is positively related to the expected wealth and negatively related to the opportunity costs of holding money. China's high monetization ratio as measured by M2/GDP is the result of a decades-long fast economic growth and a depressed financial system. Fast economic growth leads to high expected wealth. A depressed financial system leads to low opportunity costs of holding money. The combination of those two factors increases money demand dramatically and leads to very high M2/GDP (very low velocity of M2). The model is verified indirectly by testing two implied testable hypothesizes.

The study of this article raises questions on the accuracy of M2/GDP measuring monetization. M2/GDP could be a good proxy of monetization when an economy is transforming from a planned economy to a market economy. But in other cases researchers should be cautious to employ M2/GDP as a proxy measure of monetization.

Disclosure statement

No potential conflict of interest was reported by the authors.

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