On potential debt monetisation for China's post-Covid recovery: what can we learn from the past?[1]

Ziyi Cao[2] Cardiff University

Zhirong Ou[3] Cardiff University

Abstract

A measure of the degree of debt monetisation is constructed for its impact on the business cycle to be studied in a standard VAR model. Debt monetisation is hardly stimulative, as it raises public demand that crowds out almost as much demand from the private sector. However, it generates inflation, presumably because of inflationary expectations. Nevertheless the impact of debt monetisation on the business cycle dynamics is trivial, due to the low efficiency of the monetary transmission mechanism. Unless policy proposals are for extraordinarily aggressive moves, or they are accompanied by monetary reforms which facilitate monetary transmission, the recent debate on debt monetisation, we argue, possesses more theoretical meaning than practical meaning for China's post-Covid recovery.

Keywords: Debt monetisation; business cycle; VAR; China
JEL Classification: E31, E32, E63, H63

1 Introduction

The Covid-19 pandemic revives an old debate on the possible macroeconomic outcomes of debt monetisation – a means for financing indebted government by money creation – among the media, policy-makers and academics in China. The debate was much triggered by a recent seminar talk by Shangxi Liu, the President of the Chinese Academy of Fiscal Sciences (a research institute of the Ministry of Finance), who suggested that: '*...(in facing the pandemic)... a moderate monetisation of fiscal deficit would be worth considering*' (Cross and Zhang, 2020). Liu's idea was for the Ministry of Finance to issue a special, non-interest bearing, treasury bond for the People's Bank of China (PBoC hereafter) to buy directly; funds raised by this issuing would then be used for paying off deficits the fiscal authority was expected to generate with a series of anti-Covid recovery schemes. Simply put, the idea was for the PBoC to bail out the fiscal authority when the latter was running into a budget predicament.

Liu's proposal soon triggered a heated debate. Those who support it believe that, given the low efficiency of the monetary transmission mechanism and the fundamental role fiscal expansion has been playing in China's economic growth, deficit/debt monetisation would be an effective means for stimulating the economy without causing substantial crowding-out of private demand caused by a rise

of the nominal interest rate. Those who are against it are mainly concerned with potential inflation; accompanying that there are also doubts regarding the needs and feasibility, as well as worries about how such act would undermine fiscal discipline and central bank credibility.

Indeed, although monetising government liabilities is nothing new in modern monetary management – from day-to-day open market operations, to occasional large-scale money injections – research in this area has mostly focused on the US and the EU, with the backdrop of major central bank interventions, such as the Fed's purchases of the Treasury bonds during World War II, the several rounds of quantitative easing (QE) it implemented since the global financial crisis, and the QE by the ECB in dealing with the Eurozone debt crisis. By contrast, very little has been developed for the Chinese market. This is partly because the Chinese economy has been developing relatively stably since its post-1978 marketisation reform, such that unconventional expansion of public debts or central bank balance sheet was rarely needed to respond to sizable shocks. On the other hand, both the Budget Law (which enforces 'living within your means') and the Law on the People's Bank of China (which prohibits the PBoC from lending to the government directly), both published in 1995, have prevented major monetisations from happening.

The real debt problem in China emerged around 2008 when the global financial crisis laid huge pressure on economic growth, while the burden of local governments was also intensified by the task of promoting urbanisation. The 'four-trillion yuan stimulus package' assigned by the central government, plus the fierce fiscal competition among local governments, resulted in a surge of public debt including the '600-billion Special Treasury Bond' sold (indirectly) to the PBoC. As debts of the local governments continue to accumulate and many of them start to mature, and the Ministry of Finance issues new batches of anti-Covid special bond, the repaying ability of the general government, the role of the PBoC in facilitating such repayment (by monetising the public debts), and the impact of debt monetisation, become burning policy issues awaiting careful investigations.

In this paper we study how debt monetisation – defined as the PBoC's general liquidity creation associated with public debt expansion – affects the business cycle in China since the early 2000s, using a standard VAR identified by the Cholesky decomposition. We find that, while debt monetisation fails to promote economic growth, as it raises public demand that crowds out almost as much demand from the private sector, it does generate inflation, presumably mostly arising with inflation expectations. Nevertheless, the evidence also suggests that the impact of debt monetisations is trivial due to the low efficiency of the monetary transmission mechanism. These findings suggest that debt monetisation is better seen/used as an inflation management tool, rather than one for stimulating the economy in an output crisis. Unless policy proposals are for extraordinarily aggressive moves, or they are accompanied by monetary reforms which facilitate monetary transmission, the current debate on debt monetisation, we argue, therefore possesses more theoretical meaning than practical meaning for China's post-Covid recovery.

To the best of our knowledge, this is the first time the impact of debt monetisation on the business cycle dynamics of China is carefully evaluated in an empirical model. While more (especially, work embedding greater theoretical details and micro-foundations) is worth doing in future work, we believe that the findings we provide in this paper are a timely contribution to the ongoing debate.

The remainder of this paper is organised as the following: Section Two reviews the literature; Section Three measures the degree of debt monetisation in China; Section Four models the dynamic relationships among the business cycle and policy variables in a standard VAR; Section Five analyses the findings; Section Six concludes.

2 The literature

Research on debt monetisation can be dated back as early as to Barro (1977, 1978a, b) and Niskanen (1978) who study the relationship between government spending and money. Both Barro and Niskanen identify a co-movement between government spending and money creation in the US; however when fiscal deficit is substituted for spending, the test suggests no significant impact of deficit on the growth of money – hence, no evidence of 'debt monetisation'. Hamburger and Zwick (1981) revisit the issue, taking into account regime shifts and extending the discussion for it to embrace the consequences for inflation. They find that deficit did not lead to the growth of money in the 1950s because fiscal policy was rather 'conservative' at the time. However, as fiscal policy became more pro-active and the Federal Reserve focused more on interest rate stabilisation since the mid-60s, fiscal deficit became an important determinant of money, which contributed to the high inflation. Blinder (1982) examine the forecasting ability of both debt and debt monetisation. He finds both are good predictors for inflation but neither performs well in predicting real output (See also Burdekin and Wohar (1990)); he also finds that the Fed tends to monetise less when inflation is high and government spending is fast-growing.

Miller (1983) argues that persistently high deficits – whether or not monetised by the monetary authority – are inflationary, as the deficits crowd out private investments with higher interest rates slowing down the growth of the economy on the one hand, and the private sector 'monetises' the deficits voluntarily seeing government bonds a profitable, risk-free asset on the other. Leeper (1991), Sims (1994), Woodford (1998, 2001) and Cochrane (2001, 2005) provide an alternative narrative – the fiscal theory of the price level (FTPL) – where the monetary authority accommodates to the government budget to ensure that latter is always solvent; inflation, effectively being an 'inflation tax' levied by money creation here, is determined by the level of outstanding debts. Palacio-Vera (2012) considers the real sector, and finds that coordination between the fiscal and monetary authorities on the stance of fiscal policy, inflation target, and the scale and scope of monetisation, can make debt monetisation an effective stimulus even when the nominal interest rate has reached the Zero Lower Bound. Menuet *et al* (2018) study the short-run and long-run effects of debt monetisation. They find that, by weakening the long-run debt burden, debt monetisation reduces the impact of public indebtedness on productive public expenditure, which is growth and welfare enhancing. They also call for a high degree of monetisation to avoid short-term indeterminacy of the balanced growth paths.

Unfortunately, the literature has established very little on how debt monetisation affects the Chinese economy. Gan (1991) and Que (1992) conduct, respectively, a casual calculation on how much fiscal deficit contributed to inflation in the 1980s; the former finds deficit contributed little, while the latter finds it an important contributor. Yu (1999) discusses the need, room and potential consequences of debt monetisation in China, and points out that monetising debts can be a cheap and easy way for financing the public sector in the short run, but world experiences all point to a long-run failure of similar actions as inflation rises eventually and the rise may even exceed that of money.

Yi (1991), in a more general perspective, discusses China's monetisation process since the marketisation reform[4]. He argues that, although money supply had been rising dramatically as the reform deepened, severe inflation did not happen until the late 1980s, as monetisation created new demand for money sufficient to absorb the risen stock of money (See also Li (1997), Cheng and Lin (2006), J. Zhang (1997, 2006), W. Zhang (2008), Liu and Hu (2010) and Jing and Tong (2018) for similar discussions). However, as Yi himself has pointed, 'monetisation' in these studies is generally 'vague and not well-defined'. Most assessments along this line have focused on the broad expansion of

money (usually measured by the money-supply-to-GDP ratio) which may, or may not, be associated with the expansion of government debt or deficit; hence, they do not say much about whether and how debt monetisation affects particularly. This is precisely the gap we aim to fill, as we go on to elaborate in the following.

3 Debt monetisation in China

While the term 'monetisation' generally refers to the process of converting an asset to 'money' for liquidity to be created, we define debt monetisation here as the monetary authority's liquidity creation caused by the fiscal authority's debt expansion – hence, a process of financing public debt with 'helicopter money' (Friedman, 1968). The extent to which public debt may be monetised depends substantially on the institutional relationship between the fiscal authority and the central bank. In China, the PBoC had a long tradition of being a supporter of the country's fiscal authority, such that money had a history of being printed to write off public debt or fill public deficit (This was particularly the case in the late 1980s and early 1990s when excess money supply consistently led to double-digit inflation). The situation changed in the mid-1990s when the PBoC became much more independent due to the publication of the *Budget Law* and the *Law on the People's Bank of China*. Since then, the PBoC has no legal obligation (and is required by law not) to finance the fiscal authority directly. Although in the later years there were extreme events – such as the global financial crisis – that made the PBoC purchase special treasury bonds (indirectly) to finance major stimulus packages on several occasions, debt monetisation in China has been mainly in the form of open market transactions on bond repurchase agreements which serve monetary targets, instead of fiscal ones, in the past twenty years.

Previous work on this topic has, depending on the research questions, adopted somewhat different measures on the degree of debt monetisation. Most have used the central bank's holding of public debt or such holding as a fraction of total public debt outstanding (Blinder, 1982; Dwyer, 1982; Barth *et al*, 1982; Burdekin and Wohar, 1990; Palacio-Vera, 2012). Others have used some sort of monetary aggregate, such as the monetary base or M1, of which some are normalised by the economic growth, as an approximation (Thornton, 1984; Protopapadakis and Siegel, 1986; Lebow, 2004).

However, similar measures would not be appropriate when they are applied to the Chinese data. This is mainly due to two reasons. The first is that the bookkeeping method of the PBoC does not record all holdings of public debts on the bank's balance sheet, such that 'claims on government debts' on the balance sheet weighs only a small proportion of the PBoC's transactions related to debt monetisation. This small proportion is related to debts issued for particular purposes (such as to fund big infrastructure projects or fiscal stimulus packages), where the PBoC monetises the debts to facilitate the delivery of fiscal targets. The rest, the majority of monetising activities, viz., regular open market operations, takes the form of pledged repurchase agreements where the PBoC monetises public debts for the short run. However, these transactions do not induce transfer of debt ownership, as they are just central bank lending backed by government bonds. Since these bonds are not accounted as assets of the PBoC, they are not recorded by the bank's balance sheet. Hence, using the data of the PBoC's holding of public debts alone would be missing a substantial part of the debts' monetisation happened via the off-balance-sheet activities.

The other problem of using the conventional measures with the Chinese data is related to the use of monetary aggregates as a proxy measure of debt monetisation. These proxies would be good measures if the issuing of money was dominated by transactions of government bonds (For example,

the variation of M0 in the US is a close follower of that of the Federal Reserve's holding of Federal debts). However this is not the case in China, where the data show that over 30 per cent of the variation of the monetary base is due to transactions of central bank notes, changes in reserve requirement, and net inflows of foreign currencies (due to the 'managed float' exchange rate arrangements). Hence, for the monetary aggregates to be a good reflection of the degree of debt monetisation, a careful account of this bias would be necessary.

The above suggests that a proper measure of debt monetisation in China requires that *the part* of variations of money in circulation caused by public debt variations be fully, but not overly, accounted. This part, as explained earlier, embraces the PBoC's claims on government debts registered on the bank's balance sheet, as well as the bank's open market transactions endorsed by government bonds. This implies the variations of what we define to be the 'adjusted M0', which is the part of the monetary base driven solely by the bank's actual public debt holding, which is our measure of the degree of debt monetisation.

Figure 1 plots the time paths of the adjusted- and unadjusted-M0, and compares them to that of total public debt outstanding[5]. While total public debt had been expanding fairly rapidly, especially after the global financial crisis due to a series of fiscal stimulus packages, the rise of the adjusted-M0 was much less drastic. By contrast, the rise of the unadjusted-M0 shared a similar pattern with that of the public debt. Nevertheless, since only a small part of such rise was due to the adjusted-M0, its co-movement with the debt outstanding is not by itself evidence of debt monetisation. Indeed, although both the adjusted- and unadjusted-M0 are highly correlated with the debt outstanding, we find none of the money growths was Granger-caused by the debt's growth (Table 1). While the moderate rise of the adjusted-M0 does provide evidence of deepened debt monetisation, it seems that, as the PBoC became more independent, the supply of base money depended less and less on the government's debt position.

Figure 1: Rise in the monetary base and total public debt outstanding

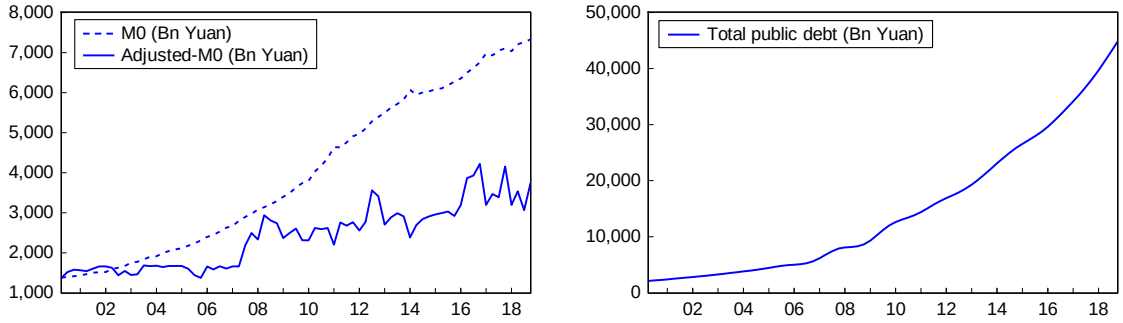


Table 1: The monetary base and total public debt outstanding
– correlations and Granger causality

Correlation coefficients	
M0 vs total public debt outstanding	0.97
Adj-M0 vs total public debt outstanding	0.88
Granger causality tests	
H_o: The growth of public debt does not cause the growth of M0.	P-value: 0.6029
H_o: The grwoth of public debt does not cause the growth of adj-M0.	P-value: 0.2142

The number of lags for the Granger causality tests is set to be 3 as per suggested by typical lag selection criteria (LR, FPE, AIC, SIC and HQ).

4 Model and data

Our model is a standard VAR(1) of business-cycle, monetary- and fiscal-policy variables, identified by the Cholesky decomposition, which takes the form:

$$Y_t = C + AY_{t-1} + U_t \quad [1]$$

where $Y_t \equiv (\dot{g}_t, \dot{y}_t, \pi_t, \dot{m}_{0,t}^{adj}, R_t)'$ is a vector of government expenditure, output, inflation, the adjusted-M0 and the nominal interest rate, '$\cdot$' denotes the growth of a variable, A is five-by-five matrix of the VAR coefficients, C and U_t are vectors of the constants and the error terms, respectively. The model can be seen as a parsimonious description of how monetary and fiscal policy instruments ($\dot{m}_{0,t}^{adj}$, due to monetisation, R_t, and $\dot{g}_t$) interact with the business cycle variables ($\dot{y}_t$ and π_t). We choose a VAR(1), instead of a VAR of higher orders, for that a) a VAR(1) is generally accepted to be a good approximation of a structural model proven to have a good fit to macroeconomic data and, b) given that our data sample (which we explain below) is relatively small, a VAR(1) ensures that our modelling of the data dynamics is not undermined by a substantial loss of the degree of freedom which could lead to model overfitting. Our choice of the VAR order is supported by most of the lag selection criteria, where we allow for up to four lags (Table 2). The multivariate LM test on the VAR(1) residuals, which rejects autocorrelation of them (Table 3), further confirms that our VAR(1) does not suffer any problem of underfitting.

Table 2: Optimal VAR order according to different criteria

No. of lags	LR	FPE	AIC	SIC	HQ
1	248.9201	2.60e-20*	-30.9094*	-29.9458*	-30.5266*
2	27.9115	3.34E-20	-30.6682	-30.8778	-29.9665
3	33.8458	3.75E-20	-30.5807	-28.011	-29.5600
4	49.5604*	2.94E-20	-30.8778	-27.5051	-29.5382

a) * indicates lag order selected by the criterion. b) LR: sequential modified likely ratio; FPE: final prediction error; AIC: Akaike information criterion; SIC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

Table 3: The LM test on the VAR(1) residuals

No. of lags	LM test stat	P value
1	23.3684	0.5561

a) H_0: There is no autocorrelation. b) Sample: 2000Q3 and 2018Q4.

The ordering of our VAR variables reflects the standard assumptions in the literature: government expenditure has a contemporaneous impact on output and inflation, but the latter only feed back to the former with a 'decision lag' (Blanchard and Perotti, 2002); output affects inflation contemporaneously with a wealth effect, but the feedback from price changes to production is delayed due to nominal contracts and costs of capital adjustment; monetary variables are adjusted in response to output and inflation, while changes in money supply are followed by changes in the

nominal interest rate. These assumptions imply a sequence – based on descending degree of exogeneity – that goes from government expenditure to output and inflation and then, to money supply and the nominal interest rate, which is what we impose for identifying the structural shocks by the Cholesky decomposition. The ordering is standard; some recent applications, among many others, include Rossi and Zubairy (2011), Bekaert *et al* (2013), Boiciuc (2015) and Nguyen *et al* (2019).

The data are observed between 2000Q3 and 2018Q4. Both government expenditure, output (measured by GDP), and the adjusted-M0 are normalised by CPI. Inflation is measured by the quarter-on-quarter growth in CPI, while the nominal interest rate is measured by the three-month weighted average of interbank lending rates. The adjusted M0, as elaborated earlier, are extracted from the M0 data for them to reflect the part of changes in the monetary base due to debt monetisation. The data for government spending is collected from the *China Yearbook of Finance* via the CNKI database. The data for GDP and CPI are collected from the Center for Quantitative Economic Research of the Federal Reserve Bank of Atlanta (Chang *et al*, 2016). The interbank lending rate is collected from the State Administration of Foreign Exchange via Datastream. The data for the adjusted M0 are calculated with the PBoC's balance sheet and open market transaction data collected from the Wind database. The time series are plotted in Figure 2. In Table 4 we show that the time series used for estimating the VAR are all stationary according to standard unit root tests.

Figure 2: Data

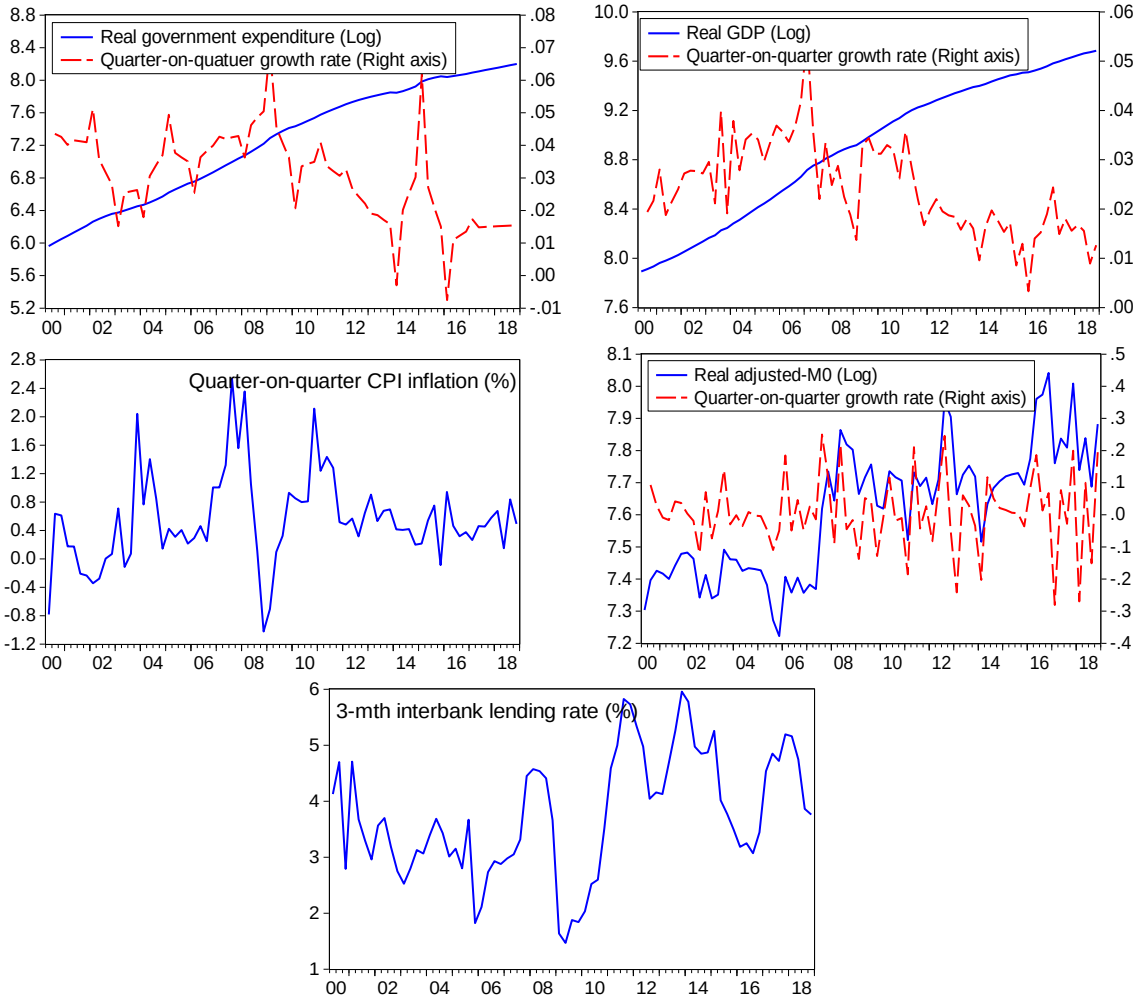


Table 4: Unit root tests of the data

Variables	ADF test stat	KPSS test stat	Remarks
$\dot{g}_t$	-1.5847	0.6564**	Stationarity supported by the KPSS test.
$\dot{y}_t$	-1.9676	0.7025**	Stationarity supported by the KPSS test.
π_t	-4.8976***	0.1145	Stationarity supported by both tests.
$\dot{m}_{0,t}^{adj}$	-7.7849***	0.2783	Stationarity supported by both tests.
R_t	-2.6247*	0.4547*	Stationarity supported by both tests.

a) *, **, *** indicate rejection of H_o at the 10%, 5% and 1% levels, respectively. b) H_o of the ADF test: the time series has a unit root; H_o of the KPSS test: the time series is stationary. c) Critical values of the ADF test: -3.52 (1%), -2.90 (5%), -2.59 (10%); Critical values of the KPSS test: 0.73 (1%), 0.46 (5%), 0.35 (10%). d) Sample: 2000Q3 and 2018Q4.

5 Findings

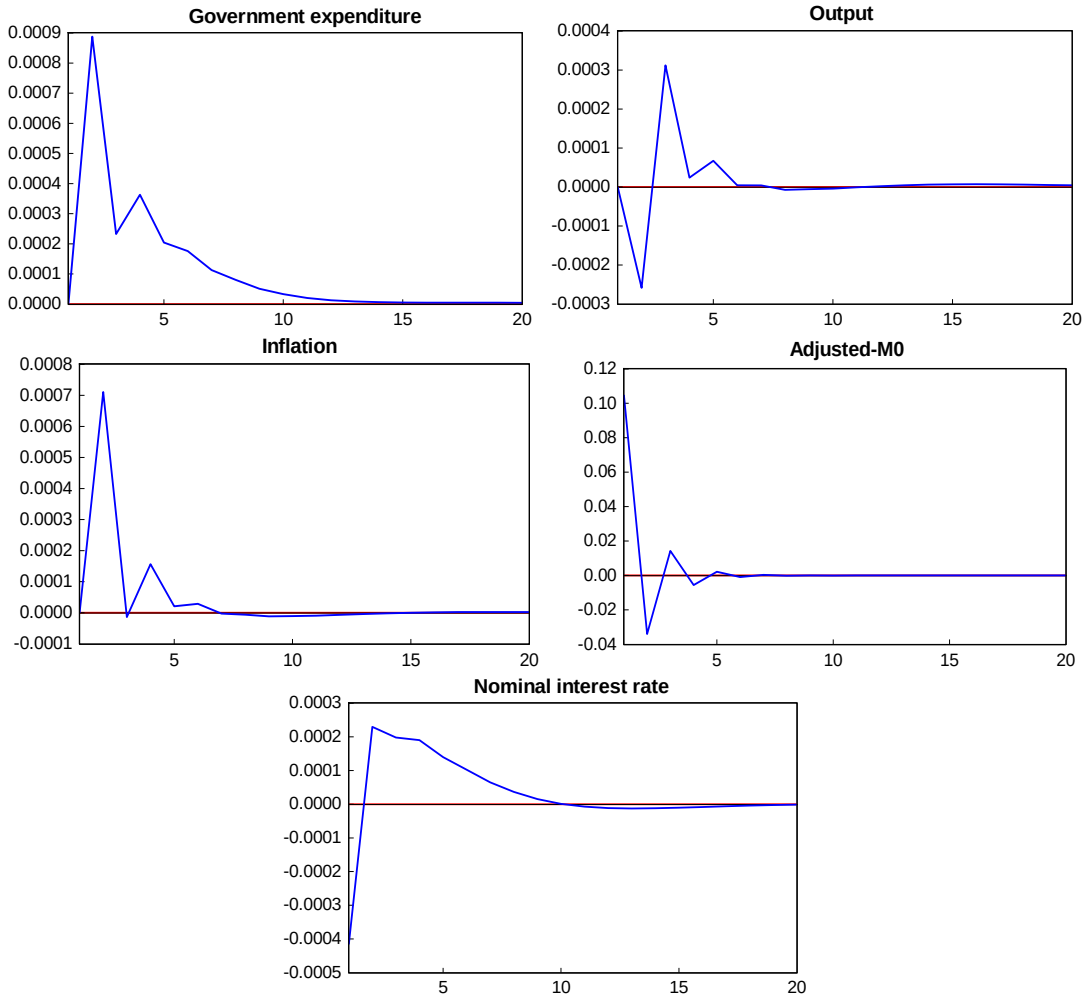
5.1 How does debt monetisation affect the business cycle?

We start by investigating how debt monetisation affects the business cycle.

Figure 3 plots the impulse responses of all the VAR variables to a one-standard-error shock to the adjusted-M0, whose innovations represent debt monetisation. A rise in the adjusted M0 eases the government's budget position, which causes government expenditure to rise. The rise in government expenditure tends to drive up the nominal interest rate, crowding out private consumption and investment (whose responses are omitted from the VAR representation here). The aggregate impact on output depends on whether the rise in government expenditure dominates the fall in consumption and investment, where on this occasion it does not initially, but does subsequently, resulting in a fall in the aggregate output on impact, followed by a fast rebound. The accumulated impact is shown to be positive, however, short-lived and minor. Inflation rises immediately, presumably due to inflation expectations; the minor impact in the subsequent periods is a combined effect of higher aggregate demand, expectations and lags. The equilibrium interest rate, which is a joint outcome of the upward pressure due to risen government expenditure, the downward pressure due to expanded monetary base, and the likely rise as policy responds to inflation, falls at the beginning, but rises straight after and converges from above gradually.

All in all, we find that debt monetisation is hardly stimulative, as it leads to a rise in the demand of the public sector that crowds out too much demand from the private sector; this may be due to relatively low income elasticity of government expenditure, or relatively high interest rate elasticity of private consumption/investment, or both. Yet, it does generate inflation, most likely because of inflation expectations. Hence, while debt monetisation may be a handy instrument for managing inflation, it would not be a desired one if the policy objective also embraces stabilisation of the real economy due to its weak impact on output.

Figure 3: Impulse responses to a monetisation shock



5.2 Variance decomposition

Table 5 decomposes the forecast-error variance of output, inflation and the nominal interest rate into the structural shocks identified by the Cholesky decomposition. Although debt monetisation affects all these variables as the impulse response functions just showed, we find that, quantitatively, its relative influence is trivial.

The variation of output is mostly affected by the output shock (41-63 per cent), which is related most likely to productivity and/or physical investment. The government expenditure shock and interest rate shock are about equally important; the former accounts for 13-29 per cent, while the latter accounts for just above 20 per cent. The inflation shock plays a small role, accounting for three to six per cent. The monetisation shock, i.e., shocks to the adjusted-M0, affects little. The inflation variation is dominated by the inflation shock (67-76 per cent). This, in a structural model (such as Smets and Wouters (2007)), could be explained by labour supply and/or mark-up to production costs. The government expenditure shock, output shock and interest rate shock each contributes a small proportion – around 14 per cent, 8 per cent and 8 per cent, respectively. The monetisation shock accounts for just above 1 per cent. Finally, the variation of the nominal interest rate is governed by the interest rate shock (52-65 per cent), but it is also substantially affected by the government expenditure shock (15-24 per cent) and the inflation shock (19-23 per cent). The interest rate shock

can be interpreted as policy errors made by the PBoC in delivering the desired interest rate; the inflation shock is likely to reflect the interest rate's responses to inflation in the spirit of a Taylor rule. Again, the monetisation shock hardly plays a role. This is perhaps not surprising given that (as elaborated in Section 3) the adjusted-M0 only constitutes a small part of the aggregate M0.

The relative unimportance of debt monetisation in the determination of the business cycle could be due to either the transmission mechanism or the relative size of the shocks, or both. On this occasion we find that it is the former, as the VAR estimates (which we report in Table 6) suggest that none of the business cycle variables is significantly affected by the adjusted-M0, while the monetisation shock is clearly more sizable than the others (Table 7). The irrelevance seems to suggest that the efficiency of monetary transmission is very low. Hence, unless in extreme cases where radical moves are taken, or monetary reforms are implemented to facilitate monetary transmission, 'regular' debt monetisation is not likely to have a virtual impact.

Table 5: Variance decomposition of the business cycle variables

Output					
Qtr. ahead	Gov. shock	Output shock	Infl. shock	Mon. shock	Int. shock
4	12.8	63.1	2.89	0.27	21.0
12	28.4	41.8	5.94	0.18	23.7
20	29.1	41.3	6.03	0.18	23.5
40	29.1	41.3	6.03	0.18	23.5
Inflation					
Qtr. ahead	Gov. shock	Output shock	Infl. shock	Mon. shock	Int. shock
4	11.7	8.71	76.0	1.48	2.18
12	14.1	8.56	67.3	1.29	8.74
20	14.6	8.48	66.9	1.28	8.70
40	14.6	8.48	66.9	1.28	8.70
Nominal interest rate					
Qtr. ahead	Gov. shock	Output shock	Infl. shock	Mon. shock	Int. shock
4	15.2	0.29	18.9	0.30	65.3
12	24.1	0.32	22.9	0.26	52.4
20	24.1	0.32	22.9	0.26	52.4
40	24.1	0.32	22.9	0.26	52.4

Table 6: Estimates of the VAR coefficients

	$\dot{g}_t$ equ.	$\dot{y}_t$ equ.	π_t equ.	$\dot{m}_{0,t}^{adj}$ equ.	R_t equ.
$\dot{g}_t$(-1)	0.6627***	0.1374**	-0.0742	0.0181	-0.1046*
$\dot{y}_t$(-1)	0.2552*	0.3836***	0.2594***	-1.6464	-0.002
π_t(-1)	-0.0069	0.3348***	0.4905***	4.0403*	0.4148***
$\dot{m}_{0,t}^{adj}$(-1)	0.0086	-0.0038	0.0068	-0.3309***	0.0051
R_t(-1)	0.0355	-0.3458***	0.0139	-1.6061	0.7447***
Const	0.0023	0.0218***	-0.0017	0.0852	0.0103**

a) ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively.
b) Sample: 2000Q3 and 2018Q4.

Table 7: Standard errors of the structural shocks

Gov. shock	Output shock	Infl. shock	Mon. shock	Int. shock
0.0094	0.0057	0.0044	0.1050	0.0057

5.3 Historical decomposition

We can now look back at the sample period to disentangle how the business cycle was affected by debt monetisation and the other shocks over that time. We first calculate the historical shocks, which we plot in Figure 4, using the estimated VAR and the data. We then decompose the timelines of output, inflation and the nominal interest rate into the effects of these shocks in Figure 5.

We find that the fast increase of output in the first half of the 2000s was mainly a result of the rise of the output shock (which would correspond to more advanced productivity in typical structural models such as Smets and Wouters (2003)), aided by government expenditure and lower interest rate. The growth then slowed down since the global financial crisis, around 2007-2009, as adverse output shocks hit; but with government expenditure and interest rate both supporting, the level of output did not fall until 2011. However, as government expenditure was reduced thereafter (due to the widespread debt predicament confronting local governments at the time) and interest rate started to rise, output declined. The strong negative output shocks that hit after 2015, followed by another round of negative government expenditure shocks, then finally made output fall below the steady-state level, showing a sign of real recession.

Inflation was mainly driven by the inflation shock (which would reflect labour market frictions and/or price mark-ups in a structural model), especially before 2012. The shock was clearly more volatile during this time, and was the most disturbing around the financial crisis (presumably reflecting the turbulence of oil prices[6]). The shock then became more moderate, and so did inflation, from 2012. All the other shocks, except the monetisation shock, affected a little, but at no point any of them dominated the determination of inflation.

The evolution of the nominal interest rate roughly followed that of inflation with a lag, but it was smoother and much less volatile. Its path was mostly affected by the interest rate shock; but both the government expenditure shock (which had a crowding-out effect) and the inflation shock (which laid pressure on nominal interest rates) were important drivers. The other two shocks – the output shock and the monetisation shock – hardly affected anything.

Thus, although the monetisation shock dominates the other shocks in size, and there were major realisations of it over the sample period (e.g., around 2006-07, 2011-13 and 2017), we find no evidence that debt monetisation played an important role in driving China's business cycle.

Figure 4: Historical structural shocks

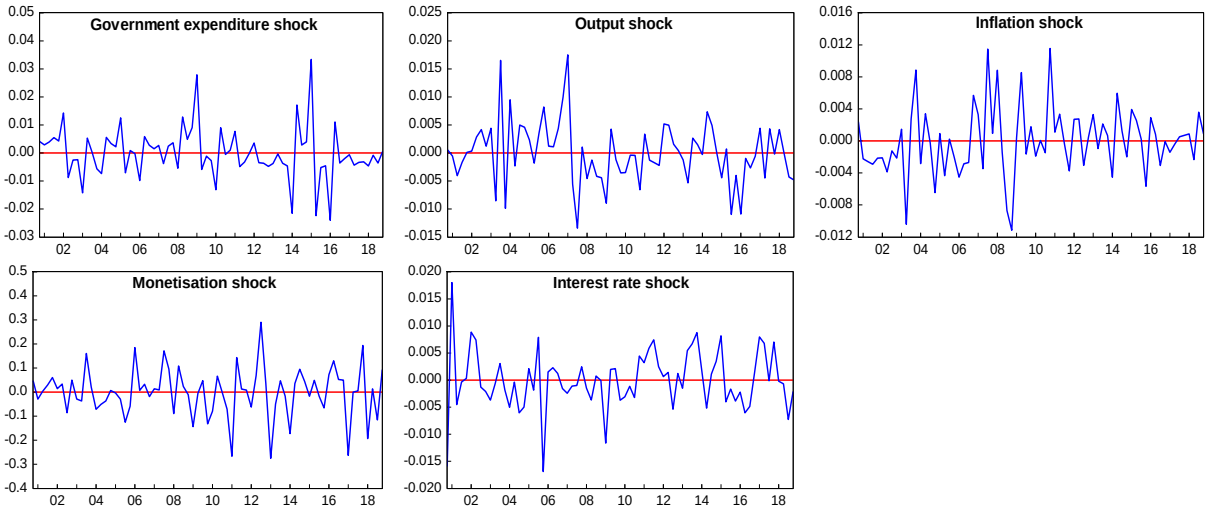
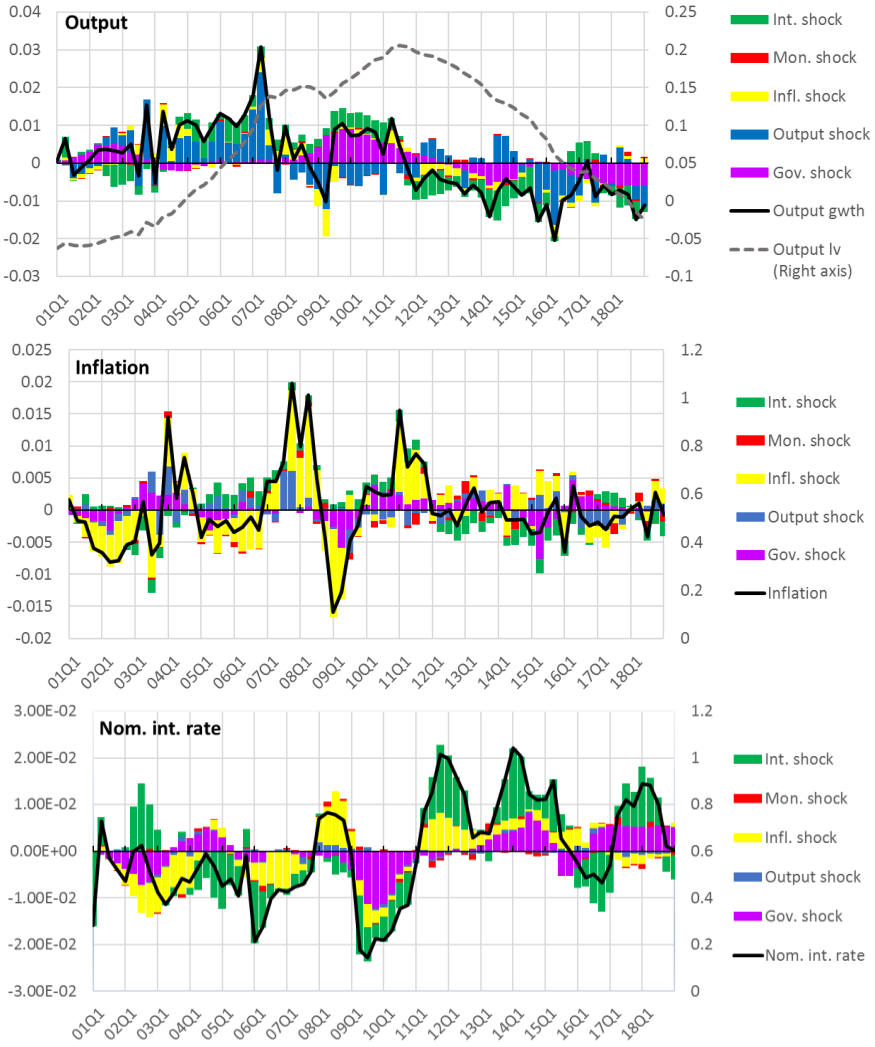


Figure 5: Historical decomposition



6 Conclusion

Debt monetisation – a process of financing public debt with seigniorage – has a long history of practice in central bank management of money. Although the topic has been widely studied for the US and EU (of which the nominal interest rate discussions have focused on the several rounds of QE and the Eurozone debt crisis), it has not been discussed much for the Chinese economy until recently; and there is little empirical evidence.

In this paper, we filled the gap by studying the impact of debt monetisation on China's business cycle, with a measure of debt monetisation carefully elaborated for it to reflect the practice of the People's Bank of China. Evidence from a standard VAR of key business cycle and policy variables suggested that debt monetisation did not contribute much to China's output growth pre-Covid. The reason seemed to be that, while it promoted government expenditure, it crowded out private demand substantially which offset the positive impact of the former. Yet, it was still inflationary as it generated sufficient inflation expectations. These findings would inform potential post-Covid recovery strategies ahead. In particular, since the inefficacy of past monetisations was likely a result of low efficiency of the monetary transmission mechanism, future proposals should allow for structural reforms that facilitate monetary transmission. Otherwise, 'regular' debt monetisations of moderate scale would not help recovery much; and, if large-scale monetisations were implemented, it could cause severe inflation with the most parsimonious return on output. However, our findings did not reject the potential of fiscal stimuli themselves; according to our historical decomposition exercise, government expenditure did contribute positively to output (and negatively to inflation) and the impact of this shock was non-trivial. What this pre-Covid experience really challenged, therefore, was not whether fiscal stimuli were worth implementing, but *how they should be financed*. We found that monetising public debt – under the current economic structure at least – would be an inflation-costly option.

What we find in this paper is broadly echoed by previous work (as we reviewed at the beginning) in that debt monetisation is inflationary, though our evidence from China suggests that it does not always enhance growth. Understanding how output is determined as debt is monetised requires one to construct a structural model (such as a DSGE model) for the casual relationship between debt, money and the business cycle to be identified. This task is on our agenda for future research.

Endnotes

[1] We are grateful to the editor and referees for helpful comments. Any remaining errors will be ours.

[2] Ziyi Cao: Cardiff University, Aberconway building, Colum Drive, Cardiff, UK, CF10 3EU. Email: caoz4@cardiff.ac.uk.

[3] Zhirong Ou: Corresponding author. Economics Section, Cardiff University, Aberconway building, Colum Drive, Cardiff, UK, CF10 3EU. Email: ouz@cardiff.ac.uk

[4] The reform is generally thought to be started in the early 1980s and completed in the mid- to late 1990s.

[5] The time series of the adjusted-M0 is calculated as the sum of the PBoC's 'claims on government debts' and the (net) increase of reverse repo in a given period. The data are from the People's Bank of China (via the Wind database). The time series of the unadjusted-M0 and total debt outstanding are from the Federal Reserve Bank of Atlanta (the CQER database) and the Federal Reserve Bank of St. Louis (the FRED database), respectively.

[6] The price of crude oil (Global price of WTI Crude) surged from 66 $/Barrel in 2006 to 99.6 $/Barrel in 2008; it then collapsed immediately in 2009, to 61.7 $/Barrel (FRED, 2020).

References

Barro R J (1977) 'Unanticipated Money Growth and Unemployment in the United States', *American Economic Review*, 67 (2), 101-115.

Barro R J (1978a) 'Unanticipated Money, Output, and the Price Level in the United States', *Journal of Political Economy*, 86 (4), 549-580.

Barro R J (1978b) 'Comment from an Unreconstructed Ricardian', *Journal of Monetary Economics*, 4 (3), 569-581.

Barth J, Sickles R & Wiest P (1982) 'Assessing the Impact of Varying Economic Conditions on Federal Reserve Behavior', *Journal of Macroeconomics*, 4 (1), 47-70.

Bekaert G, Hoerova M. & Duca M L (2013) 'Risk, uncertainty and monetary policy', *Journal of Monetary Economics*, 60 (7), 771-788.

Blanchard O & Perotti R (2002) 'An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output', *The Quarterly Journal of Economics*, 117(4), 1329-1368.

Blinder A S (1982) 'On the Monetization of Deficits', NBER Working Paper, No.1052.

Boiciuc I (2015) 'The Effects of Fiscal Policy Shocks in Romania. A SVAR Approach', *Procedia Economics and Finance*, 32, 1131-1139.

Burdekin R & Wohar M (1990) 'Deficit Monetisation, Output and Inflation in the United States', *Journal of Economic Studies*, 17 (6), 50-63.

Chang C, Chen K, Waggoner D F & Zha T (2016), 'Trends and cycles in China's macroeconomy', NBER Macroeconomics Annual, University of Chicago Press, 30 (1), 1-84.

Cheng J & Lin M H (2006) 'Empirical Study of Factors which Cause High M2/GDP in China', *East China Economic Management*, 20 (1),39-42. In Chinese.

Cochrane J H (2001) 'Long Term Debt and Optimal Policy in the Fiscal Theory of the Price Level', *Econometrica*, 69 (1), 69-116.

Cochrane J H (2005) 'Money as Stock', *Journal of Monetary Economics*, 52 (3), 501-528.

Cross G and Zhang Q (2020) 'Economists fight over the money printer', Caixin Global, https://www.caixinglobal.com/2020-05-20/caixin-insight-economists-fight-over-the-money-printer-101556540.html [Accessed June 2020].

Dwyer Jr G P (1982) 'Inflation and government deficits', *Economic Inquiry*, 20 (3), 315-329.

Friedman M (1968) 'The role of monetary policy', *American Economic Review*, 58 (1), 1-17.

Gan Y (1991) 'Empirical analysis of fiscal deficit and inflation in China: 1985-1989', *Theory and Practice of Finance*, 5, 7-12. In Chinese.

Hamburger M J & Zwick B (1981) 'Deficits, Money and Inflation', *Journal of Monetary Economics*, 7 (1), 141-150.

Jing W & Tong S Y (2018) 'Shadow Banking and China's Monetary Puzzle', *China: An International Journal*, 16 (2),151-169.

Li K W (1997) 'Money and Monetization in China's Economic Reform', *Applied Economics*, 29 (9),1139-1146.

Lebow D E (2004) 'The Monetisation of Japan's Government Debt', BIS Working Paper, No. 161.

Leeper E (1991) 'Equilibria Under 'Active' and 'Passive' Monetary and Fiscal Policies', *Journal of Monetary Economics*, 27 (1), 129-147.

Liu Y & Hu Z (2010) 'The mystery of high M2/GDP ratio revisited – the nature of global financial crisis', *Theory and Practice of Finance and Economics*, 31,11-15. In Chinese.

Menuet M, Minea A & Villieu P (2018) 'Deficit, monetization, and economic growth: a case for multiplicity and indeterminacy', *Economic Theory*, 65, 819-853.

Miller P J (1983) 'Higher Deficit Policies Lead to Higher Inflation', *Quarterly Review*, 7 (1), 8-19.

Niskanen W A (1978) 'Deficits, Government Spending, and Inflation: What Is the Evidence?', *Journal of Monetary Economics*, 4 (3), 591-602.

Nguyen T M L, Papyrakis E & Bergeijk P A G V (2019) 'Assessing the price and output effects of monetary policy in Vietnam: evidence from a VAR analysis', Applied Economics, 51 (44), 4800-4819.

Palacio-Vera A (2012) 'Debt Monetisation, Inflation, and the "Neutral" Interest Rate', *International Review of Applied Economics*, 26 (2), 267-285.

Protopapadakis A & Siegel J J (1986) 'Are government deficits monetized? Some international evidence', *Business Review*, Nov., 13-22.

Que F (1992) 'The inflation effect of the intertwining between public deficit and the loss of firms in China', *Economic Research*, 11, 40-43. In Chinese.

Rossi B & Zubairy S (2011) 'What Is the Importance of Monetary and Fiscal Shocks in Explaining U.S. Macroeconomic Fluctuations?', *Journal of Money, Credit and Banking*, 43 (6), 1247-270.

Sims C A (1994) 'A simple model for the study of the price level and the interaction of monetary and fiscal policy', *Economic Theory*, 4, 381-399.

Smets F & Wouters R (2003) 'An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area', *Journal of the European Economic Association*, 1 (5), 1123-75.

Thornton D L (1984) 'The government budget constraint with endogenous money', *Journal of Macroeconomics*, 6 (1), 57-67.

Woodford M (1998) 'Doing without money: controlling inflation in a post-monetary world', *Review of Economic Dynamics*, 1 (1), 173-219.

Woodford M (2001) 'Fiscal Requirements for Price Stability', *Journal of Money, Credit and Banking*, 33 (3), 669-728.

Yi G (1991) 'The Monetization Process in China During the Economic Reform', *China Economic Review*, 2 (1), 75-95.

Yu Y (1999) 'China should not monetise fiscal deficits -- a few points about seigniorage', *Financial Research*, 7, 1-5. In Chinese.

Zhang J (1997) 'The process of monetisation, financial control, and reform predicament of China', *Economic Research*, 8, 20-26. In Chinese.

Zhang J (2006) 'The mystery of high monetisation of China', *Economic Research*, 6, 59-69. In Chinese.

Zhang W (2008) 'The process of monetisation and the supply of endogenous money', *Financial Research*, 2, 13-32. In Chinese.