

Price Deflation and Policy

Response:

A Comparative View of Japan, China, and the United States

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I. Introduction

- This paper seeks to provide a comparative view of the phenomenon of price deflation by comparing the prewar experience of the United States and other countries with the current experience of Japan and China (and, to a lesser extent, Hong Kong).
 - We provide some empirical evidence that money demand is asymmetrically affected by demand-driven (but not supply-driven) price deflation.
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We also seek to answer the following questions:

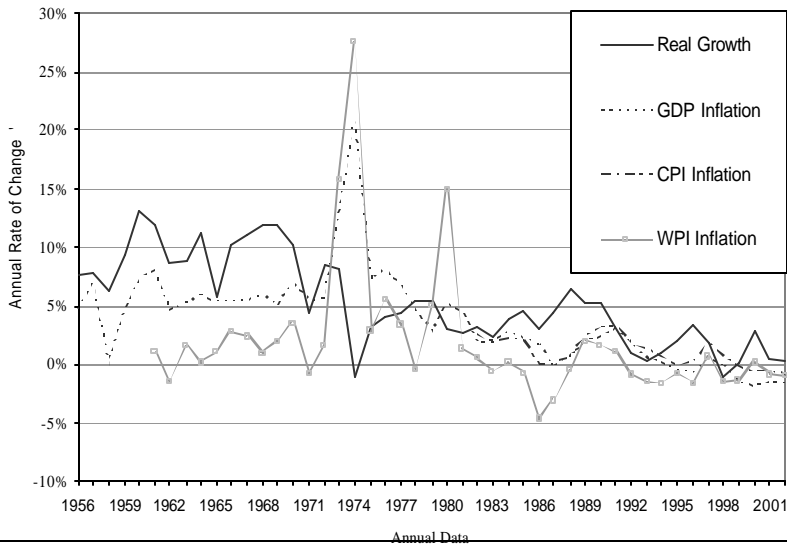
- Is Japan a leading indicator that deflation has become a serious macroeconomic problem in general?
- Is deflation merely the reserve side of inflation both in terms of the causes of deflation and in terms of the effect on the economy?
- Is deflation evidence of a liquidity trap, and does deflation in turn generate a liquidity trap? Does monetary policy cause the liquidity trap?
- Does the policy responses in Japan to the deflation process suggest the need for attitudinal changes and institutional central bank redesign in other countries?

Japan's Experience

- 1950-1973: rapid economic growth (8% annual growth in per-capita GDP, vs. 2.5% for U.S.) + moderate (5%) inflation
- 1973-1975: recession + inflation spike
- 1975-1990: moderately high (3.4% per capita vs. 2.4% for U.S) growth + gradual disinflation
- 1990-2003: Stagnating growth + deflation

When deflation starts depends upon the price index you choose. The WPI shows deflation beginning in 1985, the GDP deflator in 1994, the CPI in 1999.

Figure 1: Japan Growth and Inflation/Deflation



For other countries

- The U.S. has experienced disinflation, but no deflation (except 2001:Q4) yet.
- After 1997, China and Hong Kong – both of which peg their currencies to the dollar, unlike Japan – have experienced price deflation. China has continued to grow rapidly, while Hong Kong has experienced a recession.

Table 1. Average Inflation Rate in Comparison Economies (annual average percentage)

Country	1975:Q1 – 1979:Q4	1980:Q1 – 1984:Q4	1985:Q1– 1989:Q4	1990:Q1– 1994:Q4	1995:Q1– 1997:Q4	1998:Q1– 2002:Q4
United States:						
Deflator	7.1	6.5	3.1	2.9	2.0	1.6
CPI	8.1	7.4	3.6	3.6	2.7	2.3
Japan:						
Deflator	5.2	3.0	1.3	1.5	-0.3	-1.3
CPI (1981-)		2.2	1.0	2.0	0.6	-0.4
WPI	3.7	3.1	-1.5	-0.3	-0.6	-1.0
China:						
Deflator	0.9	2.4	8.1	10.9	7.0	-0.9
CPI	1.2	3.3	11.9	10.1	9.2	-0.3
Hong Kong:						
Deflator	9.0	9.6	7.6	8.5	4.6	-2.1
CPI (1976-)	7.9	11.6	5.8	9.5	6.7	-1.6

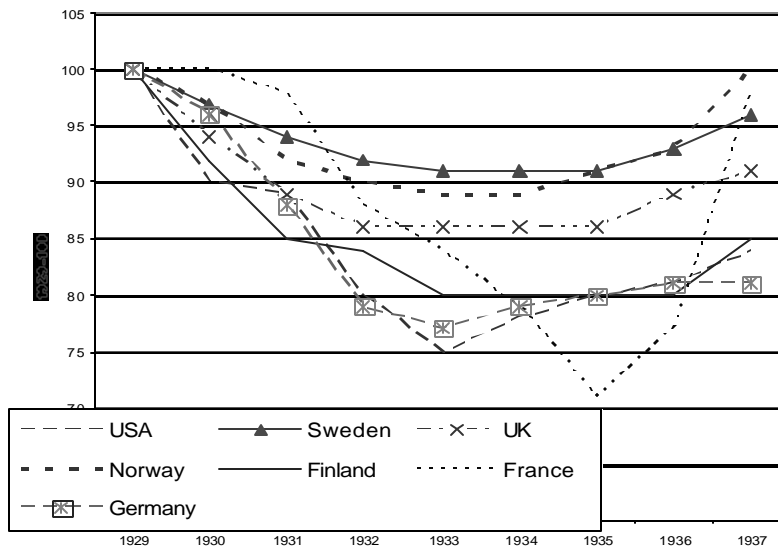
II. Recent Deflation in Historical Perspective

- Deflation relatively common before WWII
- U.S. experience:
 - 1839-43 – 42% drop
 - 1869-1896 – 38% drop
 - 1920-1922 – 20% drop
 - 1929-1933 – 27% drop
- U.K.'s revaluation of £ in early 1920s

Experience of Major Economies during the Great Depression:

- The U.K. – burned by its revaluation experience – abandoned the gold standard.
- Germany – burned by its hyperinflation – did not, and had a similar deflationary experience as the U.S. during 1929-1933.
- Sweden and Norway followed the U.K. in abandoning the gold standard, and Sweden used price level targeting for their monetary policy before gradually retargeting their exchange rates.

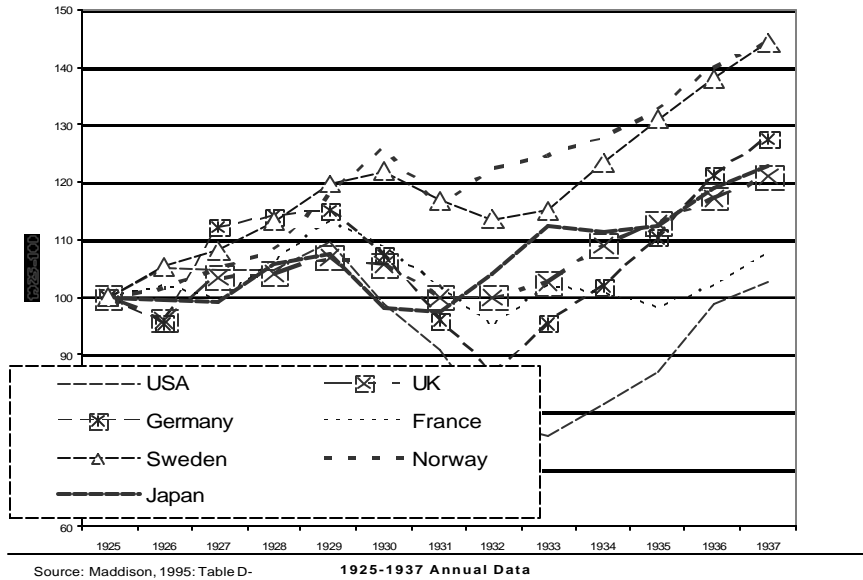
Figure 2: Consumer Prices during the Great Depression



Source: Maddison, 1995: Table D-

1929-1937 Annual Data

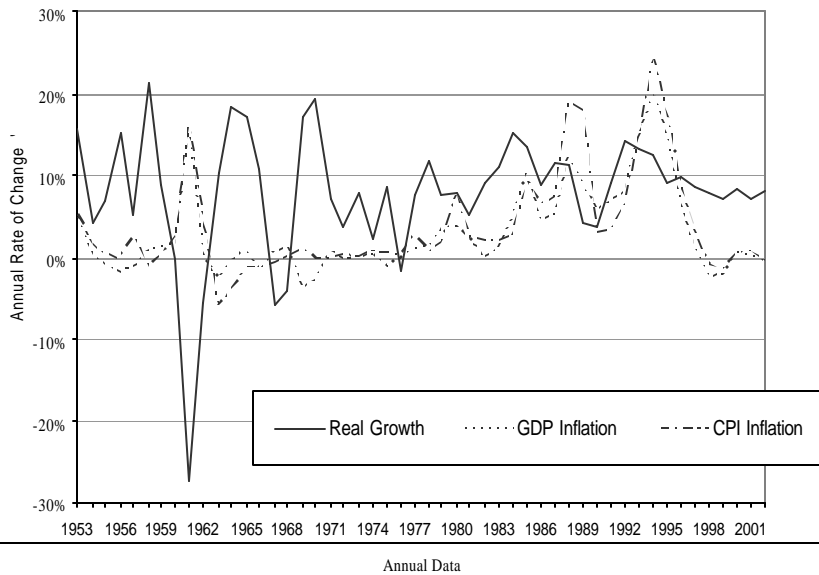
Figure 3: Per-Capita GDP during the Great Depression



China's Experience

- After Nationalist hyperinflation, restoration of price stability in 1949-1952 was matter of pride for the CCP.
- Administrative prices 1955-1978, with exception to Great Leap Forward. Pre-1976 growth unstable due to Maoist policy changes.
- Era of gradual reforms (1979-) led to rising growth rates and inflation rates. Rapid growth in bank credit (SOEs) and money supply was largely offset by money demand. First peak of inflation during Tian'anmen uprising, second peak following new reform policy of *Shehuizhuyi Shichang Jingji*. Recognition of growing bank crisis.
- Slowdown in credit expansion under Zhu Rongji, combined with increasing competition and slowing of export growth after 1997 (partly due to relatively overvalued currency), led to emergence of price deflation.

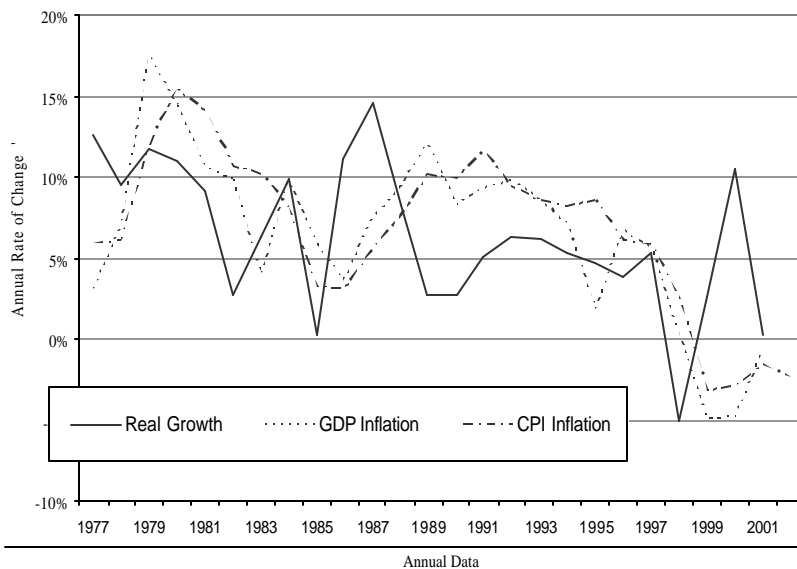
Figure 4: Mainland China Growth and Inflation/Deflation



Hong Kong's experience

- 1976-1997, 7% average annual growth in real GDP.
- Post-1997, Asian financial crisis coincident with handover to China, unsuccessful speculative attack on currency and slowdown in Asian trade led to recession of -5%.
- HK\$ pegged to US\$, but trade business is increasingly moving towards Shanghai.
- Prices fell by total of 10% between 1998 and 2002, new recession in 2002-2003. Now there is SARS.

Figure 5: Hong Kong Growth and Inflation/Deflation



III. Causes of Price Deflation

- Like inflation, deflation is ultimately a monetary phenomenon.
- But in the short-run:
 - Demand-led deflation: leftward shocks in aggregate demand include asset price declines (made more important due to financial liberalization), bank crises, restrictive fiscal policy, et cetera. Need to maintain fixed exchange rates can result in deflationary monetary policy.
 - Increased competitiveness by foreign producers (often cited in late 1990s as reason for U.S. disinflation) requires either fixed exchange rates or offsetting financial inflows.
 - Supply-led deflation: rightward shocks in aggregate demand, including increased domestic productivity and competitiveness.

The two are very different!

- Demand-led deflation is combined with recession or slowing growth, which is more likely to cause non-performing loan problem.
- Demand-led deflation is more likely to result in nominal interest rates hitting the Zero Lower-Bound (ZLB).

IV. Why Deflation is Different Than Inflation and in General, Undesirable

- *What every economist knows about it.*
 - Perfectly expected inflation is perfectly neutral, while imperfectly expected inflation has costs.
 - Hyperinflation destroys financial institutions and long-run investment incentive.
 - Price rigidity is more likely under deflation than inflation.
 - Deflation is an adjustment of an economy with excess supply towards its long-run equilibrium.

Why deflation is different...

- Cagan's hypothesis: hyperinflation leads to decreased money demand, effect is asymmetric. But if more inflation leads to less money demand, then disinflation (or deflation) should lead to more money demand.
- Deflationary expectations are asymmetric. Deflation is less common than inflation (even before WWII), and long-term contracts are less likely to include the possibility. This may help cause the banking sector's non-performing loan problem (e.g., Fisher's debt-deflation connection), which can also reduce the deposit expansion multiplier.
- The ZLB may lead to rising real rates and:
 - Reduced investment demand
 - A monetary "liquidity trap"
 - Reduced current consumption demand
- So deflation is asymmetric. A 5% inflation rate can be accommodated. A 5% deflation rate has serious consequences.

The liquidity trap

- Not exactly the old Hicksian trap taught to undergraduates, where money demand becomes infinitely elastic and monetary policy becomes completely ineffective.
- Instead, money demand increases as the spread on returns between risky and safe, liquid and illiquid assets is compressed by the ZLB. Banks lend less and hold more government securities, while financial investors hold more cash and deposits. Monetary stimulus must then grow even faster than money demand to be effective.
- A temporary monetary stimulus becomes ineffective because it does not alter deflationary expectations.
- A credible permanent stimulus would still work.
- A "monetary policy trap" can also result if central bank targets the nominal interest rate (or discount rate). Real interest rates may be a better target, but prior measurement is difficult.

The effect on consumption

- In another paper we demonstrate that there are both theoretical and empirical reasons to believe that deflationary expectations can lead to falling consumption in anticipation. This is due to rising real interest rates, inducing consumers to wait for prices to fall.
- This can amplify and extend the recession, and we think it might help explain why recessions before WWII were usually deeper and longer.
- This effect requires downward price rigidity. Once deflation occurs real consumption increases. A downward shock would immediately reduce prices but not cause deflationary expectations.

Central Bank Responses may be

Asymmetric

- In the prewar gold standard, central banks could (and did) improve the quality of assets through restrictive monetary policy. A prisoners' dilemma.
- Under modern fixed rates, central banks may be forced into monetary contraction by a balance of payments deficit, and sterilization just increases the likelihood of an eventual crisis; a BOP surplus, however, does not always force a monetary expansion, and sterilization leads to accumulation of foreign exchange reserves.
 - Of course, more central banks still seem to choose the former over the latter.
- Elsewhere, we argue that the Bank of Japan is also in an asymmetric "independence trap."

V. Empirical Analysis of Deflation in China, Japan, and the United States

- First, we assume that China is primarily experiencing supply-led deflation, while Japan has demand-led deflation.
 - **Reviewing the behavior of monetary variables:**
 - The observed price deflation trend is downward in Japan, but not so much so in China.
 - Nominal interest rates are falling, but only in Japan are real rates apparently rising.
 - Money demand is growing rapidly in both Japan and China. Deflation seems to be causing more of this in Japan than in China.
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For example...

- In **Japan**, the M2/M1 ratio has fallen from 4.4 in 1990:4 to 2.0 in 2002:3. People are willing to hold more near-cash assets.
 - From 2001:2 to 2002:2 Japan's monetary base grew by 30% and M1 grew by 34%, while M2 only grew by 4%. (This might be due to postal deposits.)
 - In **China**, the M2/M1 ratio has become stable, 2.7 in 1996 and still 2.6 in 2002. Money demand has grown rapidly relative to both GDP and currency, but this seems to be the result of financial deepening, not a liquidity trap.
 - By contrast, in the **U.S.** both the M2/GDP and M2/M1 ratios have remained relatively stable. Since 1994, the ratio of M2 to the monetary base has varied from its mean of 8.44 by an average of only 1%.
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Figure 6: Real GDP in the U.S., Japan, and China

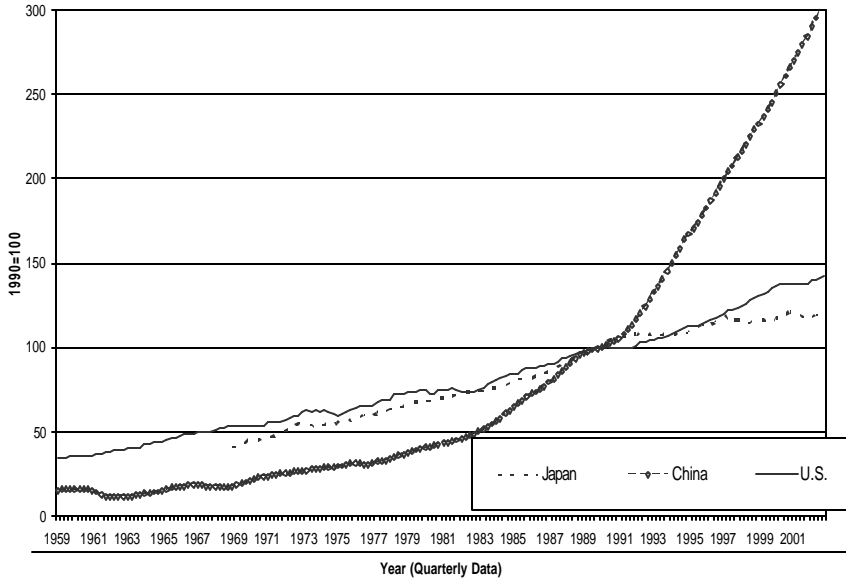


Figure 7: Price Levels (GDP Deflators) in the U.S., Japan, and China

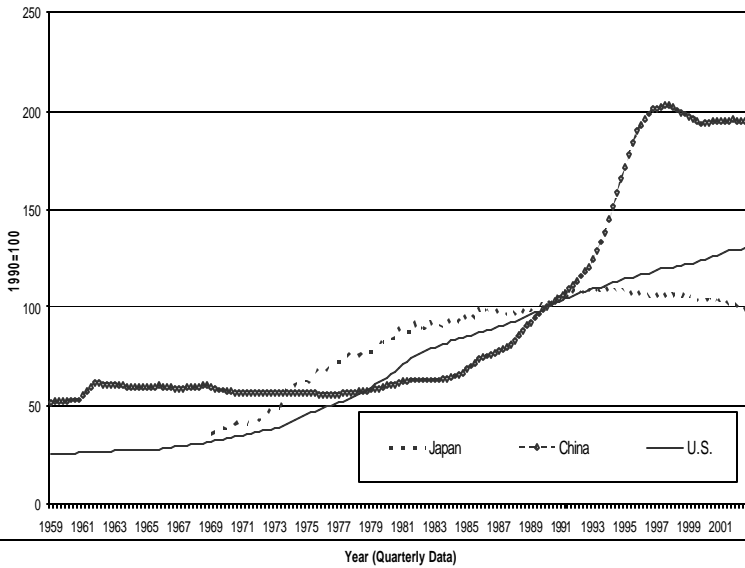


Figure 8: Nominal Interest Rates in the U.S., Japan, and China

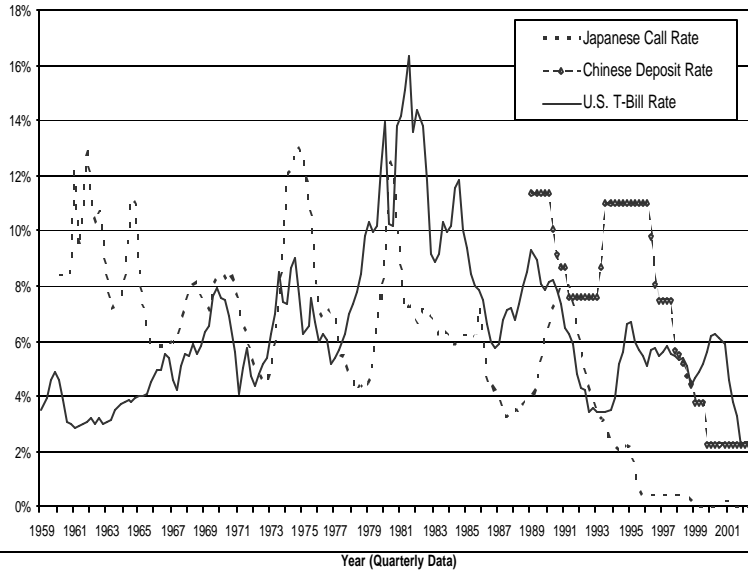


Figure 9: Real Interest Rates in the U.S., Japan, and China

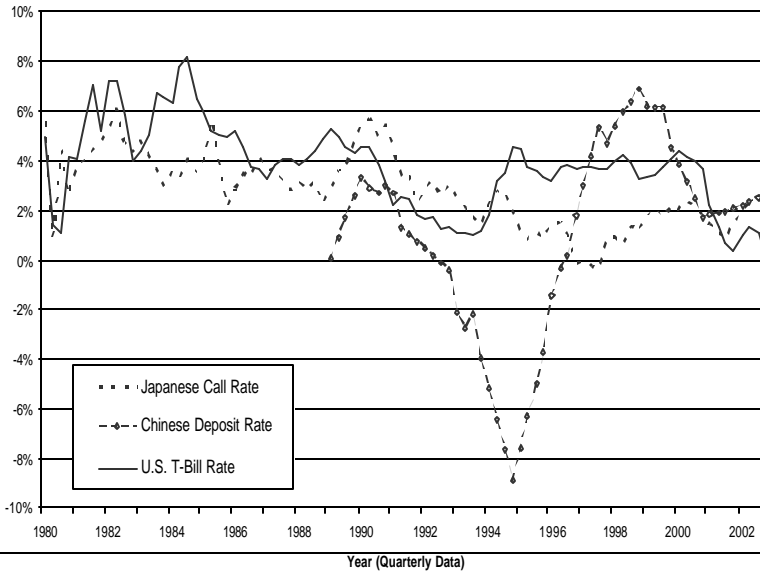


Figure 10: Money Supply in the U.S., Japan, and China

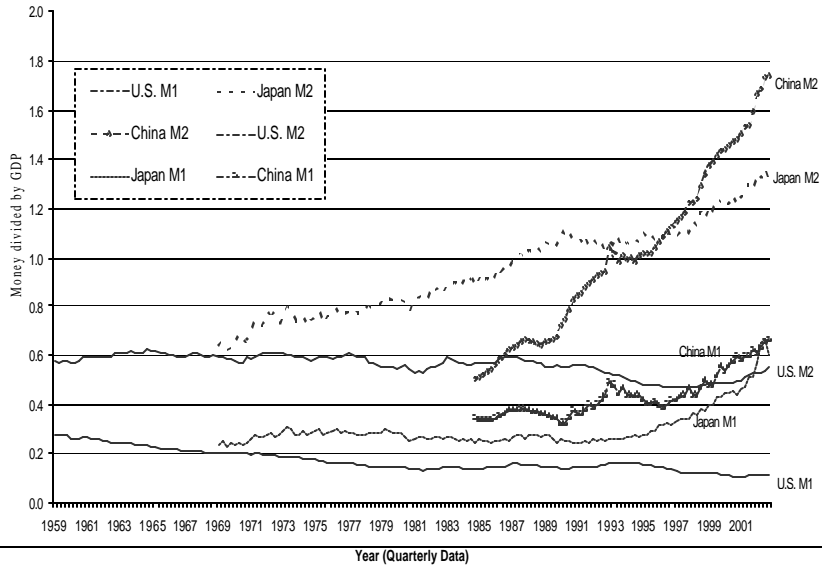
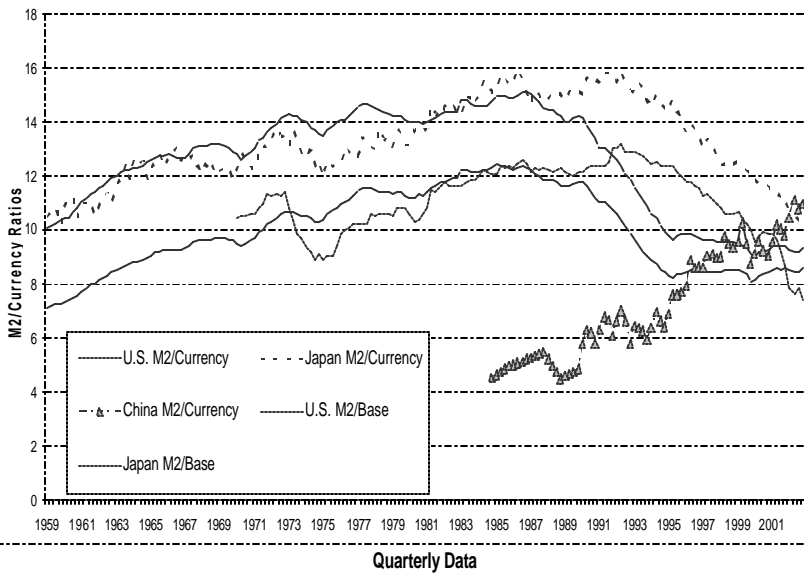


Figure 11: Deposit Expansion Multipliers



Estimations for Deflation and Money Demand

Basic money demand equation:

$$\ln(M2_t/P_t) = \beta_0 + \beta_t t + \beta_y \ln(GDP_t/P_t) + \beta_r r_t + \beta_p \pi_t + \Sigma \beta_\alpha D_t$$

Expectations:

$$\beta_y > 0, \beta_r < 0, \beta_p < 0, |\beta_t| < |\beta_p|,$$

$\Sigma \beta_\alpha > 0$ for demand-led deflation, not for supply-led deflation

Quarterly data:

- U.S. 1960:1 – 2002:4
- Japan 1970:1 – 2002:4
- China 1990:1 – 2002:4

Nonstationarity problems, Dickey-Fuller tests:

- OLS in levels to start
- with lagged dependent variables
- with difference equations
- with and without AR(1) correction

Table 2: Money Demand Regression Results

A. United States

	<u>levels</u>		<u>lagged dependent variables</u>		<u>first differences</u>	
	<u>OLS</u>	<u>AR(1)</u>	<u>OLS</u>	<u>AR(1)</u>	<u>OLS</u>	<u>AR(1)</u>
β_0	1.743**	1.205**	0.008	0.670**		
β_m			1.005**	0.604**		
β_t	-0.016**	0.011**			0.004**	0.007**
β_y	1.339**	0.334**	-0.009	0.152**	0.429**	0.102
β_p	0.008	-1.123**	-0.167**	-0.883**	-0.362**	-0.046
β_r	-0.198	-0.227**	-0.032	-0.248**	-0.360**	-0.030
ρ		0.973**		0.981**		0.670**
D-W	0.082**		0.729**		1.028**	
Adj. R ²	0.983	0.999	0.999	0.999	0.157	0.478

Interpretation for the U.S. estimates

- U.S. is the baseline, but within only one quarter with observed deflation we do not estimate this effect.
- Coefficient on real GDP is usually positive and statistically significant (but not always).
- Coefficient on real interest rate is usually negative and significant (but not always).
- Coefficient on inflation rate is usually negative and significant, and of greater magnitude than coefficient on real interest rate (but, again, not always).
- Coefficients are never of wrong sign and magnitude and statistically significant.

Table 2.B Japan

	levels		lagged dependent variable		first differences	
	OLS	AR(1)	OLS	AR(1)	OLS	AR(1)
β_0	0.588**	0.065	0.021	0.024		
β_m			0.978**	0.974**		
β_t	0.017**	0.038**			0.013**	0.014**
β_v	1.070**	0.050	-0.005	0.003	0.054	-0.172*
β_p	0.122	-0.408**	-0.194**	-0.182**	-0.418**	-0.143*
β_r	-0.068	-0.384**	-0.129*	-0.128*	-0.397*	-0.391*
$\Sigma\beta_d$	0.065**	0.090**	0.052**	0.052**	0.085**	0.097**
β_{d1}	0.030**	0.039**	0.052**	0.052**	0.036**	0.040**
β_{d2}	0.021*	0.032**	0.001	0.001	0.029**	0.035**
β_{d3}	0.015*	0.020**	-0.001	-0.000	0.020**	0.022**
ρ		0.966**		0.041		0.362**
D-W	0.353**		1.888		1.399**	
Adj. R ²	0.995	0.999	0.999	0.999	0.706	0.766

Interpretation for Japan

- Coefficient on real GDP is not well-behaved.
- Coefficient on real interest rate is negative but not always significant.
- Coefficient on inflation rate is negative and of both greater magnitude and significance.
- Current deflation has a significant, asymmetric, and positive impact on current money demand. Past deflation has an impact of somewhat smaller magnitude that becomes insignificant only when using a lagged dependent variable.

Table 2.C China

	levels		lagged dependent variable		first differences	
	OLS	AR(1)	OLS	AR(1)	OLS	AR(1)
β_0	-28.781	-8.877	-9.432**	-9.300*		
β_m			0.667**	0.675**		
β_t	0.037*	0.080**			0.036**	0.027**
β_v	1.399**	0.749**	0.571**	0.558**	0.104	0.476
β_p	-28.945**	-7.877	-10.213**	-10.065**	-0.671	-3.310
β_r	-0.579*	-0.723*	-0.488**	-0.477**	-0.976**	-1.096**
$\Sigma\beta_d$	0.017	0.022	0.006	0.006	0.015	0.018
β_{d1}	0.017	0.009	0.012	0.013	0.006	0.007
β_{d2}	-0.005	-0.000	-0.006	-0.006	-0.001	-0.001
β_{d3}	0.006	-0.013	0.000	-0.000	0.011	0.012
ρ		0.708**		-0.053		-0.055
D-W	0.810**		2.082		1.979	
Adj. R ²	0.998	0.999	0.999	0.999	0.003	0.118

Interpretation for China

- Coefficient on real GDP is positive and usually (but not always) statistically significant.
- Coefficient on real interest rate is negative, significant, and relatively large.
- Coefficient on inflation rate is negative and of greater magnitude, but not always significant.
- Deflation is not statistically significant, which is consistent with the argument that supply-led deflation is different.

VI. Policy Implications

- Deflation is not the same as disinflation, and for a variety of reasons (e.g., asymmetry, the ZLB) it can amplify and prolong recessions and make monetary policy more difficult.
- Deflation is a monetary phenomenon, and central banks which do not consider it a problem may run into trouble.
- Low rates of inflation may be preferred to zero inflation given possible measurement biases and the possibility of unexpected shocks.
- Long-term price-level targeting may be a proven and effective means for a central bank to prevent deflationary expectations.
- Formal central bank independence does not necessarily lead to good monetary policy.

Three Other Related Papers

- Cargill, T.F., & E. Parker (2001), "Financial liberalization in China: Limitations and lessons of the Japanese regime," *Journal of the Asia-Pacific Economy* 6(1): 1-21.
A better explanation of China's banking problems.
- Cargill, T.F., & E. Parker (2003), "Japanese economic structures and finance: characteristics and causes of the current slowdown," in *Structural Foundations of International Finance*, edited by Padoan, Brenton, & Boyd: chapter 9 (Edward Elgar Publishing, Inc.).
A better explanation of Japan's problems and policy missteps.
- Cargill, T.F., & E. Parker, (2003) "Central Bank Policy, Liquidity Traps, Consumption, and Japan's Economic and Financial Stagnation."
Exploration of the effect of deflation on consumption and the political economy of the Bank of Japan's "independence trap."

All available at: <http://unr.edu/homepage/elliottp/wp.html>

VII. Concluding Comment

- The economics profession does not appear to fully understand price deflation, and may be dismissing real and significant negative effects. (Krugman makes this point in his *Depression Economics*).
 - There are lessons we can learn from a review of both past and current deflationary experiences, and we have tried to cover some of them here.
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