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**Working Paper**

## US pressure on China's currency: Milton Friedman and the silver episode revisited

Claremont Colleges Working Papers, No. 2005-07

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*Suggested Citation:* Burdekin, Richard C. K. (2005) : US pressure on China's currency: Milton Friedman and the silver episode revisited, Claremont Colleges Working Papers, No. 2005-07, Claremont McKenna College, Department of Economics, Claremont, CA

This Version is available at:

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# **US Pressure on China's Currency: Milton Friedman and the Silver Episode Revisited**

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**November 2005**

\*The author is indebted to Marc Weidenmier for the historical decompositions, thanks Yanjie Feng Burdekin for interpretative help, and is most grateful to Nancy Tao for excellent research assistance and to the Chiang Ching-Kuo Foundation for generous financial support.

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## **US Pressure on China's Currency: Milton Friedman and the Silver Episode Revisited**

### *Abstract*

Post-2003 US pressure for Chinese currency appreciation has met with concerns regarding the possible impact on China's economic growth and vulnerable financial system. Such pressure was transmitted in a more tangible form in the 1930s under the post-1933 US silver purchase program. New empirical evidence suggests a significant link between the policy-induced driving up of US silver prices and Chinese price and exchange rate levels. Credit shortages, especially away from the Shanghai financial center, appear to have accompanied the silver-induced price declines and exchange rate appreciation and bad loans tied to declining real estate values also became a problem as China's deflation intensified after 1933. It seems that US pressure for drastic exchange rate appreciation did real harm in the 1930s and this history hardly encourages acceding voluntarily to such pressures today.

JEL codes: E31, E65, F42, N15

It stretches credibility to suppose that prices in China were sufficiently flexible that a major deflation would have a negligible effect on real magnitudes.

(Friedman, 1992, p. 77)

Instead of capital flowing in from abroad, more is going out in respect of past loans and investments than is coming in in the form of new transactions. And instead of capital flowing into the interior, even the limited capital derived ... [there] is being drained into the maritime ports for unproductive safety. The result is not only a starving of new development, but also, since the capital exported is in the form of silver, the country's currency, a secondary form of currency deflation, forcing prices down further and adding to the real burdens of rent and taxation.

(Salter, 1934, pp. 7-8)

By remaining on a silver standard while all other major world economies tied their currencies to gold, China enjoyed a flexible exchange rate with the gold bloc. This "flexible" rate tied the currency to a commodity whose price was, however, not only determined abroad but, after 1933, strongly driven by the actions of the United States. Friedman and Schwartz (1963) and Friedman (1992) discuss how, while China got a boost from a depreciating exchange rate during the early years of the Great Depression as silver prices fell, automatically pulling China's currency lower relative to the gold bloc countries,<sup>1</sup> the post-1933 US silver purchase program reversed China's prior good fortune and put strong upward pressure on China's silver-based currency. The United States essentially forced drastic currency appreciation on China in the 1930s and the consequences give ample warning as to the potentially dangerous consequences of sudden upward adjustments of the type that China was being urged to accede to in the post-2003 period.

US silver purchases were first authorized in December 1933 and the Silver Purchase Act was signed into law on June 19, 1934. The US price of silver bottomed in December 1932, briefly falling below 25 cents an ounce (Westerfield, 1936, p. 26). The silver price then more than doubled between December 1933 and April 1935, peaking at 81 cents an ounce on April 26, 1935 (Friedman, 1992, p. 67).

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<sup>1</sup>See also Lai and Gau (2003) on the benefits enjoyed by China vis-à-vis the gold bloc after 1929.

The sharply rising monthly closing price of silver in New York, is shown in Figure 1. As silver rose, the value of China's currency, the fapi, rose too and the declining number of yuan required to purchase each US dollar over this period of rising silver prices is shown in Figure 2. The approximate 40% rise against the US dollar in 1933-1935 was accompanied by a near 50% rise against the pound sterling and a 177% rise against the Japanese yen from 1931 to 1935 (Chung-kuo k'o-hsüeh yüan, 1958, p. 112).

Brandt and Sargent (1989) and Rawski (1993) challenge Friedman's (1992) view that the Chinese economy suffered from the US silver purchase program and the ongoing rise in silver prices and China's exchange rate, however. Given that there is no argument that China endured severe deflation between 1932 and 1934,<sup>2</sup> these revisionist views imply that not only was a silver-based country not hurt by a rising world silver price but also that the real economy remained robust to double-digit deflation. But, after large-scale silver purchases got underway, US exports to the rest of the world rose between September 1934 and September 1935 rose while exports to China *fell* by 38% (Westerfield, 1936, p. 112). Longer-run time series analysis by Bailey and Bhaopichitr (2004) suggests that the world silver price appears to have had a significant effect on China's own exports over the 1866-1928 period. Meanwhile, a plethora of accounts by both Chinese and western contemporaries and observers echo the view that China was significantly hurt by the rising silver price in the 1930s and that the accelerating deflation had severe effects on the real economy.<sup>3</sup>

Rawski (1993, p. 757) points to Yeh (1979) for confirmation that "contrary to Friedman's unsubstantiated assertions, the world depression caused no significant or protracted decline in China's real output." Ignoring concerns with real output data for the 1930s, coming amidst the loss of Manchuria to Japan in 1931 and other wartime disruptions, Yeh's (1979, pp. 97-98) figures, as they stand, do

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<sup>2</sup>Rawski (1993, p. 757) himself reports data on Chinese retail and wholesale price indices showing declines of 18% and 10%, respectively, between 1932 and 1934.

<sup>3</sup>See, for example, Salter (1934), Stone (1934), Leavens (1935), Lewis (1935), *Silver and Prices in China* (1935), Wu (1935), Fetter and Bratter (1936), Lin (1936), Roberts (1936), T'ang (1936), Westerfield (1936), Chi (1937), Bloch (1938), Li (1939), Shen (1941) and Young (1971).

nevertheless suggest an 8.7% drop in China's GDP and a 7.4% drop in personal consumption between 1933 and 1934. The apparent absence of declines either side of the 1933-1934 plunge does suggest China's relative insulation from the Great Depression but this is consistent with Friedman's own view that China did well until the US silver purchase program drove up world silver prices, carrying China's silver-based currency up with it, and leading to a sharp economic downturn in China.

This paper first attempts to provide additional evidence on the developments in China in early 1930s. Contrary to Brandt and Sargent's (1989) claim that China's banking system was the key to economic resilience, there seems considerable evidence that many banks committed themselves to risky real-estate-based loans that had serious consequences once deflation set in. Tight credit market conditions and the number of bank failures attest to this being an area of weakness not of strength. Moreover, an exodus of silver from the interior of the country to Shanghai helped to temporarily insulate the country's financial center from the difficulties experienced elsewhere and led some other provinces to actually pass laws prohibiting, or restricting, the internal export of silver. This is a particularly important concern because most of the available time series data focus on Shanghai and thereby likely understate the economic plight of the country as a whole. Even in Shanghai, however, extant evidence points to severe economic problems in 1934-1935 at the time of the large run-up in silver prices as the large-scale US purchase program got underway.

The second contribution of this paper is to provide new evidence on the empirical link between the silver price, China's exchange vis-à-vis the \$US, and China's price level. This regression analysis supports the view that the exchange rate moved with the silver price and that these exchange rate movements were a significant determinant of China's price level. Historical decompositions suggest a key role for silver in accounting for the ups and downs in Chinese price and exchange rate levels over the 1927-1937 period. Coupled with the available data on developments in the real economy, it seems that contemporary concerns about the effects of the US silver purchase program on China were not misplaced.

China's experience, while providing an example of the potential insulation properties of a floating exchange rate, also gives a clear warning as to the dangers of tying the currency to a commodity whose price is subject to external control. The 1930s experience also points to the potential risks of sudden currency appreciation – a lesson that may have some bearing on the post-2003 US pressure for China to allow more rapid appreciation of the renminbi.

## 1. CHINA'S ECONOMIC WEAKNESS AT THE TIME OF THE US SILVER PURCHASE PROGRAM

Wholesale price data on other Chinese cities consistently imply that Shanghai's steep price decline in 1933-1934 was less severe than that experienced elsewhere. Available data on four other cities, plus the North China province of Huabei, reveals less deflation than Shanghai in 1932 but considerably worse price declines in 1933 and 1934 that averaged double-digit deflation each year in Hankow and the Nationalist capital Nanking (Table 1).<sup>4</sup> The greater deflationary pressures away from the Shanghai financial center are not inconsistent with the pressures associated with the drain of silver from the interior of China to Shanghai in 1933-1934. Table 2 shows the flow of silver from Shanghai to the interior suddenly reversing in 1932. With agricultural commodity prices falling even more steeply than goods prices, Chinese farmers' suffering from a severe worsening of the terms of trade was exacerbated as the "outflow of silver from rural areas to Shanghai and other cities made it more difficult for farmers to obtain loans" (Feuerwerker, 1995, p. 128).<sup>5</sup> The internal flow into Shanghai more than offset the international outflow of silver until 1934, however, thereby cushioned the financial center against the

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<sup>4</sup>Brandt and Sargent (1989, p. 39) also report data showing this pattern, with Changsha, another city in the interior of China, registering even more deflation than Hankow.

<sup>5</sup>The extent of the agricultural product price declines also appear have been more severe away from Shanghai. While the Shanghai price of wheat had experienced an overall price decline of 40% by 1934, counties in the interior province of Shandong reported declines in both wheat and land prices ranging from 60% to 80% in 1934 (Pomeranz, 1992, p. 315).

deflationary consequences while exacerbating the effects in the interior (Lin, 1936, p. 54). Large-scale bank failures occurred in provinces like Hankow between 1933 and 1935 and a number of provincial governments took measures to restrict the outflow of silver in the early 1930s (Tamagna, 1942, pp. 81-84).<sup>6</sup>

Lin (1936, pp. 57-59) points to additional strains resulting from reduced lending by foreign banks that

ushered in a struggle for liquidity [that] ... resulted in a drastic curtailment of credit, intensifying the depressing influences of falling prices on trade and industry ... Reflecting in part the acute stringency of credit, the rates of native interest ... began to rise again in the fall of 1934, following the external drain of silver ... Even at the prohibitive level prevailing in 1935, ... frequently no call loans could be obtained irrespective of the security offered.

The failure rate among native Chinese banks (reaching 148 across 31 Chinese cities in 1935) certainly does not seem to align itself with the rosy banking situation alluded to by Brandt and Sargent (1989).

Furthermore, Ci (1992, p. 197) notes that

[b]ecause of the great shortage of ready silver in the interior, the reserves possessed by the various banks in the interior when making new note issues were extremely low. For instance, the cash reserve of the Sichuan Local Bank was only 4 per cent in the early 1930s ..., a world of difference from the 60 per cent norm. Such being the case, whenever a war broke out, banks were closed and the people suffered a great deal from the fact that [local] currencies were inconvertible.<sup>7</sup>

It also does not seem that there is much support for Brandt and Sargent's (1989, p. 38) belief that, prior to 1935, "bank loans both to the government and to private firms were made along conservative lines designed to assure that convertibility of notes and deposits were maintained." Indeed, the prior excesses of the Chinese banks likely made China much more vulnerable to the effects of the US silver

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<sup>6</sup>China's experience may have been somewhat analogous to the US case where funds moving from rural areas to eastern money center banks put increasing pressure on the banks in the interior in the early 1930s (Rockoff, 2004).

<sup>7</sup>Fluctuations of the local currencies against the national currency was also likely a factor hurting market integration across China's provinces (as with the depreciations experienced in both Sichuan and Yunnan in China's southwest – Wright, 2000, pp. 717-718). According to Ci (1992) the problem of depreciating local currencies was widespread and extended even to metallic issues of copper coins and subsidiary silver.



purchases than would otherwise have been the case. Following a trend rather reminiscent of much more recent developments in Japan and elsewhere, excess liquidity had been channeled into real-estate-based loans that left banking liquidity dependent upon the stability of the price level in general and real estate prices in particular (Lin, 1936, pp. 56-57). Bank advances based on real estate and other non-liquid assets led to a situation where such local banks “frequently suffered disastrous runs, as the value of rural real estate has fallen” (*Silver and Prices in China*, 1935, p. 155). Falling real estate values in Shanghai posed problems in the financial center as well by 1934. Leavens (1935, p. 56) observed:

Since most banks had loaned rather heavily on real estate, they were anxious to reduce old loans and unwilling to make new ones. There were no purchasers, so that banks and individuals found themselves with frozen assets on their hands. The failures of some Chinese banks and of an American bank [the American Oriental Bank] and associated real estate companies in the spring of 1935 were precipitated by the financial stringency.

While the United States cannot be blamed for earlier over-zealous lending practices by Chinese banks, it does not seem that China’s banking system was particularly well-placed to weather the new strains resulting from it. Nor does business in general seem to have done well. Monthly business failures in Shanghai soared from 17.83 a month in 1933, to 30.50 a month in 1934 and then to 41.67 a month in the first six months of 1935 (Lin, 1936, p. 61). The volume of real estate transactions in Shanghai fell by over 92% between 1931 and 1934 before dropping a further 42% over the first ten months of 1935 (Lin, 1936, p. 64). The general stock index, meanwhile, dropped by approximately 7% in 1933 and by nearly 14% in 1934 (see Table 3). Finally, as Friedman (1992, p. 76) points out, the accelerating decline in imports, in both nominal and real terms, over 1933-1935 seems inconsistent with any idea that China derived any real benefit from the rising world price of silver. Indeed, export prices consistently fell faster than import prices and there was no reversal in the declining export/import price ratio until 1935 (Table 4).

This still leaves the question of the seemingly-anomalous continued growth in China’s overall money supply, even as silver flowed out of China into the United States, that is suggested in the data

compiled by Rawski (1989). Such positive money growth, although questioned by Friedman (1992), appears to be buttressed by a 46% increase in note issue by Shanghai banks over the December 1931 to June 1934 period – an increase readily facilitated by the fact that the overall stock of silver in Shanghai more than doubled over this same period (Tamagna, 1942, p. 82). Owing to the silver influx from the interior of the country, Shanghai did not see any depletion in its silver stock until the latter part of the year. Tang (1936, p. 109) points out that only in September 1934 did the internal flow of silver into Shanghai reverse – in a sudden shift that

was due not to internal conditions, but mainly to external. Most of the silver shipped from Shanghai to the interior found its way out of the country, and was ultimately purchased by the United States Government.<sup>8</sup>

The monetary reform on November 5, 1935 then freed the note issue from its old link to the (shrinking) stock of available silver. Given the annual nature of Rawski's (1989) figures, it is unclear how much of the small 1934 increase reflects a mix of seemingly-rapid expansion early in the year and a sharp cutback thereafter. Similarly, it is unknown how much of the apparent 1935 money supply increase occurred late in the year after the new monetary standard was introduced on November 3, 1935. At that time all silver in circulation was nationalized and new note issues by the three government banks, with only limited silver backing, became legal tender.<sup>9</sup>

But regardless of whether or not the Chinese money supply continued to expand in spite of the effects of the US silver purchases, it clearly did not do so by enough to ward off the negative effects.

There seems to be no doubt that prices fell severely after 1931 and the annual decline in wholesale prices

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<sup>8</sup>The funds realized from the outflow of silver from China (via smuggling after the capital controls imposed by China in October 1934) appear to have largely remained out of the country as capital flight (Chang, 1988). Therefore, rather than delivering a 'boon' to the Chinese economy by making existing silver holdings more valuable (Brandt and Sargent, 1989), the US silver purchases actually seem to have triggered an outpouring of needed capital as holders increasingly doubted the viability of China's silver standard in the face of the surging world price of silver.

<sup>9</sup>The new mixed monetary standard was based on a reserve of 25% silver, 35% foreign currency and 40% government bonds (Tamagna, 1942, p. 145). A prior October 15, 1934 attempt to limit the outflow of silver through the establishment of an export tax on silver, and an equalization charge, had proved insufficient to arrest the deflationary silver drain (Shen, 1941, p. 16).

reached double digits in some Chinese cities. Real output also declined at least initially even if Yeh's (1979) estimates are accepted unquestioningly. China's money growth was therefore unambiguously insufficient to avoid deflation and insufficient to avoid a sharp, albeit temporary, decline in business activity. And, even as domestic banks issued more notes, the sharp cut back note issuance by foreign banks (falling by 20.7% in 1933 and 35.1% in 1934 – Wu, 1958, p. 31) scarcely suggests that these institutions saw an abundance of good lending opportunities in China. In quantity theory terms,  $PY$  clearly fell, and any overall increase in  $M$  must have been more than offset by a decline in  $V$ , the velocity of circulation. Velocity typically falls in the presence of expectations of deflation (see Burdekin and Siklos, 2004, for extended discussion) and rising rates of business and bank failure undoubtedly gave much added incentive to hoard available funds and cut back on non-essential purchases. Although Rawski's (1989, p. 163) implied 1932-1934 velocity decline of 30% or more seems rather high, this may well reflect the economic weakness and uncertainty pervading the contemporary accounts of the time. It certainly could not plausibly be taken as indicative of benign economic conditions – again even accepting without question money supply and output estimates that seem considerably more favorable than eyewitness accounts and other data suggest.

## 2. EMPIRICAL EVIDENCE ON CHINA'S EXCHANGE RATE AND INFLATION RESPONSES

For the US silver purchases to have hurt China during the 1930s, a necessary, albeit not sufficient, condition would be for the Chinese price level to fall as the currency strengthened against the dollar and for the currency appreciation to be linked to silver prices and/or the onset of the US silver purchase program. Lai and Gau's (2003) vector autoregressive analysis suggests significant effects of silver on China's prices and exchange rates over the 1929-1935 period but does not consider the impact of China's break from silver following the US silver purchase program. The present regression analysis uses monthly data on the Shanghai wholesale price index, the yuan/\$US exchange rate and the New York

silver cash price. In order to allow for effects of the purchasing power of silver rather than the absolute silver price (cf, *Silver and Prices in China*, 1935), a real silver price series is constructed by deflating the silver price by the US producer price index. Given that these series prove to be nonstationary but not cointegrated in levels, each series is employed in log first difference form in the regression analysis. The estimation period covers the “Nanking decade” of Nationalist rule in China, running from 1927 until the outbreak of all-out war with Japan in July 1937.<sup>10</sup>

Table 1 provides regression results as well as data definitions and sources. The inflation rate in Shanghai is found to be significantly related to its own lagged value and the current and lagged exchange rate with the \$US. The coefficients on the exchange rate have the expected positive sign, such that yuan depreciation leads to higher prices or, more to the point, a stronger yuan has a deflationary effect. The contemporaneous exchange rate is significant at the 5% level and the lagged exchange rate is significant at the 1% level. Allowance for additional lags, and for the silver price, showed these extra terms to be insignificant. The silver price, whether measured in nominal or in real terms, is found to have a significant effect on the exchange rate, however, as shown in Table 5 (columns (2) and (3)). The negative coefficients, significant at the 1% level in each case, imply that, as expected, a higher silver price leads to a stronger Chinese currency.

The failure of silver price movements to add significant explanatory power to the inflation equation presented in Table 1 (column (1)) likely reflects the fact that this effect is already partially embodied in the exchange rate series itself. Moreover, a dummy variable for the post-October 1935 period is significant at the 1% level in the inflation equation. This implies that there is a step up in the

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<sup>10</sup>The decade in which the Nationalists ruled from their capital in Nanking still suffered from armed strife with warlords and communist insurgents as well as the 1931 Japanese occupation of the north-eastern province of Manchuria (cf, Fenby, 2004). Loss of territorial control as well as competing money issues by Japanese puppet banks and other local issuers make all national economic data for this period problematic even prior to 1937 – hence the reliance on a Shanghai, rather than national, price index and an international exchange rate measure. Available real GDP and money supply series (Yeh, 1979; Rawski, 1989) are annual estimates only and cannot be used here.

inflation rate after China abandoned the link to silver in November 1935.<sup>11</sup> Furthermore, causality testing reveals that US silver prices Granger-cause Chinese inflation over the 1928-1935 period but not over the full sample ending in June 1937 (see Table 2). The exchange rate Granger-causes inflation over the whole period, however. This suggests that the exchange rate was consistently important over the Nanking decade and that both the US silver price, and China's 1935 break from silver, had significant effects.<sup>12</sup>

The importance of silver to China during the Nanking decade receives further support from the results of a historical decompositions (using the RATS software package) that assess the additional explanatory power contributed by the (log of) the silver price, the exchange rate and the (log of) China's own price level over and above a baseline forecast for these same variables. Figure 3 provides the historical decomposition of China's price level and the first panel shows the contribution made by the silver price. Relative to the baseline forecast, allowing for the silver price effect yields an exceedingly close match to the actual ups and downs of the price level over the sample period. The fit is especially good after the United States exits the gold standard in 1933 and launches the silver purchase program. Figure 4 provides the historical decompositions of the exchange rate and, once again, the first panel suggests a mapping between the forecast values and the actual historical movements once the silver effects are factored in. As before, the silver price effects provide for an especially good fit after 1933. Finally, Figure 5 suggests that the silver price movements are themselves largely self-driven over the

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<sup>11</sup>Neither this dummy nor the lagged dependent variable are significant in the exchange rate equation. The insignificance of the dummy variable in the exchange rate equation may reflect the fixed exchange rate policy imposed as part of the November 1935 reforms – with the three Government banks authorized to buy and sell unlimited amounts of foreign exchange to maintain the newly-established rates against the \$US, the pound sterling and the Japanese yen (Shen, 1941).

<sup>12</sup>Using the real silver price in place of the nominal silver price does not change any of the inferences drawn above (see Appendix Table A.1). The only seemingly-spurious result is the finding that the exchange rate Granger-causes the silver price rather than the other way round. This is almost certainly a figment of the contemporaneous, rather than lagged, effects identified in Table 5.

sample period, consistent with silver price movements exerting an exogenous influence on the Chinese price level and exchange rate over the Nanking decade.<sup>13</sup>

### 3. CONCLUSIONS

The historical decompositions, combined with the earlier conventional regression analysis, appear to offer abundant confirmation that silver prices, and the US silver purchases, were an important influence on Chinese prices and exchange rates. For the Chinese economy to have been insulated from these effects requires both agricultural and industrial producers to have been entirely insensitive to both local price movements and exchange rate movements. Despite doubts as to how bad China's real economy really was at the peak of the US silver purchases, the deflationary effects surely made performance significantly less strong than it would otherwise have been. The sheer size of the price and exchange rate effects simply cannot be plausibly dismissed nor can the evidence that these effects were, in significant part, silver-driven. There is also abundant, albeit fragmented, evidence that monetary effects on the real economy over this period were themselves substantial, especially in the countryside.

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<sup>13</sup>The inferences drawn from Figures 3-5 are generally maintained if we substitute the real silver price for the nominal silver price. Allowing for the effects of the real silver price provides a slightly less tight fit with the actual price and exchange rate movements than before, but still mimics well the ups and downs in the series. Meanwhile, the real silver price, like the nominal silver price, seems largely self-driven (See Appendix Figures A.1-A.3).

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TABLE 1: Wholesale Price Inflation Across China, 1929-1936

	1929	1930	1931	1932	1933	1934	1935	1936
Shanghai	2.8	9.9	10.4	-11.3	-7.7	-6.5	-0.7	12.6
Huabei (North China Province)	2.9	4.3	5.8	-7.9	-10.5	-8.6	3.5	15.8
Guangzhou	0.1	4.9	11.0	1.1	-8.1	-9.8	-10.2	24.5
Hankow	–	–	–	-1.8	-12.2	-9.8	0.2	9.0
Nanking	–	–	–	-5.0	-8.6	-12.5	-0.3	5.6
Tsingtao	–	–	–	-3.7	-8.4	-8.5	3.0	4.5

Source: Chung-kuo k'o-hsüeh yüan (1958, pp. 91-92) and author's calculations

TABLE 2: Internal and External Flows of Silver, 1929-1935

	Millions of Dollars						
	1929	1930	1931	1932	1933	1934	1935
Internal Inflow to Shanghai	123.9	109.2	111.7	160.9	103.9	44.6	15.9
Internal Outflow from Shanghai	182.8	142.5	166.7	19.8	26.2	103.9	36.7
Net Internal Inflow	-58.8	-33.2	-55.0	141.1	77.8	-59.3	-20.8
Net Chinese Imports of Silver	164.9	104.4	70.8	-11.4	-14.1	-256.7	-59.4

Note: Internal flow data for 1935 is only through the month of October

Source: Lin (1936, pp. 54) and Chung-kuo k'o-hsüeh yüan (1958, pp. 108-109)

TABLE 3: Shanghai Stock Market Performance, 1932-1935

	Monthly Index Values (July 1931 = 100)			
	1932	1933	1934	1935
January	–	75.61	70.30	59.37
February	–	75.32	69.71	57.98
March	–	71.40	68.70	56.95
April	81.53	69.10	66.81	56.90
May	81.27	68.23	66.06	56.71
June	80.25	70.47	65.75	56.53
July	78.58	71.03	64.52	56.53
August	78.06	71.07	63.46	56.58
September	78.74	72.19	63.38	56.53
October	78.95	71.40	62.73	–
November	78.27	70.46	61.99	–
December	75.27	70.07	60.30	–

Source: Lin (1936, p. 62)

TABLE 4: Export and Import Price Performance, 1926-1936

	Shanghai Export Price Index	Shanghai Import Price Index	Export/Import Price Ratio
1926	100.0	100.0	100
1927	106.1	107.3	99
1928	104.5	102.6	102
1929	105.2	107.7	98
1930	108.3	126.7	85
1931	107.5	150.2	72
1932	90.4	140.2	64
1933	82.0	132.3	62
1934	71.7	132.1	54
1935	77.6	128.4	60
1936	96.1	141.7	68

Source: Chung-kuo k'o-hsüeh yüan (1958, p. 61)

TABLE 5: Regression Results for Nationalist-Era Chinese Inflation and Exchange Rate Equations

Right-hand-side variables	Inflation Equation		Exchange Rate Equation	
	(1)	(2)	(3)	(3)
Constant	-0.002 (-1.20)	0.005 (1.12)	0.006 (1.39)	
Inflation (-1)	0.166** (2.14)			
Exchange Rate	0.068** (2.01)			
Exchange Rate (-1)	0.187*** (6.17)	-0.14 (-1.16)	-0.05 (-0.72)	
US Silver Price		-0.579*** (-3.95)		
US Real Silver Price				-0.533*** (-4.90)
Post-November 1935 Dummy Variable	0.011*** (2.81)	-0.012 (-1.46)	-0.015 (-1.22)	
Adjusted R <sup>2</sup>	0.394	0.256	0.198	

Notes:

Inflation = the log growth rate of Shanghai wholesale prices

Exchange Rate = the log growth rate of the yuan/\$US rate

US Silver Price = the log growth rate of the New York silver cash price (\$US/ounce)

Real US Silver Price = the log growth rate of the US silver price deflated by the US producer price index

Sample period is 1928:01-1937:06 for all equations, estimation method is OLS,

t-statistics in parentheses are based on Newey-West heteroskedasticity- and autocorrelation-consistent standard errors for inflation, and White heteroskedasticity-consistent errors for exchange rate equations, numbers in parentheses after the independent variables denote the lag order (if any),

\*\*\*, \*\*, and \* denote significance at the 99%, 95%, and 90% levels, respectively,

t-statistics are listed in parentheses below each coefficient, and

all data are drawn from the Global Financial Database (<http://www.globalfindata.com>) except for the US producer price index (all commodities), which is from the US Bureau of Labor Statistics

(<http://www.bls.gov>).

TABLE 6: Granger-Causality Tests on Inflation, the Exchange Rate and the Silver Price

Causal Relationship Tested	F- Statistic
<i>1928:01 - 1935:10</i>	
US Silver Price → Inflation	3.27** [0.0152]
Inflation → US Silver Price	0.87 [0.4854]
Exchange Rate → Inflation	7.23*** [0.0000]
Inflation → Exchange Rate	0.81 [0.5241]
Exchange Rate → US Silver Price	4.55*** [0.0022]
US Silver Price → Exchange Rate	1.43 [0.2323]
<i>1928:01 - 1937:06</i>	
US Silver Price → Inflation	1.79 [0.1356]
Inflation → US Silver Price	0.88 [0.4770]
Exchange Rate → Inflation	10.14*** [0.0000]
Inflation → Exchange Rate	0.62 [0.6507]
Exchange Rate → US Silver Price	5.2106*** [0.0007]
US Silver Price → Exchange Rate	1.11 [0.3568]

Notes:

\*\*\*, \*\* and \* denote significance at the 99%, 95% and 90% levels, respectively, the figures in brackets are the exact significance levels (P-values), and four lags have been included.



APPENDIX TABLE A.1: Granger-Causality with the Real Silver Price in the Three-Equation System

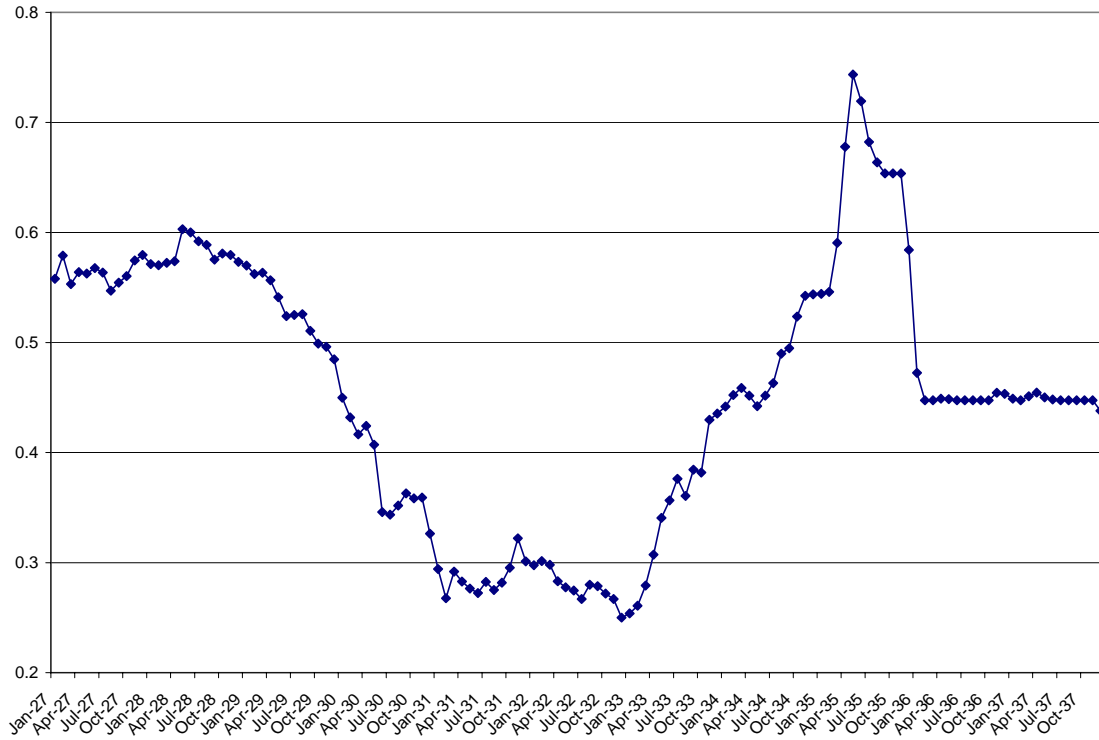
Causal Relationship Tested	F- Statistic
<i>1928:01 - 1935:09</i>	
US Silver Price → Inflation	3.00** [0.0229]
Inflation → US Silver Price	0.57 [0.6819]
Exchange Rate → Inflation	7.23*** [0.0000]
Inflation → Exchange Rate	0.81 [0.5241]
Exchange Rate → US Silver Price	3.45** [0.0116]
US Silver Price → Exchange Rate	0.80 [0.5266]
<i>1928:01 - 1937:06</i>	
US Silver Price → Inflation	1.97 [0.1047]
Inflation → US Silver Price	1.26 [0.2911]
Exchange Rate → Inflation	10.14*** [0.0000]
Inflation → Exchange Rate	0.62 [0.6507]
Exchange Rate → US Silver Price	3.610*** [0.0085]
US Silver Price → Exchange Rate	0.65 [0.6253]

Notes:

\*\*\*, \*\* and \* denote significance at the 99%, 95% and 90% levels, respectively, the figures in brackets are the exact significance levels (P-values), and four lags have been included.

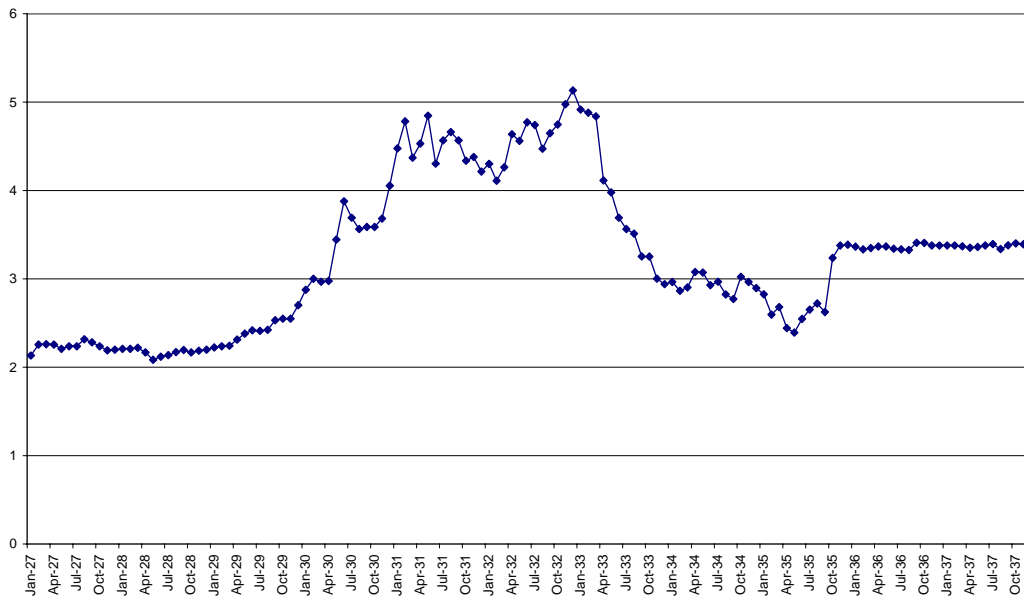
**Figure 1**

**Silver Price in New York (Jan. 1927-Dec. 1937)**  
(End of month \$US closing prices)

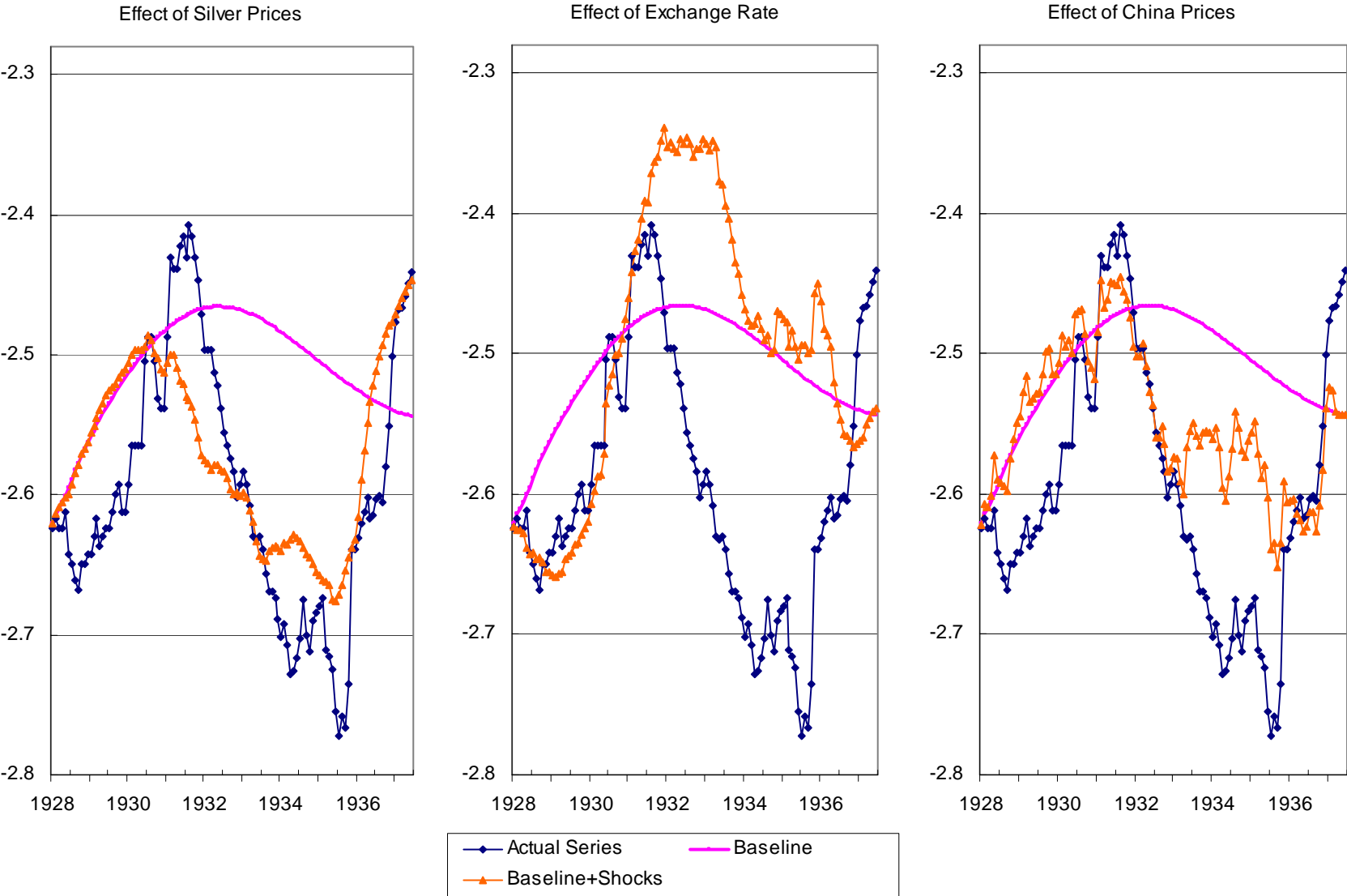


**Figure 2**

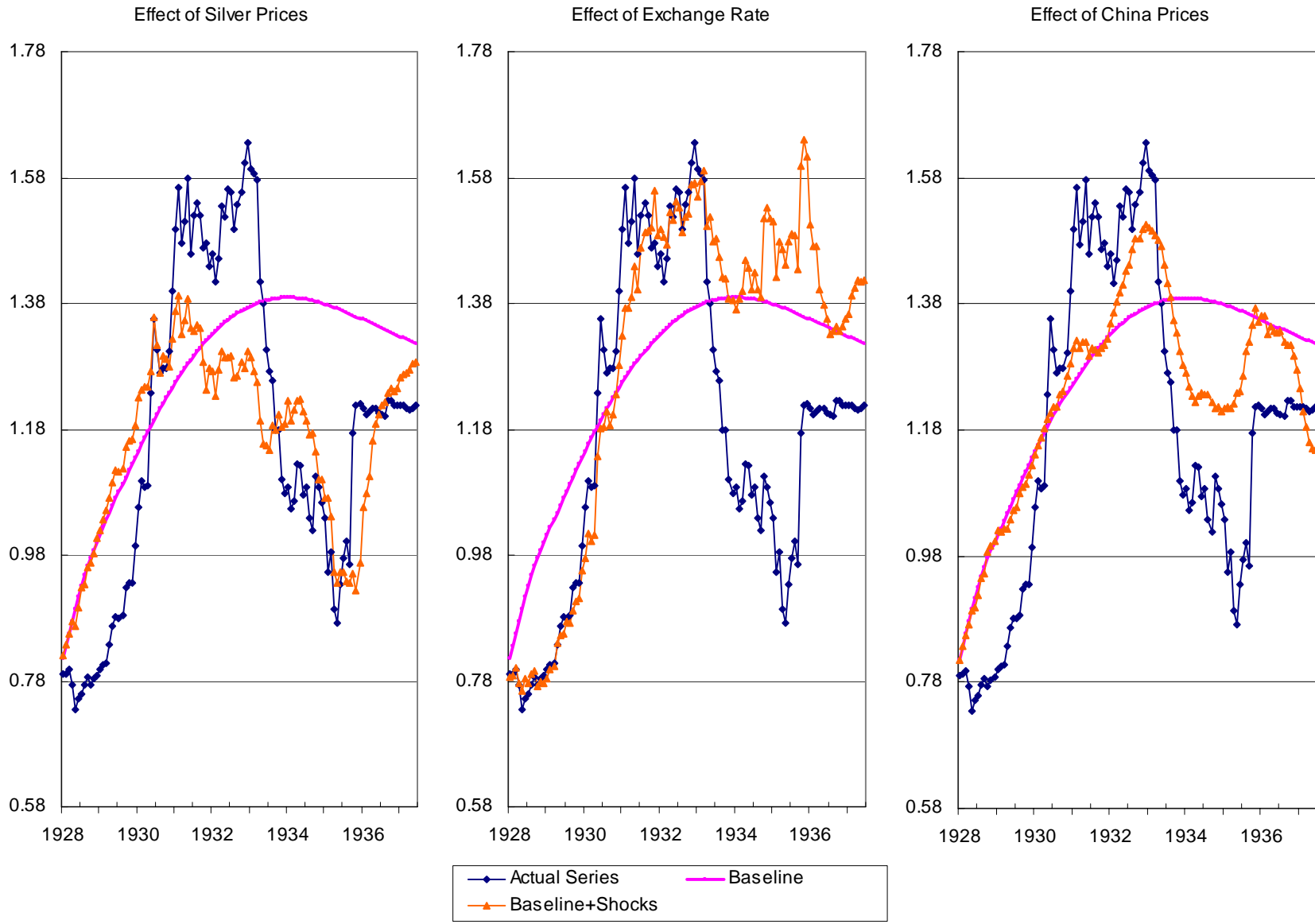
**Chinese Exchange Rate vs. the US Dollar (Jan. 1927-Dec. 1937)**  
(end of month yuan/\$US closing prices)



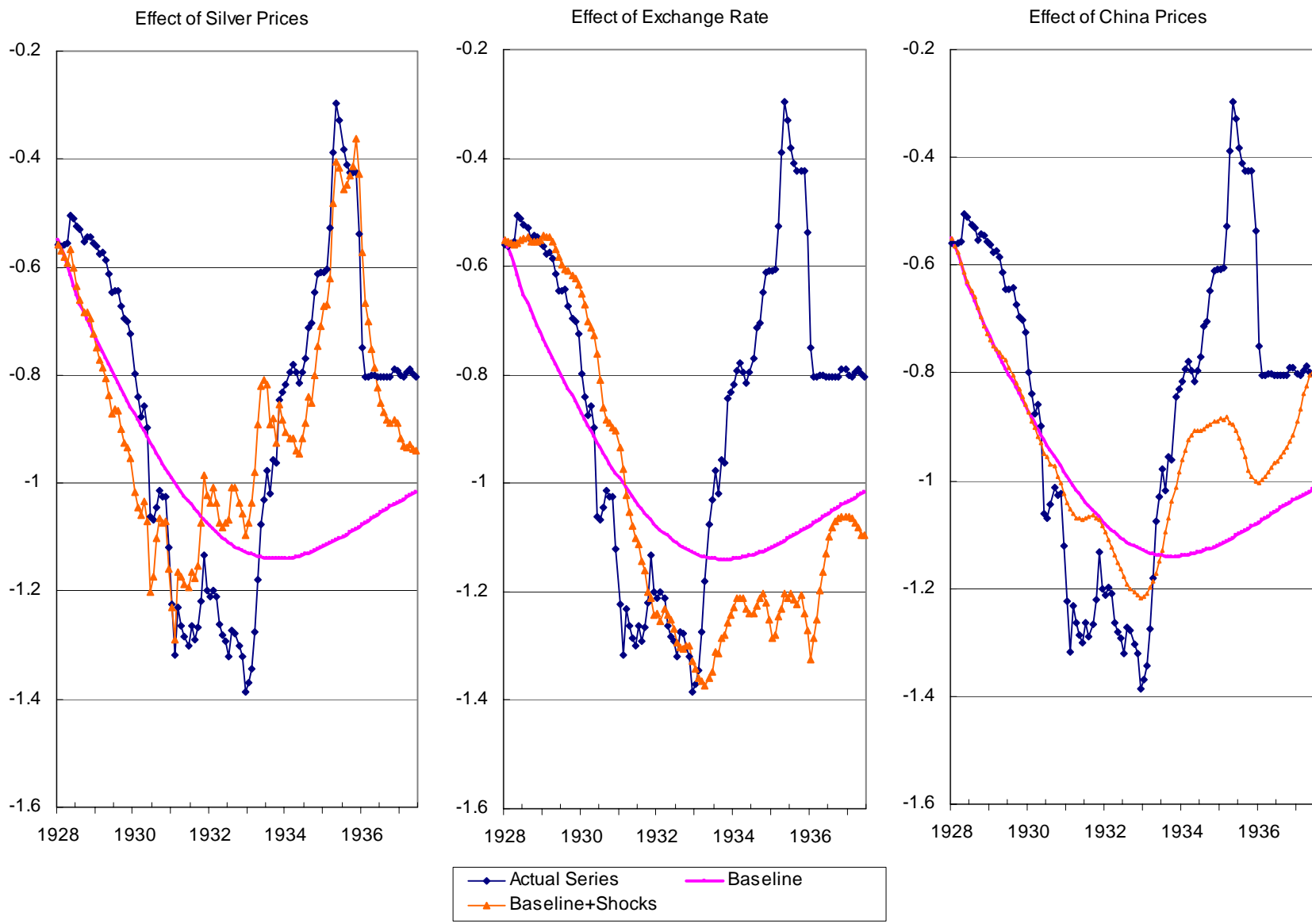
**Figure 3: Historical Decomposition of China Prices**



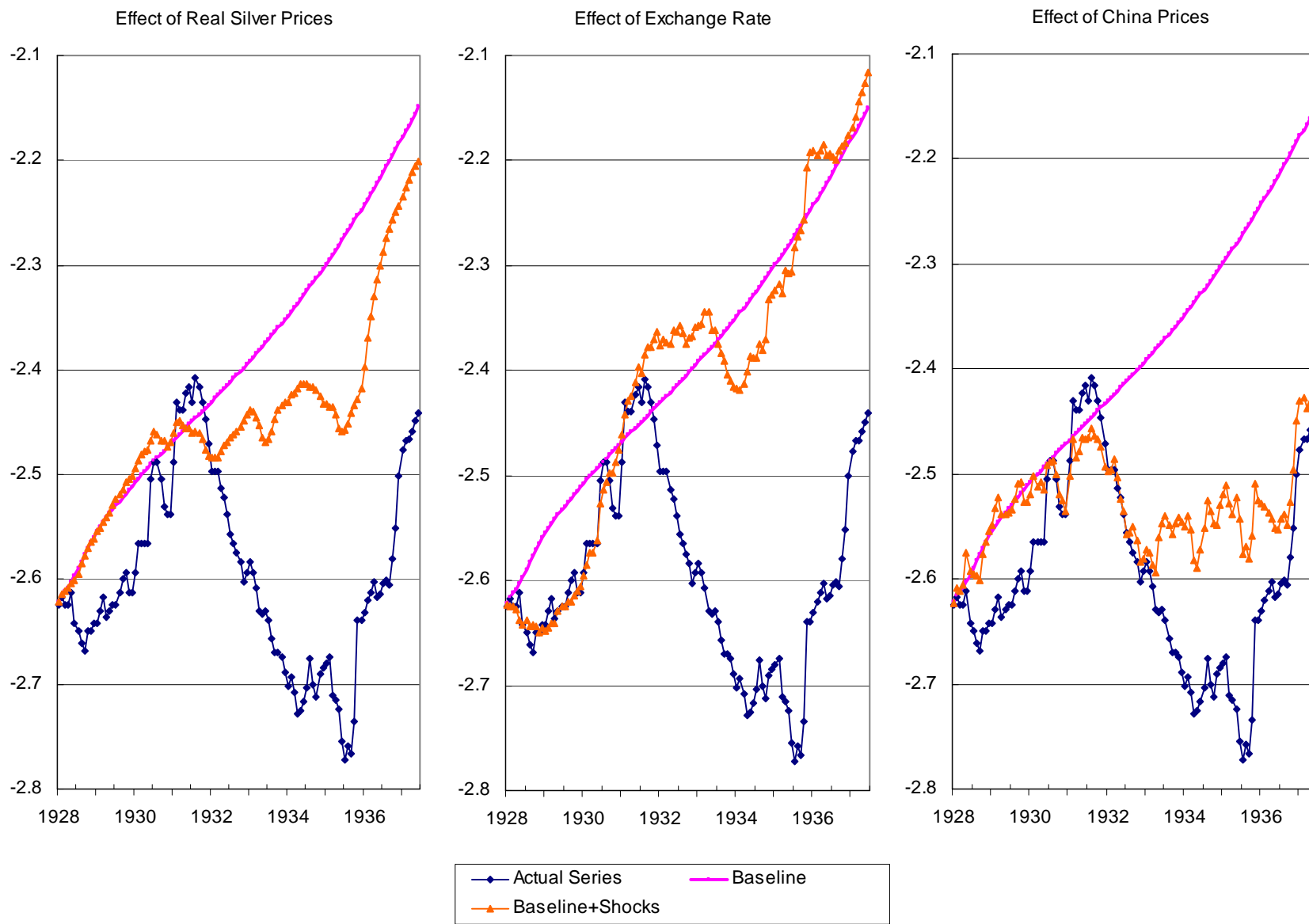
**Figure 4: Historical Decomposition of the Exchange Rate**



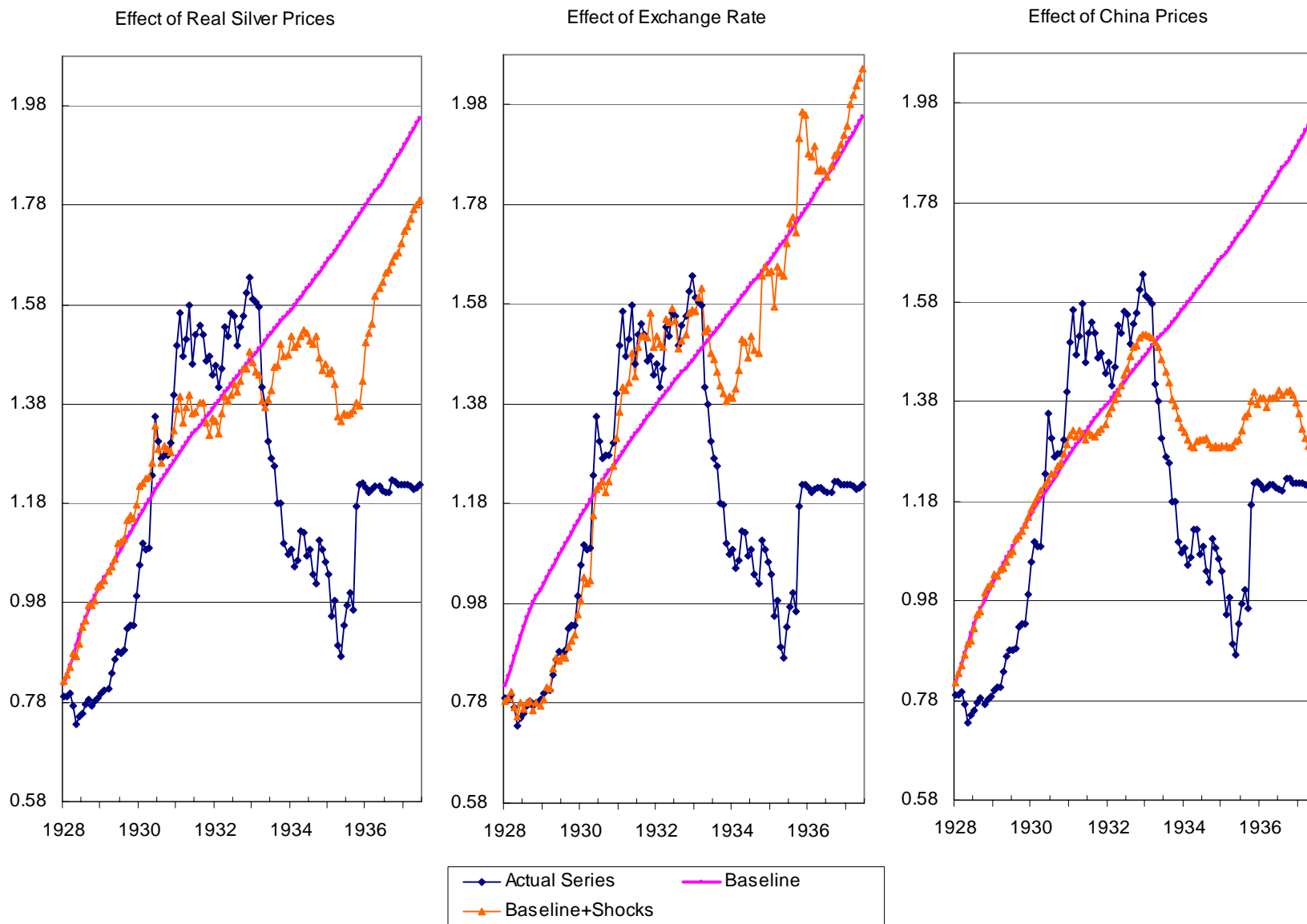
**Figure 5: Historical Decomposition of Silver Prices**



**Figure A.1: Historical Decomposition of China Prices**



**Figure A.2: Historical Decomposition of the Exchange Rate**





**Figure A.3: Historical Decomposition of Real Silver Price**

