

How Did Takahashi Korekiyo Rescue Japan from the Great Depression?*

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Abstract

Japan achieved an early recovery from the Great Depression of the 1930s. A veteran finance minister, Takahashi Korekiyo, managed to stage the recovery by prescribing a combination of expansionary fiscal, exchange rate, and monetary policies. To explore the effect of Takahashi's macroeconomic policy stimulus measures during the early 1930s, we construct a six-variable structural vector auto-regression (S-VAR) model. The six variables are output, price, fiscal policy, exchange rate, money, and inflation expectations. Our analysis reveals that the exchange rate adjustment undertaken as an independent policy tool had the strongest effect, while monetary and fiscal policies had much weaker effects, throughout the early 1930s. During the second half of 1931, in particular, speculation on Japan's departure from the gold standard and the inflation likely to follow reversed expectations: instead of expecting deflation, people began to expect inflation months ahead of the actual departure from the gold standard in December of that year. The effects of fiscal policy were limited. The monetary policy largely accommodated exchange rate settings.

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1 Introduction

The Japanese economy performed remarkably well during the Great Depression of the 1930s. After two years of double-digit deflation in 1930 and 1931, Japan escaped from the deflationary trend, in 1932. Over the next five years it went on to experience robust economic growth and mild inflation, even as depression persisted in many other parts of the world.¹

Korekiyo Takahashi, a veteran finance minister serving in his fifth-seventh term, brought about an early recovery for Japan by prescribing a combination of expansionary exchange rate, fiscal, and monetary policies. Just months after his return as minister, Takahashi moved Japan off the gold standard to depreciate the yen. Over the next few years he prescribed fiscal stimulus and an easy monetary policy.² Takahashi's policy has drawn attention from economic historians, economists, and policymakers from around the world since. Ben Bernanke, among others, has spoken highly of Takahashi's accomplishments: "Finance Minister Korekiyo Takahashi brilliantly rescued Japan from the Great Depression through reflationary policies in the early 1930s."³

Chronology

- September 1917: Japan suspends the gold standard
- September 1923: Great Kanto Earthquake
- April 1925: Britain returns to the gold standard at the pre-World-War-I parity
- March-May 1927: Showa Financial Crisis in Japan
- October 1929: NY Stock Exchange crashes
- January 1930: Japan returns to the gold standard at the pre-World War I parity
- September 1931: Britain departs from the gold standard

¹Patrick, "Economic Muddle." For an international comparison of economic performance during the early 1930s, see Shizume, "Japanese Economy."

²Smethurst, *Takahashi Korekiyo*, pp.238-267; Nakamura, *Economic growth*, pp.232-262.

³Bernanke, Ben, "Some Thoughts on Monetary Policy in Japan," Remarks by Ben S. Bernanke, Member, Board of Governors of the Federal Reserve System, before the 60th Anniversary Meeting, Japan Society of Monetary Economics, Tokyo, Japan, May 31, 2003.

- December 1931: Japan departs from the gold standard
- March 1932: Takahashi proposes that the Bank of Japan (BOJ) underwrite government bonds; BOJ reduces the official discount rate (ODR)
- June 1932: Japan expands the fiducial limit set for the issuance of BOJ notes; Diet passes the fiscal budget for the year with a deficit financed by BOJ credit; BOJ reduces the ODR
- July 1932: Diet passes the Capital Flight Prevention Act and makes it effective
- August 1932: BOJ reduces the ODR
- November 1932: BOJ starts underwriting government bonds
- March 1933: Diet passes the Foreign Exchange Control Act (effective in May 1933)
- April 1933: USA departs from the gold standard
- July 1933: BOJ reduces the ODR
- February 1936: Takahashi is assassinated

While most economic historians agree that Takahashi's policy package stimulated the Japanese economy as a whole, they do not agree on which parts of the package were more effective and which parts were less.⁴ Some argue that Japan's early economic recovery can mainly be credited to the depreciation of the yen.⁵ Others claim that the key was fiscal stimulus. Others still are convinced that the easy monetary policy kick-started the recovery. Some emphasize the impact of the Keynesian path in creating effective demand, while others stress the central role of the expectations of price changes in the future.

Observing data in Japan's interwar period, we notice that Takahashi pursued a policy package of increasing fiscal deficit, depreciating the currency, and expanding the money stock during his term. We now know little, however, of the dynamics of the policy shifts. Which

⁴Okura-Teranishi and Iwami et al. claim that various factors such as the depreciated yen, deficit spending, and expansionist policy in the Asian Continent contributed to the recovery. Okura and Teranishi, "exchange rate and economic recovery," and Iwami, Okazaki and Yoshikawa, "the Great Depression in Japan."

⁵Nanto and Takagi, "Korekiyo Takahashi and Japan's recovery,"; and Takagi, the "flexible exchange rate."

parts of the policy package were crucial for Japan's recovery from the Great Depression? What kind of policy shift brought about the changes in prices and output? Which parts of the package were deliberate policy actions and which were reactions to changes in the economy or the influences of other policy changes?

To disentangle the various possible directions of causality, we need to identify and measure the exogenous and endogenous components of each macroeconomic variable in a systematic way. A structural vector autoregressive (S-VAR) methodology is useful for this purpose. Cha introduces an S-VAR analysis to capture the magnitude of respective policy effects in Japan during this period. He uses the S-VAR model with monthly data on world output, the real effective exchange rate, the real government deficit, high-powered money, the volume of railway freight (as a proxy for aggregate real output), and real wages for the period of January 1929 to September 1936 (93 months). He concludes that fiscal expansion stands out as the single most important cause of Japan's upswing in the early 1930s.⁶

Recent macroeconomic policy debates in Japan shed new light on the role of expectations. Some economists argue that Takahashi's decisive monetary policy rescued Japan from the Great Depression of the 1930s by reversing people's expectations from deflation to inflation.⁷

This paper re-examines the transmission mechanism of the recession and recovery during the interwar period in Japan empirically using the S-VAR model with three state variables (output, price, and inflation expectation) and three policy variables (fiscal, exchange rate, and money stock). Several novel features of our analysis set this study apart from the existing literature. First, our VAR allows us to incorporate the variables underlying the explanations of Japan's recovery from the Great Depression into a single empirical model. Their impacts on output, for example, are expressed using the relevant impulse response functions. In addition, the historical role of each variable can be examined using the decomposition of past movements in macroeconomic variables implied by the VAR. Second, our VAR model contains a direct measure of the public's inflation expectations, extracted from commodity futures prices. This approach helps us identify exogenous movements in inflation expectations, which in turn allows us to study the role of the expectations in the business cycles during the

⁶Cha, "Did Takahashi Korekiyo Rescue Japan?"

⁷Iida and Okada, "expected inflation."

interwar period in Japan. Third, the sample in our analysis is relatively large compared with the samples in previous studies, which allows us to make more precise estimations.

This analysis demonstrates, as a principal finding, that exchange rate adjustment undertaken as an independent policy tool played the most important role, while monetary and fiscal policies had much less effect, throughout the early 1930s. During the second half of 1931, in particular, speculation on Japan's departure from the gold standard and the inflation likely to follow reversed expectations: instead of expecting deflation, people began to expect inflation months ahead of the actual departure from the gold standard in December of that year. The effects of fiscal policy were limited. Monetary policy largely accommodated exchange rate settings.

The rest of this paper proceeds as follows. Section 2 describes our data and econometric methodology. Section 3 presents the empirical results. Section 4 discusses our findings in relation to anecdotal evidence and previous studies. Section 5 concludes.

2 Econometric Methodology and Data

This section explores the transmission mechanism of Takahashi's fiscal, exchange rate, and monetary policies, including the expectation channel, and estimates the magnitude of the effects of these policies. To this end, we extract measures of the expected inflation from commodity futures prices and use the VAR model to distinguish between the causes and effects of the movements of the macro variables and inflation expectations.

2.1 Inflation Expectations for Commodity Futures Prices

Regarding the public's expectation of inflation/deflation, we follow Hamilton's notion that commodity futures prices contain some information about people's expectations of inflation/deflation.⁸

Let S_{it} denote the current spot price of commodity i and let $f_{it}(j)$ denote the futures price of commodity i for the j -period-ahead. Following Hamilton (1987), we use the 1-month futures price $f_{it}(1)$ as the spot price and $f_{it}(j)$ as the $j - 1$ -month futures price of commodity

⁸Hamilton, "deflation during the Great Depression."

i . The expected inflation for the $j - 1$ -period-ahead anticipated by futures market participants for commodity i at period t , π_{it}^e , is measured as follows:

$$\pi_{it}^e = 100(\log(f_{it}(j)) - \log(f_{it}(1))). \quad (1)$$

We collect data on the four commodity futures prices of cotton yarn (1-month futures, 7-month futures, January 1920-December 1936), raw cotton (1-month futures, 7-month futures, January 1927-December 1936), rice (1-month futures, 3-month futures, January 1920-December 1936), and silk (1-month futures, 5-month futures, December 1923-December 1936).

While the commodity futures data contain some idiosyncratic noise, commodity futures prices contain substantial elements of the general inflation expectations within the economy. By using commodity futures prices as direct measures of inflation expectations, we gain independent information on inflation expectations helpful for identifying their exogenous shocks and examining the role of inflation expectations in the economy.

2.2 VAR Specification

To analyze the dynamic relationship among macroeconomic variables, we construct the following 6-variable S-VAR model consisting of the following variables: output (y_t), price (p_t), expected inflation of the commodity i (π_{it}^e), fiscal policy measure (g_t), exchange rate (e_t), and money (m_t):

$$B(L)X_t = b_0 + \epsilon_t, \quad (2)$$

where $X_t = (y_t, p_t, \pi_{it}^e, g_t, e_t, m_t)'$, b_0 is a six-by-one constant vector, $B(L) = B_0 - B_1L - \dots - B_pL^p$ is a p th order lag polynomial of a six-by-six coefficient matrix B_j ($j = 1, \dots, p$), and $\epsilon_t = (\epsilon_{yt}, \epsilon_{pt}, \epsilon_{\pi_{it}^e}, \epsilon_{gt}, \epsilon_{et}, \epsilon_{mt})'$ is a six-by-one vector of serially uncorrelated structural disturbances with a mean zero and a covariance matrix Σ_ϵ .

In our VAR model, we place macroeconomic variables before policy instrument variables. This ordering assumes that policymakers see the current macroeconomic variables when they set the policy instruments, but that the macroeconomic variables will only respond to a policy

shock with one lag. This ordering is essentially the same as that employed by Christiano et al. (1999). We put the fiscal policy first, among the policy variables, as the government determined its fiscal policy independently from the other policies in the period in question. We put the exchange rate second and leave the money stock last, as the monetary policy was thought to be conducted in a manner accommodating to the other policies during that period.⁹ Structural disturbances are assumed to be orthogonalized, so that, with appropriate normalization, $\Sigma_\epsilon = I$.

The structural model above can be described in the following reduced-form VAR:

$$A(L)X_t = a_0 + u_t, \tag{3}$$

where a_0 is a six-by-one constant vector, $A(L) = I - A_1L - \dots - A_pL^p$ is a p th order lag polynomial of a six-by-six coefficient matrix A_j ($j = 1, \dots, p$), and $u_t = (u_{yt}, u_{pt}, u_{\pi_t^e}, u_{gt}, u_{et}, u_{mt})'$ is a six-by-one vector of serially uncorrelated structural disturbances with a mean zero and a covariance matrix Σ_u . Here, a Choleski decomposition of the reduced-form covariance matrix Σ_u is used to orthogonalize the reduced-form innovations.

y_t is output measured by the volume of railway freight; p_t is wholesale prices; π_{it}^e is inflation expectations derived from commodity futures prices; g_t is the real fiscal balance measured by changes in the financial assets and liabilities of the government, and deflated by wholesale prices; e_t is the effective exchange rate calculated from the export-weighted average value of the U.S. dollar, pound-sterling, French franc, and Shanghai tael against the yen; and m_t is money stock measured by cash in circulation.

The volume of railway freight is taken as the measure of output, as this is the most reliable data for the full-sample period of January 1920 through December 1936. Several other industrial production indexes (IIPs) are available for sub-sample periods, and we have confirmed that the railway freight data moves in tandem with them.

The real fiscal balance is calculated by taking the difference of the net balance of the central government from the previous month and then deflating it by the wholesale price index. On the liability side we use the overall government liabilities, including long-term and

⁹Changes in the order of variables do not qualitatively alter the regression results.

short-term government securities and borrowings from the central bank. On the asset side we use government deposits to the central bank. These steps, taken together, allow us to count all of the activities of the central government.

The effective exchange rate of the yen is used as a weighted average of exchange rates against the US dollar, the British pound-sterling, the French franc, and the Chinese (Shanghai) tael. The weight of Japanese exports to respective countries and their colonies is used (the 1917 weight for the period from January 1920 to December 1931 and the 1936 weight for the period from January 1932 to February 1936). Japanese exports to those regions account for 89 percent of the total Japanese exports in 1917 and for 57 percent of the total Japanese exports in 1936. The United States, Great Britain, and France returned to and departed from the gold standard at different times during sample period, while China stayed on the silver standard until its currency reform of November 1935.

We use the commodity price inflation expectations derived in eq. (1). Our VAR analysis employs cotton yarn, the commodity with the most readily available data, as the benchmark result. The robustness of the main empirical results reported below is confirmed when the other commodity futures data are used.

The frequency of our data is monthly, and the sample period is from January 1920 to December 1936. All of the variables are transformed into the logarithmic form and multiplied by 100, except for the real fiscal balance (which takes negative value at times). We estimate the VAR in levels, since it yields consistent estimates even if each variable is nonstationary.¹⁰ The lag length is set to four in the reduced-form VAR estimation, which is sufficient to capture the system dynamics and ensure no serial correlation in the residuals.¹¹

¹⁰See Hamilton (1994) pp. 651–653.

¹¹We perform a modified likelihood ratio test proposed by Sims (1980) to check whether taking four lags is sufficient. The null of four lags is tested against the alternative of six lags or eight lags. The chi-square statistics indicate that the null hypothesis is not rejected by conventional significance levels for any of the models considered. We also perform the multivariate Lagrange multiplier (LM) test for residual serial correlation for up to the $\{1, \dots, 13\}$ th order. See Johansen (1995), p. 22 for the formula for the LM statistic. The LM statistics for each order indicate that the null hypothesis of no serial correlation is not rejected by asymptotically significance levels.

3 Empirical Results

This section presents the empirical results based on the VAR framework just described. We offer three sets of results: (i) time series of identified structural shocks, (ii) impulse responses, and (iii) historical decompositions of macroeconomic variables that are explained by the structural shocks; namely, real output, price, expected inflation, fiscal, exchange rate, and monetary shocks.

3.1 Identified Structural Shocks

Figure 1 displays six time series of structural shocks: output shocks, price shocks, expected inflation shocks, fiscal shocks, exchange rate shocks, and monetary shocks. These shocks tend to be noisy, as all of them are serially uncorrelated by construction. For ease of interpretation we report the centered, moving average of the shock for the previous 11 months; that is, $\sum_{l=0}^{11} \epsilon_{kt-l}/12$ for $k = y, p, \pi_i^e, g, e, m$. The eight lines in light gray denote major events, namely, the Great Kanto Earthquake (September 1923), the outbreak of the Showa Financial Crisis (March 1927), the NY Stock Exchange crash (October 1929), the Japanese return to the gold standard (January 1930), the British departure from the gold standard (September 1931), the Japanese departure from the gold standard (December 1931), the start of government bond underwriting by the BOJ (November 1932), and the US departure from the gold standard (April 1933). We should note that the shocks we have extracted from our VAR system are independent from the structural shocks on other variables. The shocks on fiscal, exchange rate, and monetary variables are independent policy shocks not induced as responses to fluctuations in other variables. Meanwhile, the shocks on output, price, and expected inflation are exogenous shocks that cannot be accounted for by fluctuations in other variables. As our model includes expected inflation components, we identify price shocks as unexpected shocks that can be treated independently from expected inflation shocks.

The shocks shown in the panel are largely consistent with the anecdotal evidence. In the upper left panel of Figure 1 we see two major troughs in unexpected output shocks, one after the Great Kanto earthquake in 1923 and one after the Japanese return to the gold standard in 1930, and each is followed by a recovery in output.

In the upper right panel we see major troughs in unexpected price shocks during the post-world-war-I deflationary period of 1920 and during the *de-jure* gold standard period of 1930-31, each followed by an upper swing, and a third trough after the US departure from the gold standard in 1933.

In the middle left panel we see independently growing deflation expectations before and during Japan's return to the gold standard in 1930-31, and an upswing in inflation expectations about when Japan departs from the gold standard at the end of 1931.

In the middle right panel we see persistent contractionary fiscal policy shocks during the second half of the 1920s. Contrary to the conventional arguments, the fiscal policy shocks during the first half of the Takahashi term in 1931-1936 show no significant upswing independent from the shocks on other variables. We will come back to this point later in this paper.

In the lower left panel we see major independent shocks towards a weaker yen after the British return to the gold standard in April 1925, followed by an upswing in shocks towards a stronger yen after the British departure from the gold standard in September 1931, followed by a new round shocks towards a dramatically weaker yen after the Japanese departure from the gold standard in December 1931.

In the lower right panel we see major contractionary shocks in monetary aggregates before the outbreak of the Showa Financial Crisis in 1927, followed by sudden stimulative shocks just after the crisis. The monetary aggregates show small shocks as an independent policy variable during the *de-jure* gold standard period of 1930-31 and Takahashi's subsequent term.

3.2 Impulse Responses

Figure 2 displays all estimated impulse responses to a one-standard-deviation shock to each variable. The first to sixth rows represent the dynamic responses of the six variables to an output shock, a price shock, an expected inflation shock, a fiscal shock, an exchange rate shock, and a monetary shock, respectively. The solid line in each plot indicates the estimated responses and the dotted lines enclose the 1.64 standard error band (90% confidence interval) calculated using 1000 bootstrap samples.

Here we will first turn to the impulse responses to exchange rate shocks, shown in the fifth row of Figure 2. In the chart on the far left, the real output moves to the bottom one year after an exchange rate shock (appreciation in the exchange rate), with statistical significance, then rises back to a steady state level. Goods prices also respond negatively to the exchange rate shock, though the standard error band appears to be relatively wide. These results suggest that exchange rate shocks had strong influences on the real economy independently during the interwar period. We also note that the rise in the exchange rate is followed by a decline in the money stock. This indicates that the monetary authority endogenously responded to the yen appreciation by decreasing the money stock, a move which was tantamount to accommodating the money supply in response to the exchange rate change. We also note a downward trend in the fiscal balance tends in response to the exchange rate appreciation. This implies that the government also considered the exchange rate when setting its fiscal policy. Overall, these responses to the exchange rate shock reflect the open nature of the Japanese economy during the interwar period.

The charts in the bottom row of Figure 2 plot the impulse responses to a monetary shock. A monetary shock (an exogenous increase in the money stock) is followed by a depreciation of the yen, indicating that an upward adjustment of the money stock by the monetary authority pushes the yen value down. The shock, in turn, raises real output and prices, which implies that the aggressive monetary expansions had substantial impacts on the real economy by stimulating the aggregate demand. On the other hand, as we observe in the fourth row of Figure 2, fiscal policy shocks have limited impacts on real output and prices, which is in contrast with Cha's finding.

Real output shocks, which are often interpreted as productivity/technology shocks in the literature, have significant impacts on real output but limited impacts on prices. Price shocks (unexpected changes in aggregate prices) have significant effects on prices. These shocks have large effects when they strike, and the effects are rapidly transmitted.

The expectation shocks (exogenous changes in the expected inflation) have persistent and statistically significant impacts on the output and prices. The peak comes about a-year-and-a-half after the initial shocks, and is long-lived. This implies that the expectation shocks

identified in our VAR model played an important role over the business cycle during the interwar period. We also note that the shock leads to a rise in fiscal deficit, a depreciation in the exchange rate, and a rise in the money stock. This suggests that shocks contain forward-looking information reflective of market expectations or forecasts of future macroeconomic events such as fiscal expansion, depreciation of the yen, and monetary expansion.

3.3 Historical Decompositions

The next part of this study, the historical decomposition analysis, examines how our model interprets history. Figure 3 decomposes the real output series into six components that are respectively explained by six types of structural shock: the output shock, unexpected price shock, expected inflation shock, fiscal shock, exchange rate shock, and monetary shock. All the series are displayed as deviations from the linear trend. The solid line shows the decomposed series and the dotted line indicates the estimated series before the decomposition.

In the upper-left chart in Figure 3, we find that, while real output shocks explain a large part of the fluctuations in output during the second half of the 1920s, most of the fluctuations were due to factors other than the exogenous real output shocks during the early 1930s. The lower-left chart shows that exchange rate shocks had significant impacts on real output throughout the sample period, especially on the upswing in real output in 1932-1934. We also find that the changes in the expected and unexpected inflation help to explain the fall and rise in output in the early 1930s, which indicates that these shocks had some impact on real output. Monetary shocks had significant impacts on real output, but the effect differed on each occasion: the shocks contributed to a downturn in output before the Financial Crisis in 1927, followed by an upswing just afterwards, then counteracted the sharp decline of output in 1930-1931. Monetary shocks had limited impact during the recovery of 1932-1933. Fiscal policy shocks had no effect on the real output, which suggest that changes in the fiscal balance played virtually no role as an independent policy tool during the recovery or the early 1930s.

Next, we examine the quantitative effects of structural shocks on inflation expectations in fuller detail. In the arguments by Mishkin (1990) and Cecchetti (1992), the inflation expectations for commodity prices π_{it}^e do not directly serve as a measure of aggregate inflation

expectations, as this measure includes noise in particular commodities. Taking the same approach here, we calculate the inflation expectations for WPI, that is, for general prices, instead of for individual commodity prices.

Specifically, we focus on the VAR forecast based on the information available in each period. This is an approximation to rational expectations under which people use all available information to predict the future, and is frequently used as a forecasting strategy. Letting $Z_t = [1, X_t, X_{t-1}, \dots, X_{t-p+1}]'$, eq. (3) can be represented as a VAR(1) process:

$$Z_t = AZ_{t-1} + Hu_t, \quad (4)$$

where

$$A_{(6p+1) \times (6p+1)} = \begin{bmatrix} 1 & \mathbf{0}' & \cdots & \mathbf{0}' & \mathbf{0}' \\ 1 \times 1 & 6 \times 1 & & 6 \times 1 & 6 \times 1 \\ \mathbf{a}_0 & A_1 & \cdots & A_{p-1} & A_p \\ 6 \times 1 & 6 \times 6 & & 6 \times 6 & 6 \times 6 \\ \mathbf{0} & I & \cdots & \underline{0} & \underline{0} \\ 6 \times 1 & 6 \times 6 & & 6 \times 6 & 6 \times 6 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ \mathbf{0} & \underline{0} & \cdots & I & \underline{0} \\ 6 \times 1 & 6 \times 6 & & 6 \times 6 & 6 \times 6 \end{bmatrix} \text{ and } H_{(6p+1) \times 6} = \begin{bmatrix} \mathbf{0}' \\ 6 \times 1 \\ I \\ 6 \times 6 \\ \underline{0} \\ 6(p-1) \times 6 \end{bmatrix}.$$

Hence, Z_t is an approximation to the agents' information set, which includes constant, current, and past realizations of output; price; expected inflation; fiscal balance; exchange rate, and money. Forecasts of the endogenous variables are given by the multi-period forecasting formula:

$$E_t[Z_{t+j}] = A^j Z_t. \quad (5)$$

Let \mathbf{c}'_p be selection vectors that single out the future price level. Then, we obtain forecasting value for the price level 6 months ahead, as follows:

$$E_t[p_{t+6}] = \mathbf{c}'_p A^6 Z_t. \quad (6)$$

The estimates of A in our VARs give us forecasts of the price level 6 months ahead, $\hat{p}_{t+6} = \mathbf{c}'_p \hat{A}^6 Z_t$ from eq. (6). With this, we calculate the estimated value of the aggregate expected inflation as $\pi_t^e = \hat{p}_{t+6} - p_t$.

Next, we compare the inflation expectations estimated by our VAR model with the inflation expectations for four individual commodity futures prices π_{it}^e (Cotton Yarn, 6 months ahead, Raw Cotton, 4 months ahead, Rice, 2 months ahead, Silk, 4 months ahead) constructed by eq. (1). In addition, we use the principal component techniques to extract common components from the idiosyncratic component of the inflation expectations for individual commodity futures prices.

Figure 4 shows the inflation expectations for WPI estimated by our VAR model, the inflation expectations for the four commodity prices π_{it}^e and their principal component. The inflation expectations for WPI estimated by our VAR model move along with the principal component of inflation expectations on commodity futures prices, while the inflation expectations for individual commodity futures prices deviate substantially from their common components. Here we look first at the turning point of expectations from deflation to (positive) inflation in the WPI. The expected rate of inflation suddenly rose to a positive figure in September 1931, a few months before the departure from the gold standard in December, then decreased over the 3-month period after the departure, and increased again. These results are consistent with the findings of Iida and Okada (2004), who estimate the rate of inflation expectations in the 1920s and 1930s in Japan using the interest rate model developed by Mishkin (1990). We have yet to elucidate the dynamics behind these fluctuations in inflation expectations.¹²

Second, in Figure 5, we compare the estimated inflation expectations with actual inflation for general prices (WPI price inflation). We find that the inflation expectations were less volatile than the actual inflation throughout the sample period. More importantly, the deflation from September 1929 to the end of 1931 was mainly explained by the unexpected component. This is consistent with the US findings from Hamilton (1987, 1992), but inconsis-

¹²Iida and Okada (2004) argue that the first and second impacts on inflation expectations were speculation on the departure from the gold standard and the announcement of the introduction of government bond underwriting by the Bank of Japan, respectively. They do not, however, show any empirical evidence.

tent with the finding from Cecchetti (1992). Broadly, it suggests that the severe contraction of the Japanese economy in 1930 and 1931 was brought about by adverse effects of unanticipated price declines on the economy.

Third, we employ a historical decomposition analysis on the calculated WPI inflation expectations, as shown in Figure 6. The results here show that the rise in inflation expectations in 1931 was mainly attributable to exogenous changes in expectations, while that in 1932 was mainly a direct consequence of the yen depreciation. These results imply that an upward swing in inflation expectations contributed to price increases in the second half of 1931, but not in 1932. The yen depreciation after Japan's departure from the gold standard in December 1931 was preceded by an upward swing of inflation expectations. This suggests that speculations on Japan's probable departure from the gold standard, and on the inflation likely to follow, reversed the public's expectations from deflation to inflation well ahead of Japan's actual departure from the gold standard at the end of the year. And, the second upward swing in actual inflation was induced by the real effect of currency depreciation. The results also imply that monetary shocks have little effect after 1930, and that fiscal shocks produce virtually no effect over time. This suggests that monetary aggregates played only a marginal role as an independent policy variable throughout Takahashi's term as the Finance Minister in the early 1930s, and surprisingly, that fiscal policy had virtually no effect on inflation expectations at that time. This is inconsistent with the conclusion from Cha (2003), that is, that fiscal policy played the most significant role in the economic recovery during the early 1930s.

Many studies argue that Takahashi rescued the Japanese economy from the Great Depression through a package of macroeconomic stimulus measures combining fiscal, exchange rate, and monetary policies. Our results reveal that the depreciation of the yen, changes in inflation expectations, and unexpected price changes all contributed to production growth after Japan departed from the gold standard in December 1931, while monetary and fiscal policies had very limited effects, if any. According to our analyses, policymakers shaped some of their policy measures in response to economic conditions and other policy shifts in a systematic fashion, while undertaking other policy actions independently. To elaborate this point, Figures 7, 8, and 9 plot historical decompositions of fluctuations in the fiscal balance,

exchange rate, and money stock, respectively, into components attributed to structural shocks in output, price, inflation expectations, fiscal balance, exchange rate, and money stock.

Figure 7 shows a historical decomposition of fluctuations in the fiscal balance. Fiscal policy shocks apparently accounted for most of the independent fiscal balance movements over time. Periodically, however, we observe deviations from the independent movements of the fiscal balance. These deviations can be largely explained by the expectation shocks and the exchange rate shocks. Later we will look more deeply into the background of these deviations.

Figure 8 shows a historical decomposition of exchange rate fluctuation. The component explained by the exchange rate shocks rapidly fell in December 1931, indicating that the exchange rate shocks accounted for a large part of the exchange rate depreciation at that time. Inflation-expectation shocks and unexpected price shocks also turn out to be important factor in explaining the large hump in the exchange rate when Japan returned to and then departed from the gold standard. Specifically, the upward swing in inflation expectations from September 1931, when Britain departed from the gold standard, explain a substantial part of the yen depreciation over the ensuing months. Unexpected declines in price explain the appreciation of the yen from the end 1929, suggesting that the price adjustments occurred just after the return to the gold standard was announced in July 1929 and before the actual return in January 1930.

Figure 9 plots a historical decomposition of fluctuations in the money stock. The independent monetary shocks apparently explain a substantial part of the fluctuations in money stock throughout the sample period. As it turns out, these shocks are the sole factor explaining the upward spike in the money stock during the Showa Financial Crisis of 1927. Meanwhile, unexpected output and price shocks, the inflation-expectation shocks, and the exchange rate shocks also contributed to the large swings in money stock in the early 1930s. These results suggest that the policy actions by the Bank of Japan during the Great Depression and the Takahashi period, actions that were widely viewed contractionary and expansionary, in succession, may be emblematic not of an active, exogenous monetary policy, but of an accommodative, endogenous series of policy responses to changes in economic conditions such as the

exchange rate and inflation expectations, as well as exogenous output and price movements.

3.4 Robustness

To examine the robustness of the VAR model, we re-estimated the model under a number of alternative settings. First, when we extended the lag length of the VAR from four lags to eight lags, the model produced qualitatively similar results with more complex impulse responses. Next, we re-ran the VAR using the alternative measures of the commodity futures price (raw cotton (1-month futures, 7-month futures, January 1927-December 1936), rice (1-month futures, 3-month futures, January 1920-December 1936), and silk (1-month futures, 5-month futures, December 1923-December 1936)) to examine whether the alternative inflation expectation shocks produced impacts on the macroeconomic variables similar to those observed in the benchmark results. We also included the U.S. output into our regression, to check whether this variable would alter the results. In addition, we re-ran the VAR using the consumption price index as a different proxy for aggregate prices, and using the index of industrial production as a proxy for real output. None of these experiments changed the qualitative nature of the results.

Finally, we examined the structural stability of our reduced form dynamic models.¹³ Following the example from Cha (2003), we set the starting point of the sample in January 1929, excluding the period from January 1920 through December 1928, and checked the robustness of our previous results. Figure 10 presents the estimated impulse responses to each of the structural shocks. Qualitatively similar impulse responses were obtained, even when the sample period was shortened to exclude most of the 1920s. The corresponding responses in Figure 2 and 10 look quite similar. Figures 11 and 12 show the decomposition of past movements in output and estimated inflation expectations, respectively, for the subsample of 1929-1936. Again, the results are qualitatively similar even if we shorten the sample period. These findings suggest that our benchmark model captures the characteristics of the recession

¹³We have applied a modified likelihood ratio test to determine whether the overall parameter values were unchanged between the two periods before and after a given possible break date. When we set possible break dates every month for the period from January 1928 to January 1932, the null hypothesis that all the model parameters are the same is rejected against the alternative of a structural shift. The results suggest that there was a break sometime between January 1928 and January 1932.

and recovery from the end of the 1920s into the early 1930s.

4 Discussion

Our results show that, on the one hand, the depreciation of the yen and the consequent change in inflation expectations had dominant effects on the macro economy when Japan escaped from the Great Depression of the early 1930s. In the wake of Britain's departure from the gold standard, speculation on Japan's departure precipitated a drastic change in inflation expectations months ahead of the actual departure. On the other hand, our results show that fiscal and monetary policies had much less effect on the economy, as independent policy measures.

Our findings are consistent with the anecdotal evidence. Market participants anticipated that Britain's departure from the gold standard would force Japan to follow. From September to November 1931, the Monthly Report from the Tokyo Stock Exchange (TSE) repeatedly stated that, in the wake of Britain's departure from the gold standard, market participants expected Japan to follow suit and once again place an embargo on gold exports.¹⁴ In the same vein, the Bank of Japan reported, in October 1931, that Britain's departure from the gold standard revived speculations on a Japanese departure among investors in London and Continental Europe.¹⁵

Japan suspended the gold standard in September 1917, five days after the United States did the same. Then, during the 1920s, Japan sought to return to the gold standard as a primary policy goal. Incidents such as the Great Kanto Earthquake of September 1923 and the Showa Financial Crisis in the spring of 1927 delayed the government's final decision. Finally, in July 1929, the Hamaguchi Cabinet of the Minseito Party published a manifesto, placing Japan's return to the gold standard at the very top. In ensuing months they let the yen appreciate to the level of the pre-war parity and pushed forward with fiscal austerity measures. They succeeded in reinstating gold standard in January 1930, but this lasted for only about two years. When the opposing Seiyu Kai Party came into power in December

¹⁴TSE Monthly Report, September 1931, October 1931, and November 1931.

¹⁵The Report to the Semiannual Meeting of Executives and Branch Managers, October 13, 1931, BOJ Archives No. 3942.

1931, Takahashi declared that Japan would depart from the gold standard and embark on a phase of a fiscal expansion.¹⁶ These episodes illustrate the nature of fiscal policy during the 1920s and early 1930s, a period deeply influenced by exchange rate policy.

Our results are inconsistent with those of Cha, who concludes that fiscal expansion became the leading source of recovery during the Takahashi term. In a sense, we expand Cha's econometric analysis on the effect of Takahashi's policy package during the early 1930s by extending the sample period from 93 months to 204 months, and, more significantly, by including prices and inflation expectations in the analysis.

From what sources do the differences between our results and those of Cha (2003) emerge? If the differences stem from the inclusion of price dynamics and the role of inflation expectations, we will obtain the same results as Cha by running the S-VAR model without variables representing price and inflation expectations.

Here, we employ S-VAR model with four variables, namely, output, real fiscal balance, the effective exchange rate, and money stock, omitting wholesale price and inflation expectations. As Figure 13 shows, this formula provides a result qualitatively similar to Cha's, with a strong fiscal policy effect on output. In other words, the price and inflation expectations variable drastically alter Cha's interpretation of the effects of Takahashi's policy package. Our benchmark results show that fiscal policy had only a limited effect on the output and prices throughout Takahashi's term in the early 1930s, though the government conducted fiscal policy as an independent policy instrument. This implies that the exclusion of inflation expectation variables led to an overestimation of the fiscal policy effect. Most notably, when Takahashi pushed up fiscal spending during the first half of 1932, the yen depreciation boosted the Japanese economy both through the expectation channel and through the subsequent increase in real demand.

5 Concluding Remarks

As a whole, changes in exchange rate played the most important role in accounting for the Japanese economic recovery during the early 1930s. During the second half of 1931, in par-

¹⁶Shizume, "Sustainability of Public Debt: Evidence from Japan before the Second World War".

ticular, speculation on Japan's departure from the gold standard and the inflation likely to follow reversed the public's expectation from deflation to inflation well ahead of the actual departure at the end of the year. Meanwhile, the exchange rate constrained fiscal and monetary policies. When Japan departed from the gold standard and the yen fell, the authorities reached out to act, looking to the exchange rate and external balances.

Our story is consistent with Temin (1989) and Eichengreen (1992), who argue that the departure from the gold standard was crucial for the economic recovery of the 1930s. Our new finding shows that inflation expectations played a substantial role in the dynamics at work.

Regarding monetary policy, our estimated model suggests that independent shocks in monetary policy accounted for little not only in the economic recovery during the Takahashi term, but also in the variations in the money stock. The independent policy shifts may have been effective at that time, but the monetary policy response largely accommodated changes in economic conditions and other policy changes such as the exchange rate settings.

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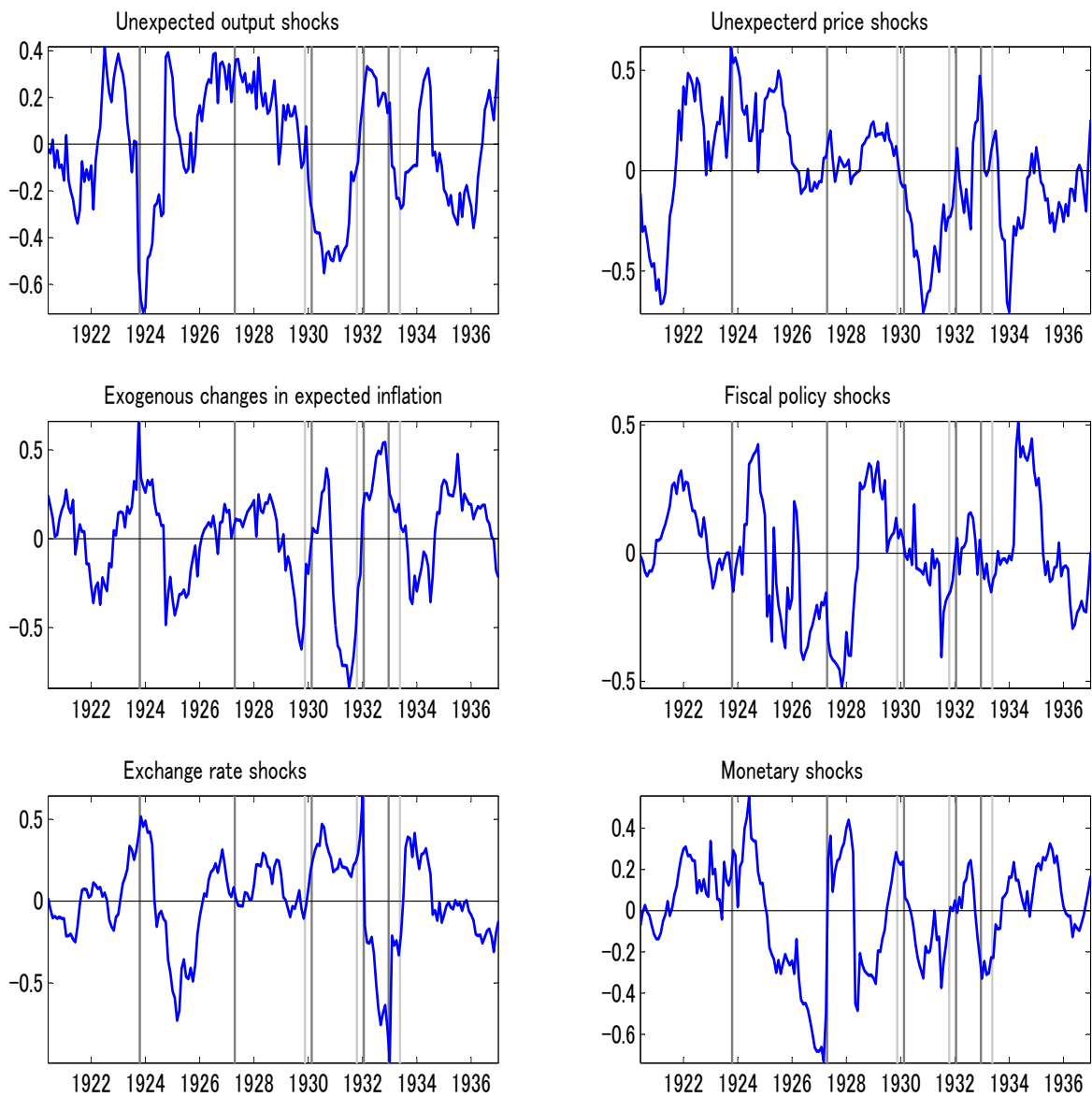


Figure 1: Identified Structural Shocks

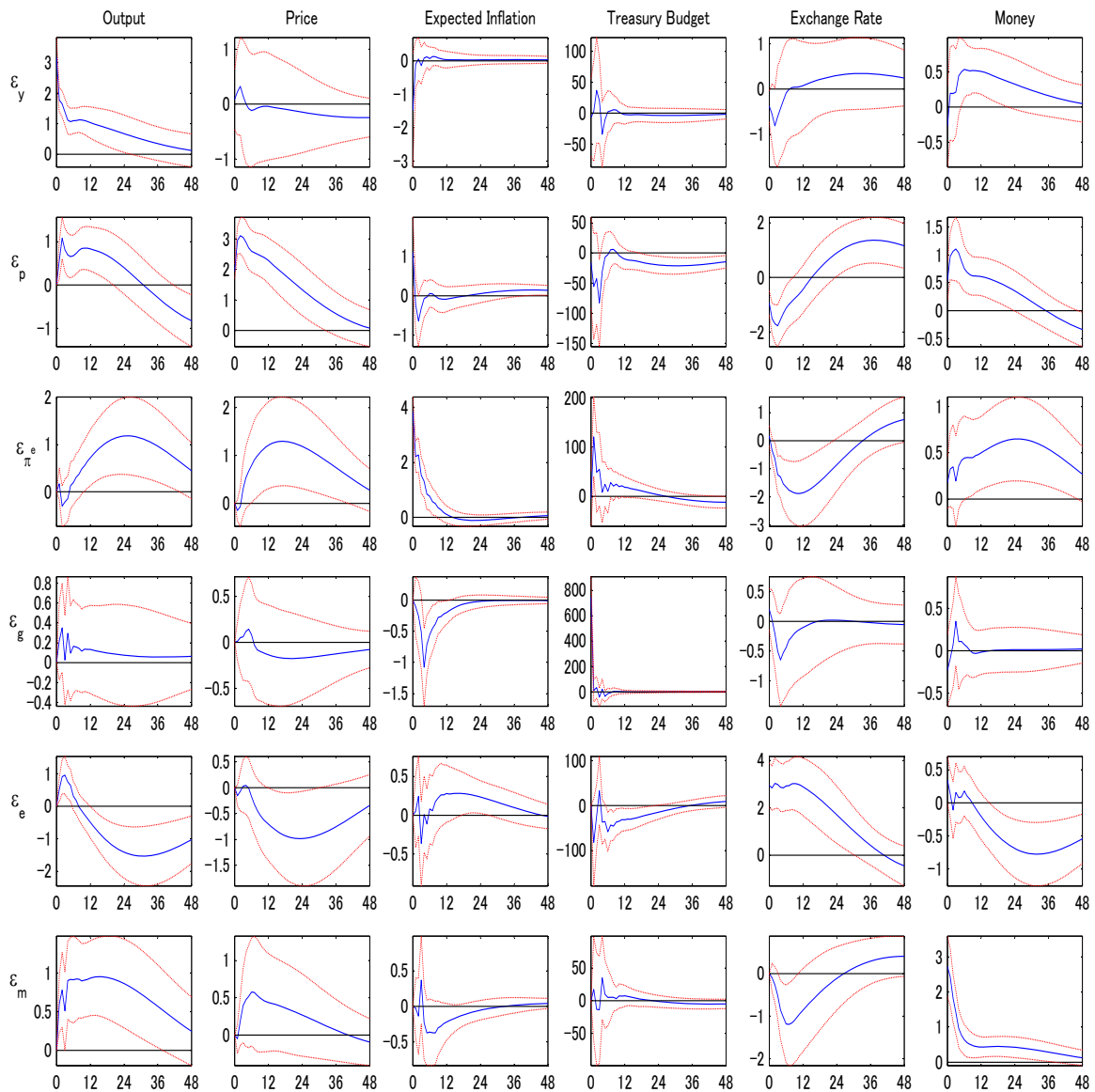


Figure 2: Impulse Responses

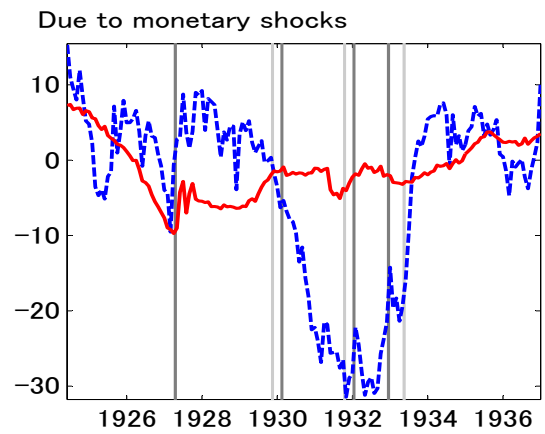
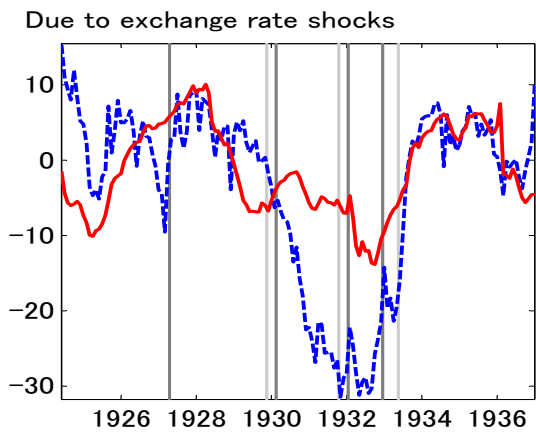
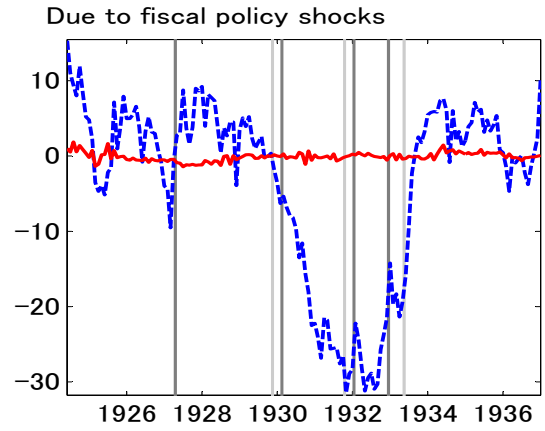
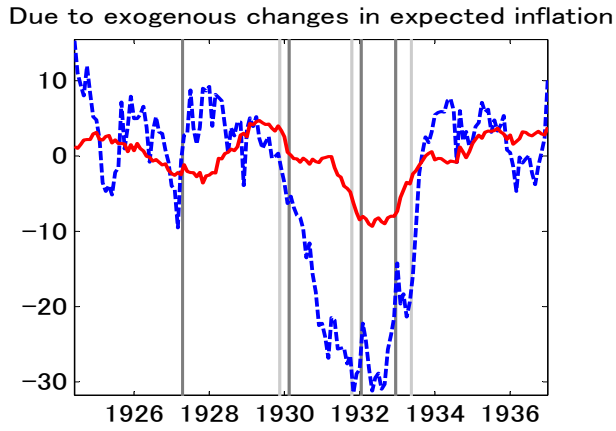
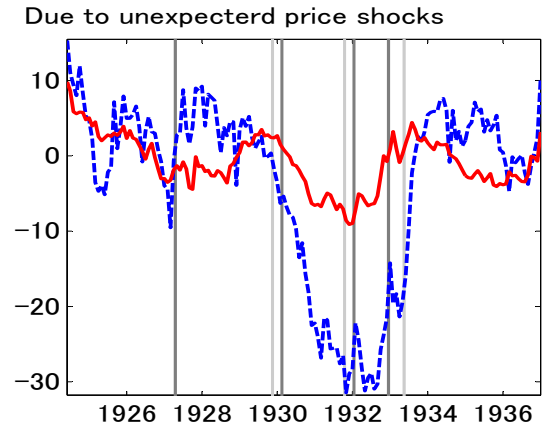
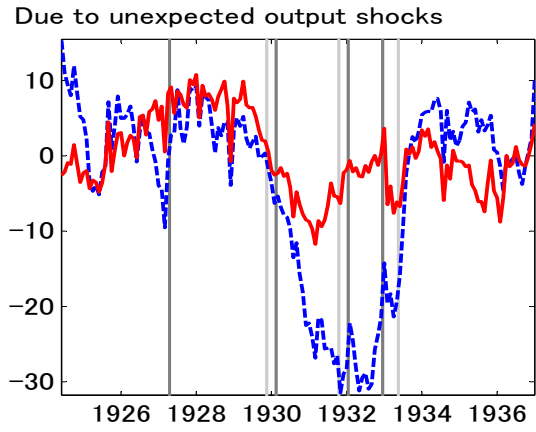


Figure 3: Historical Decomposition of Output

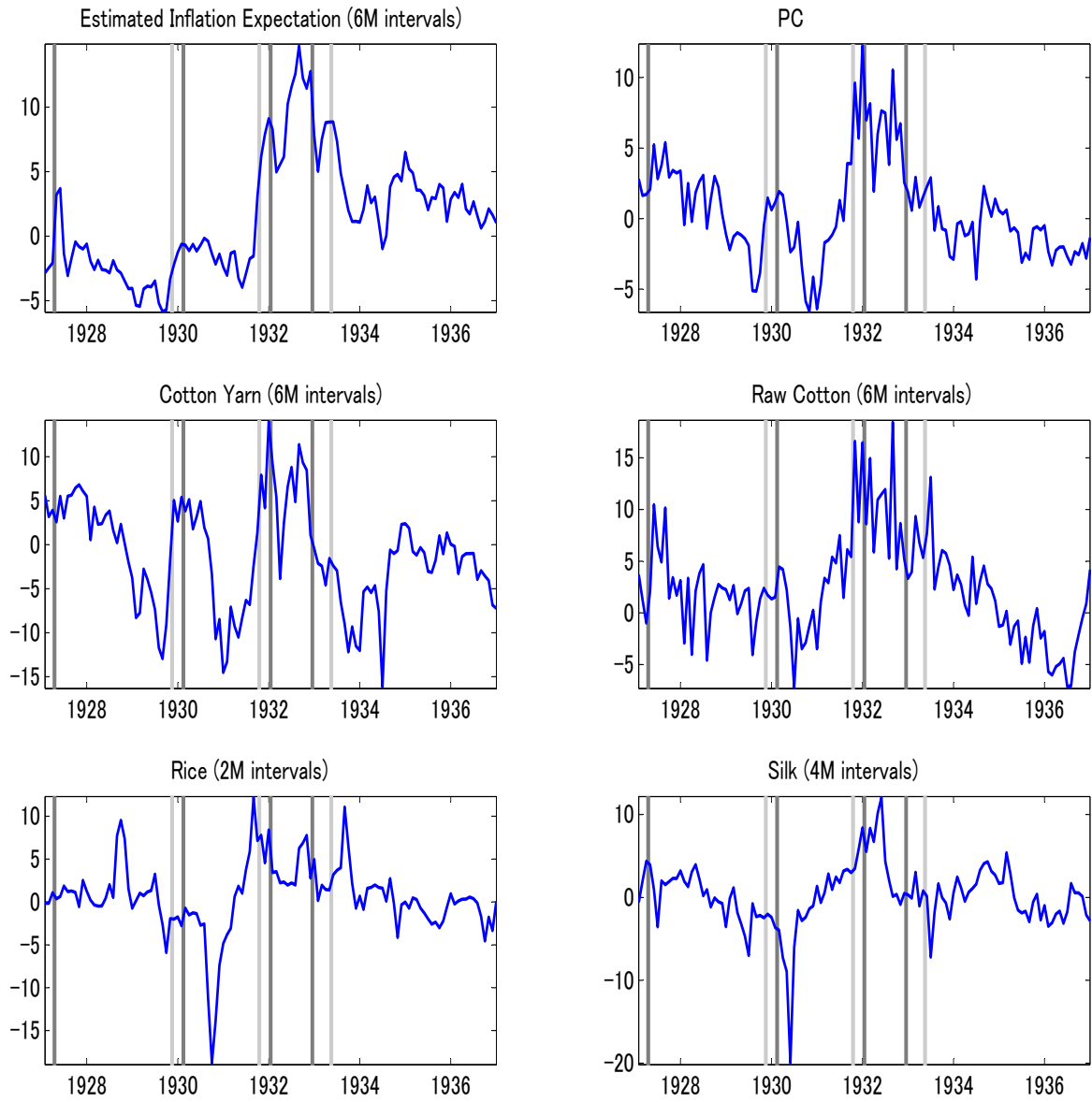


Figure 4: WPI Estimated Inflation ($\widehat{E_t(p_{t+6})} - p_t$) vs. Futures

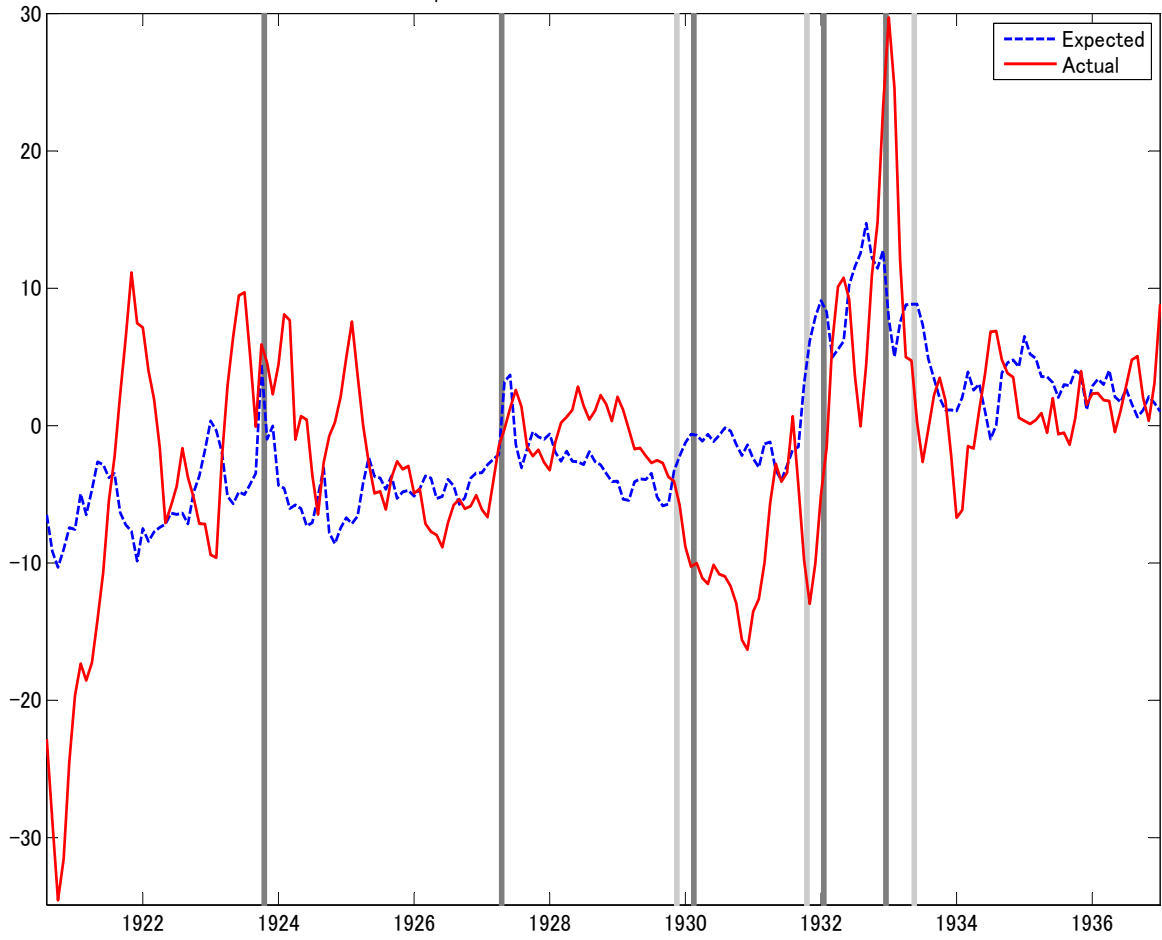
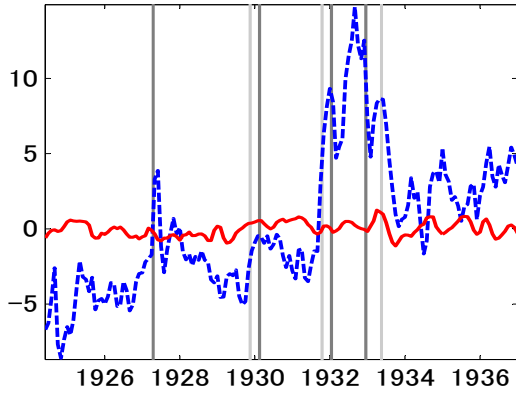
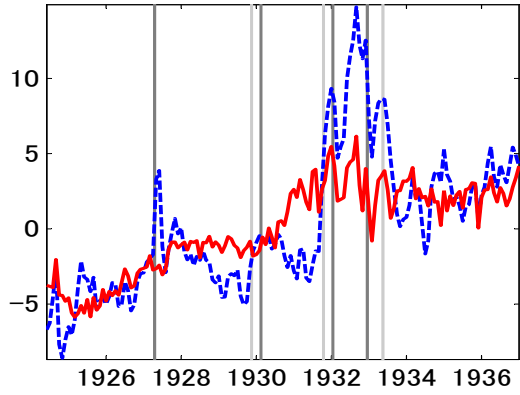


Figure 5: WPI Actual Inflation $(p_t - p_{t-6})$ vs. WPI Expected Inflation $(E_t(\widehat{p}_{t+6}) - p_t)$

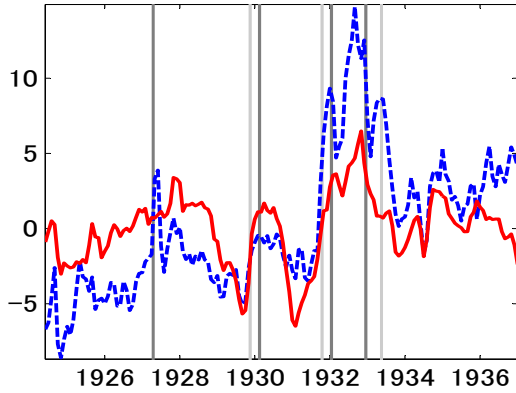
Due to unexpected output shocks



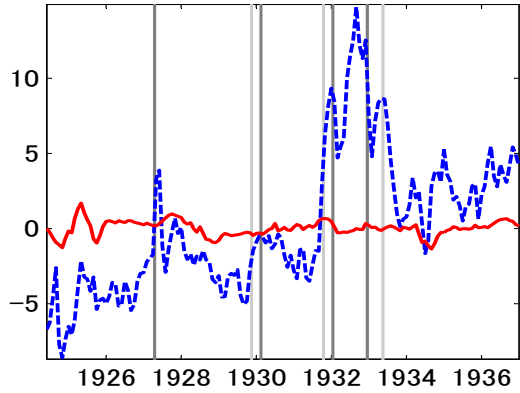
Due to unexpected price shocks



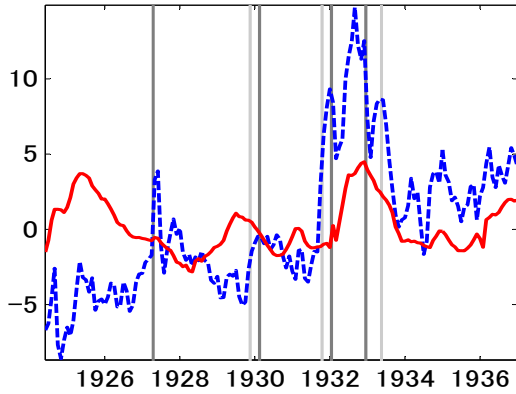
Due to exogenous changes in expected inflation



Due to fiscal policy shocks



Due to exchange rate shocks



Due to monetary shocks

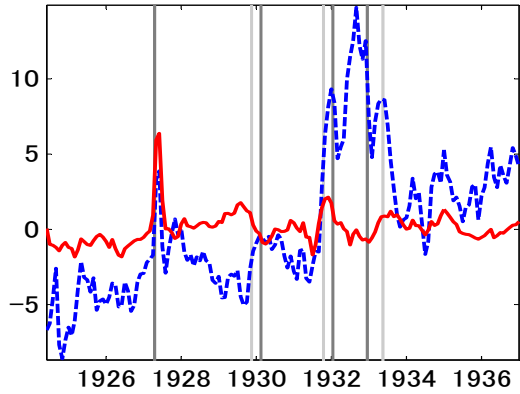


Figure 6: Historical Decomposition of Expected Inflation

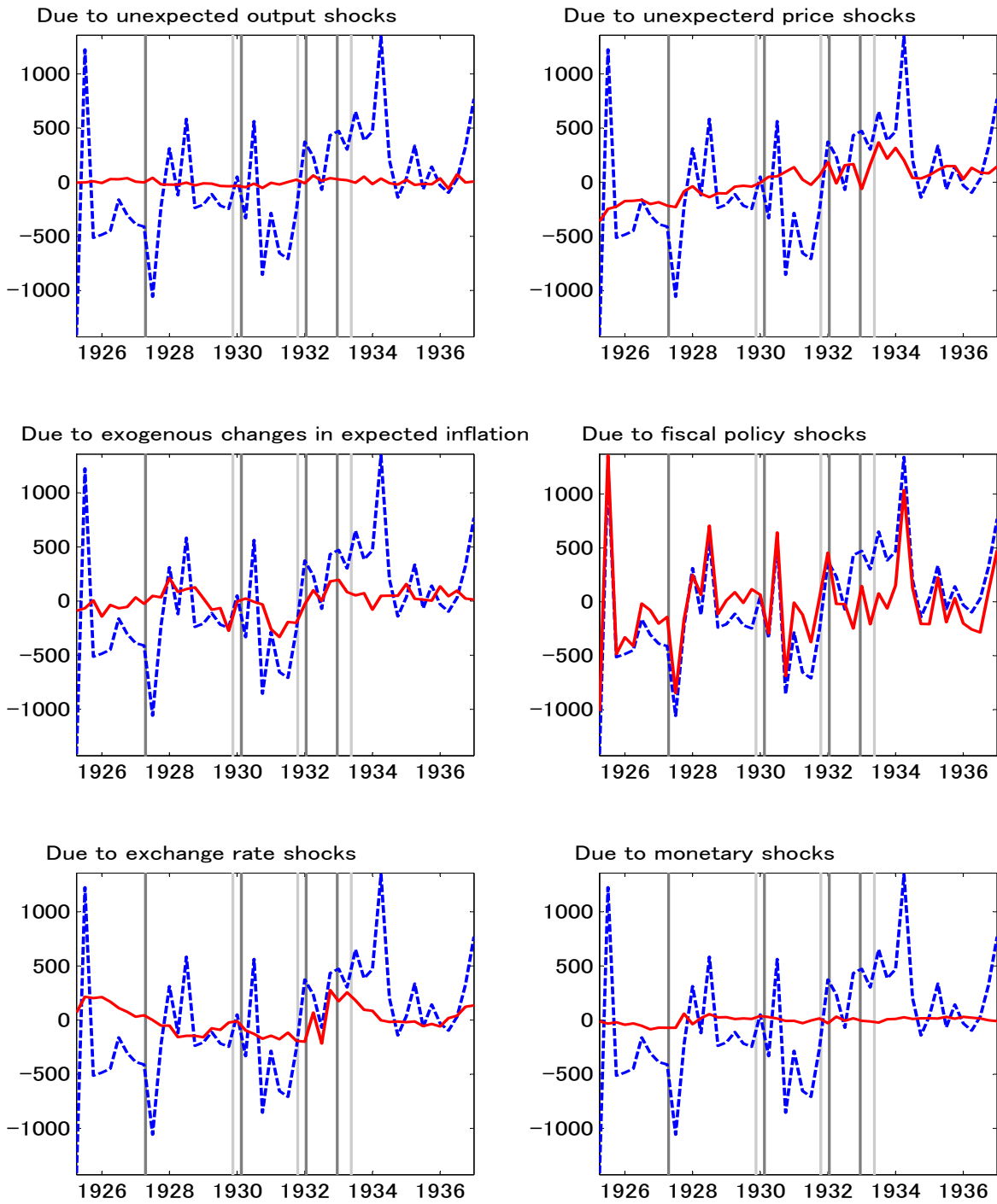


Figure 7: Historical Decomposition of Treasury Budget

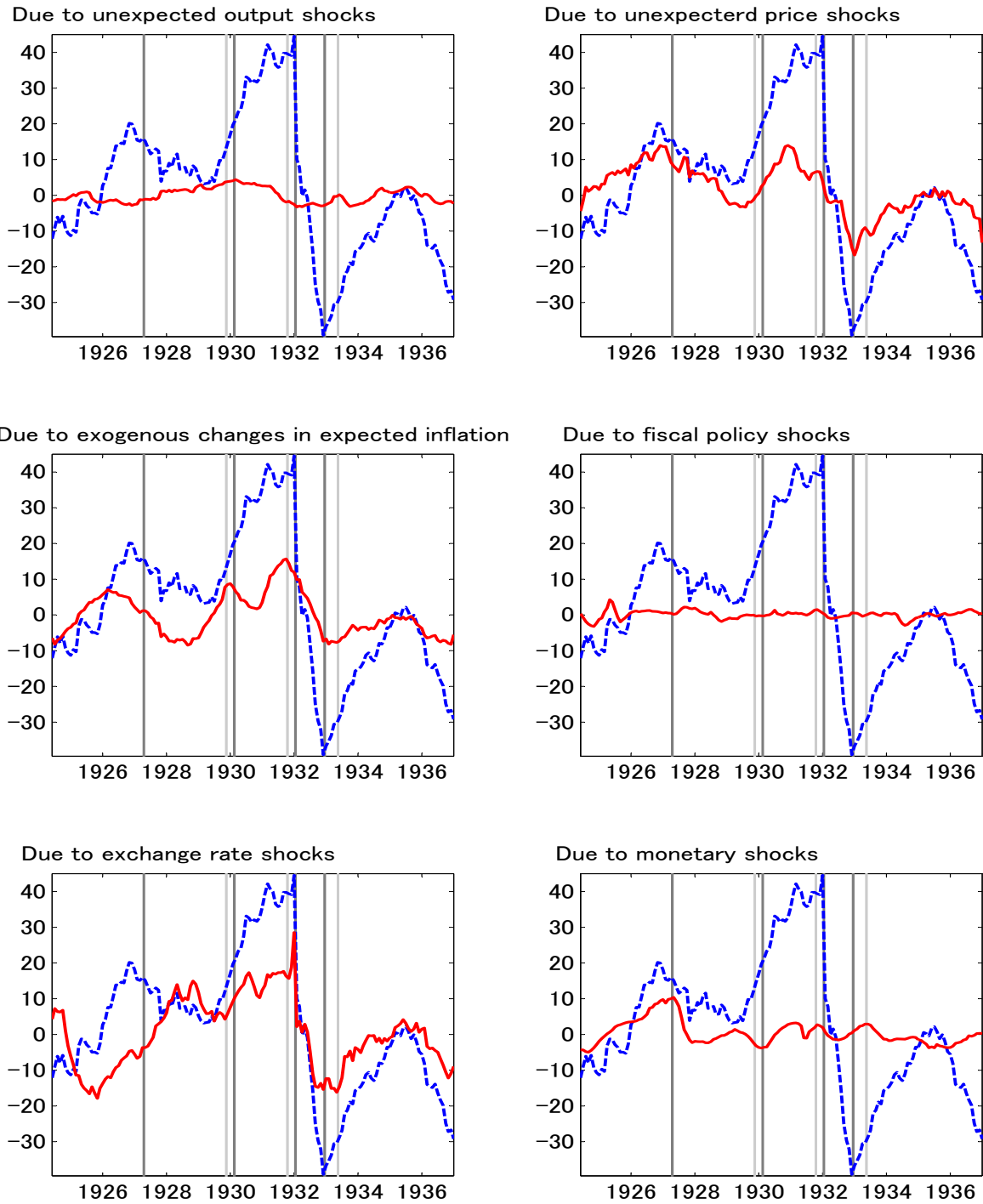


Figure 8: Historical Decomposition of Exchange Rate

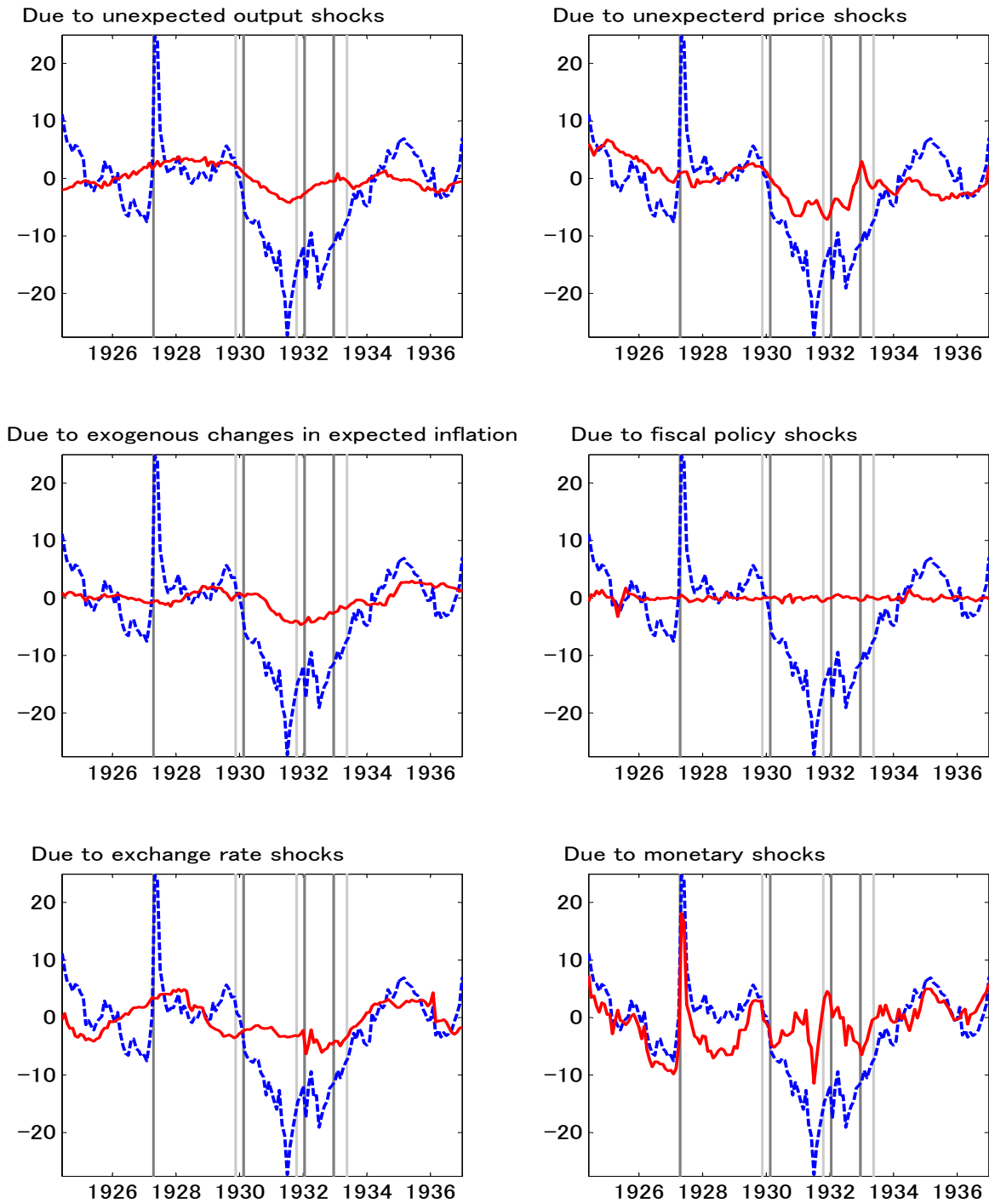


Figure 9: Historical Decomposition of Money

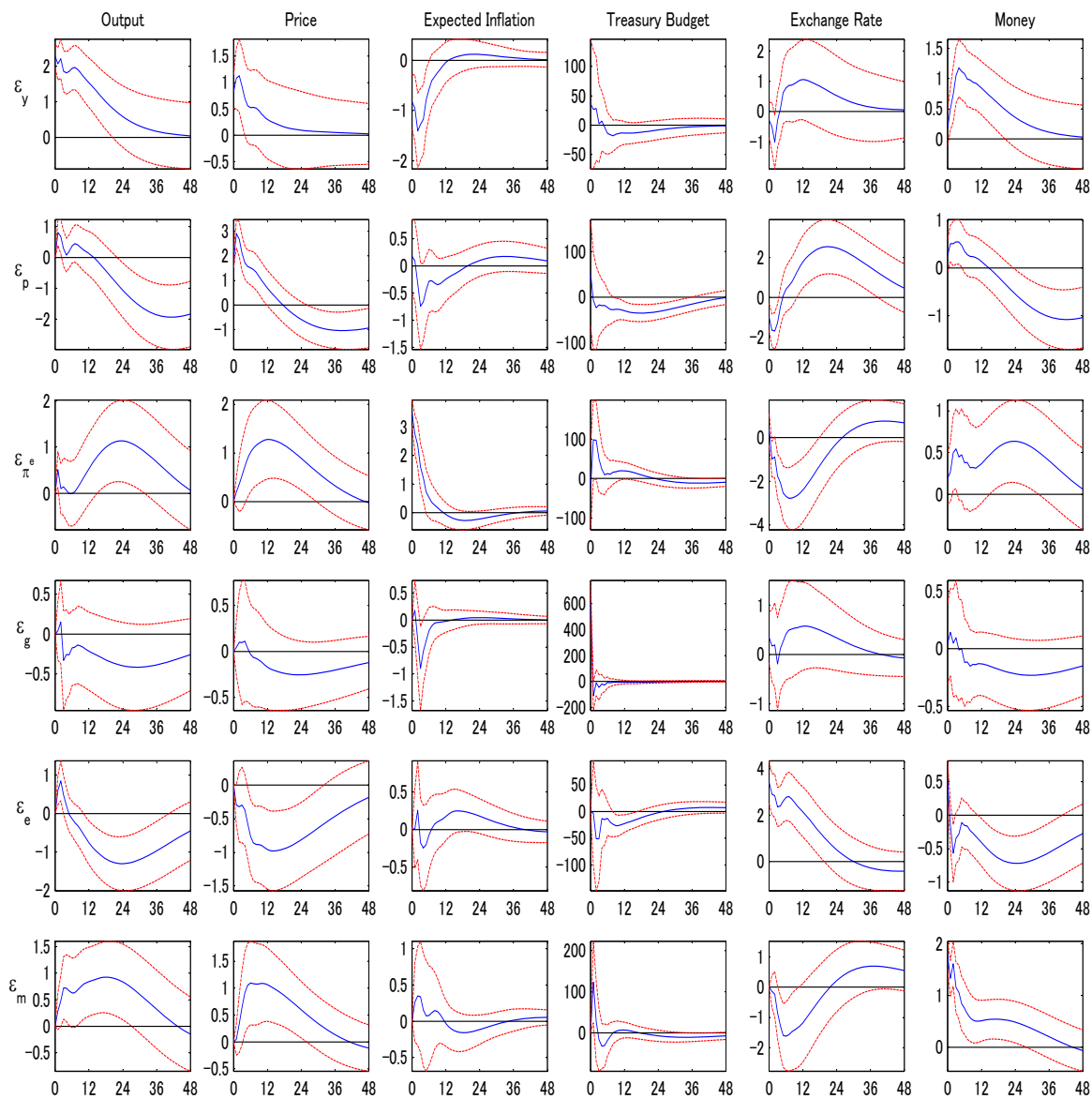


Figure 10: Impulse Responses (Subsample: 1929:1–1936:12)

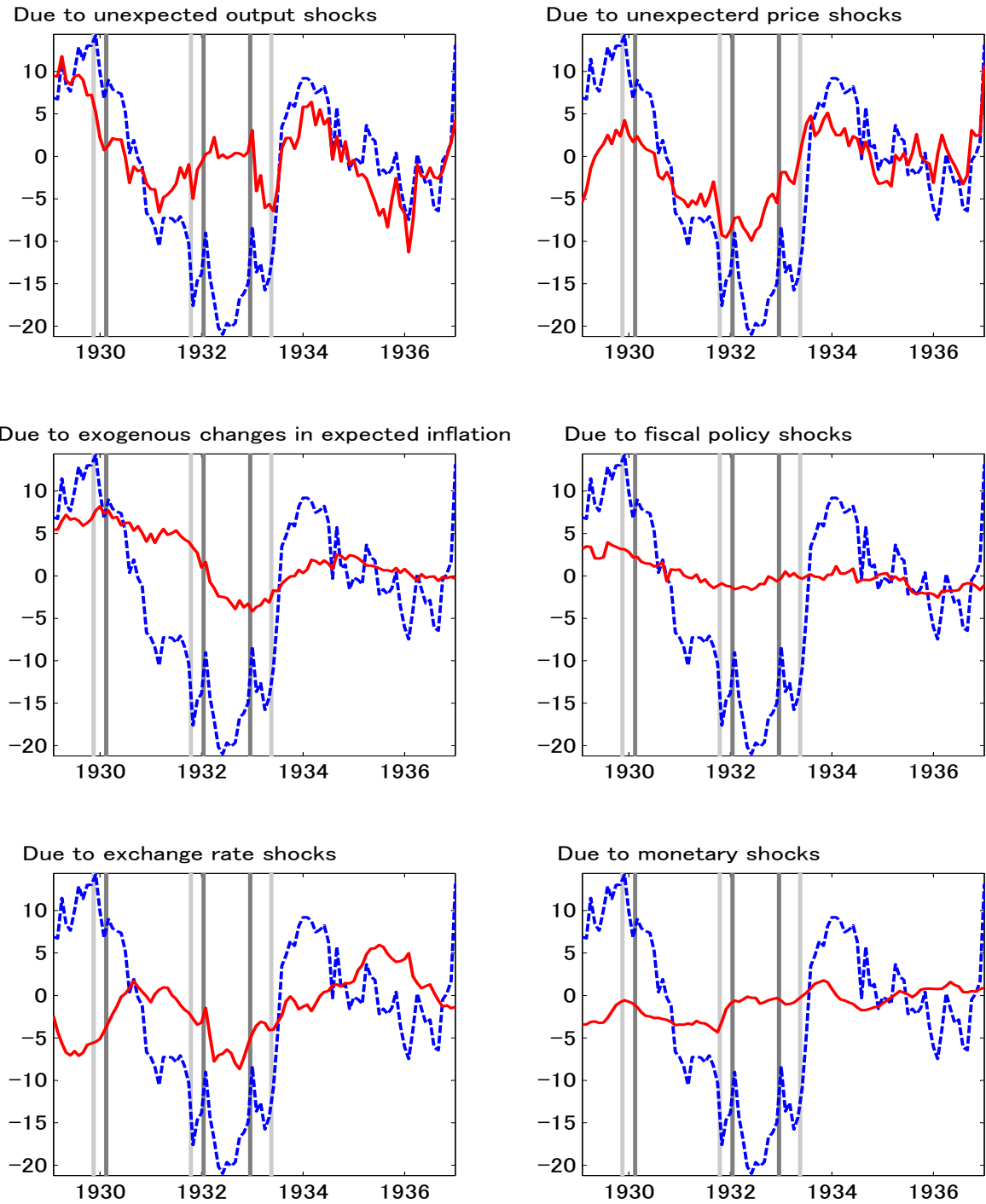


Figure 11: Historical Decomposition of Output (Subsample: 1929:1–1936:12)

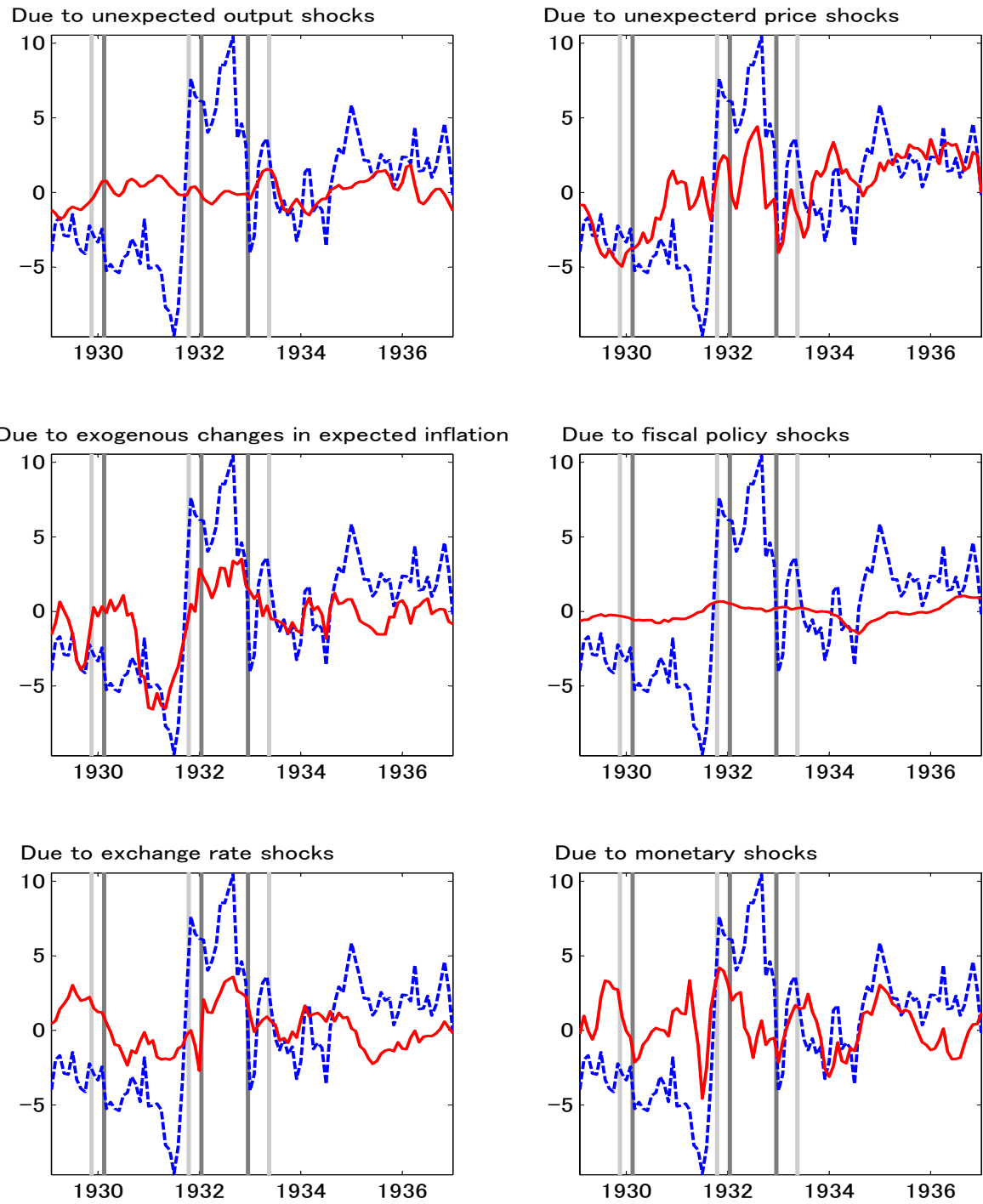


Figure 12: Historical Decomposition of Expected Inflation (Subsample: 1929:1–1936:12)

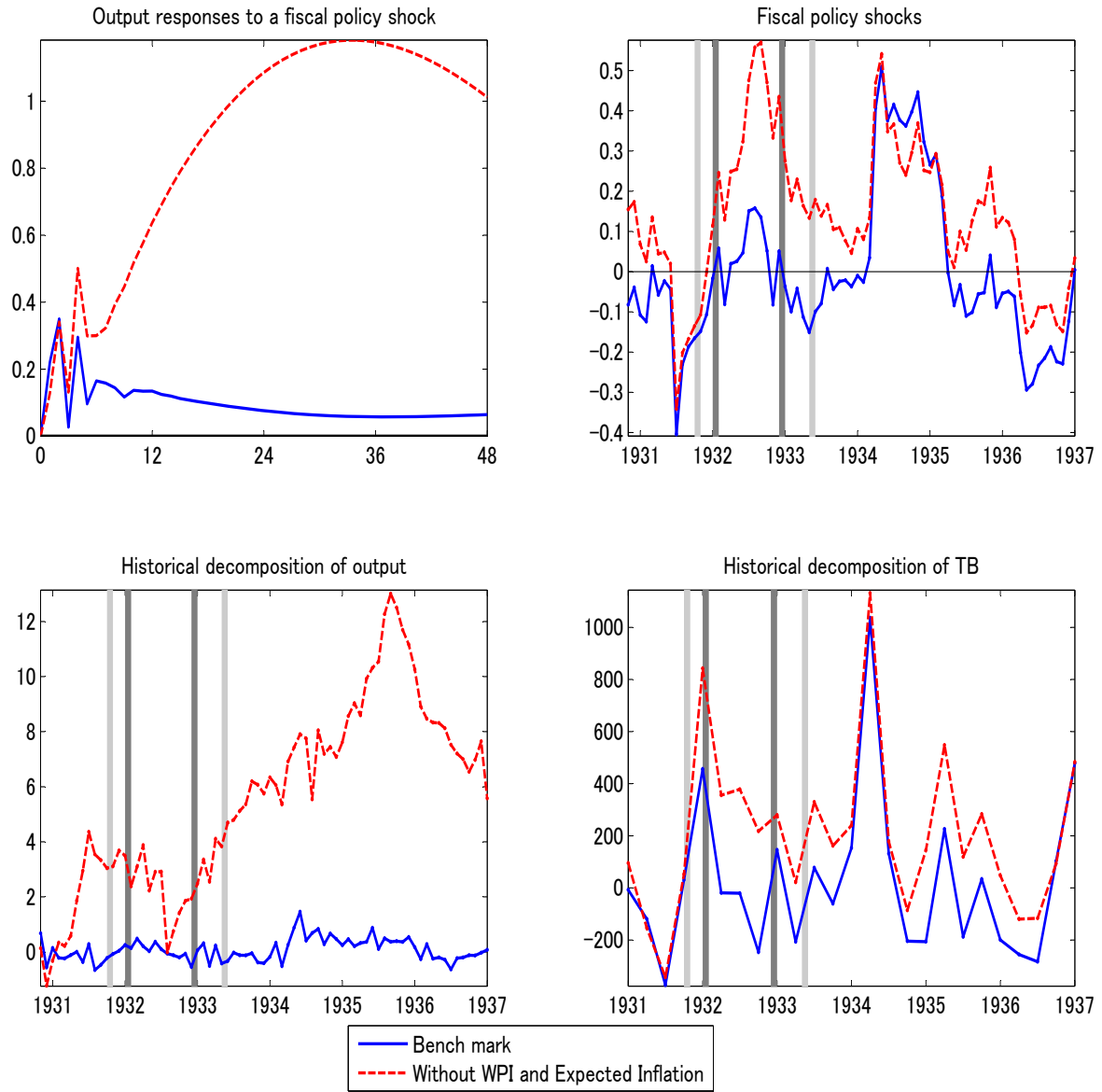


Figure 13: Benchmark model vs. VAR Model without price and expected inflation