On large-scale money finance in the presence of black markets: the case of the Japanese economy during and immediately after World War II[1]

June, 2017

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Abstract: This paper demonstrates how strong demand for the Bank of Japan (BoJ) notes emerged from illegal dealers in black markets during the wartime and postwar years 1937-1949. As a consequence of large-scale income leakages into black markets under the strict price control, the formal economy including the government suffered from severe financial shortages. Thus, the newly printed BoJ notes worked as an instrument for the government to finance the war expenditures and the postwar rehabilitation indirectly from black markets, while they served as a means for illegal dealers to conceal illicit income. The scale of such income leakages can be precisely inferred from the statistical discrepancy between aggregate expenditure and aggregate income in the national accounts. Some policy implications for currency reforms are also explored with consideration for the fact that the emergence of black markets necessitated the BoJ's money finance.

Key words: money finance, wartime finance, price controls, black markets, national accounts, statistical discrepancies.

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1. Introduction

This paper demonstrates how strong demand for the Bank of Japan (BoJ) notes emerged from illegal dealers in black markets during the wartime and postwar years 1937-1949 when the economy was heavily controlled in terms of quantities and prices. Under the strict price control, a substantial part of aggregate income leaked out of the formal economy into black markets. Consequently, the formal economy, including the central government, suffered from serious financial shortages. To overcome such a financial shortage, the government let the BoJ issue the bank notes massively to directly underwrite public bonds, which notes were in turn circulated through the formal economy, and were eventually held by illegal dealers in black markets. That is, the newly printed BoJ notes worked as an instrument for the government to finance the war expenditures and the postwar rehabilitation indirectly from black markets, while they served as a means for illegal dealers to conceal illicit income.

The scale of income leakages into black markets can be precisely inferred from the statistical discrepancy between aggregate expenditure and aggregate income in the national accounts when the price controls are introduced strictly. More concretely, under the strict price controls, producers officially disclose as if they sold all of their products at official prices; however, they never reported any illegal margins from selling the products through the intermediation of black market dealers. On the other hand, given the extreme scarcity of goods resulting from strict rationing, producers and consumers are forced to purchase part of final and intermediate goods from black markets, and producers recorded expensive payments to undercover dealers on their books. Consequently, aggregate expenditure increases by the additional cost of the final goods purchased in black markets, while aggregate income, measured as value added, decreases by the additional cost of the intermediate goods procured from illegal dealers. As a result, there emerge largely positive statistical discrepancies as the size of income leakages into black markets under the strict price controls.

According to the Japanese national accounts compiled by the Economic Planning Agency (1964), hereafter the EPA national accounts, aggregate expenditure continued to exceed aggregate income in nominal terms for the years 1937-1949, during which the Japanese economy had been

heavily controlled by the central government in terms of quantities and prices. First, this paper demonstrates that such largely positive statistical discrepancies were not so much a reflection of the disturbing effects of measurement or aggregation errors, as they were a necessary consequence of the price controls, which had been implemented strictly for most intermediate and final goods by the central government during and immediately after the war.

Second, this paper explores the possible macroeconomic impacts of such income leakages into black markets. It follows from such positive statistical discrepancies that the net national savings from aggregate income was short of the sum of net investment and net exports as a part of aggregate expenditure. That is, formal economic agents, public or private, could not finance their investment or exports fully only with the assistance of tax/subsidy transfers or borrowings from those in the formal economy.

There existed two major channels through which the income that leaked into black markets flowed back to the formal economy. One natural channel was that private agents in the formal economy bartered directly with illegal dealers by exchanging inventories held by firms and durables held by households for black market resources. Although seemingly counterintuitive, on the other hand, the BoJ's direct underwriting of public bonds was an inevitable fiscal instrument used by the government to finance fiscal expenses *indirectly* from black markets.

We thus consider closely the latter channel. The government could not finance fiscal expenses any more from the formal economy which suffered from income leakages into black markets, and it could not deal directly with illegitimate agents in black markets either. But, the government could deal directly with a legitimate institution, the BoJ. The new notes issued to the government by the BoJ first circulated as a medium of exchange among those in the formal economy. Then, the new bank notes eventually flowed into black markets because the total expenditure made by those in the formal economy exceeded the total income received by them. In turn, undercover dealers held the newly issued BoJ notes to conceal illicit income by exploiting the uninscribed nature of central bank notes. In this case, the eventual holders of the new BoJ notes were not formal private agents, but those in black markets. In sum, the government could money-finance fiscal expenses *indirectly* from black markets without dealing directly with illegal dealers.

This paper has four important contributions. First, it successfully establishes possible macroeconomic relationships between a formal economy and an underground economy that emerges from strict price controls. While many papers, including Rockoff (1984) for the US and Williams (1945) for non-US countries, point out that strict price controls triggered the emergence of black markets, little research has been done in terms of economy-wide interaction between a formal economy and black markets.

Second, this study contributes to the literature on measuring the informal economy.[3] In this literature, statistical discrepancies between aggregate expenditure and aggregate income have been frequently regarded as a proxy for the size of the underground economy (see O'Higgins (1989)), and in the context of the Japanese national accounts, Mizoguchi and Nojima (1993) and Mizoguchi (1996) make an informal statement that the presence of black markets was responsible for largely positive statistical discrepancies in the postwar EPA national accounts. On the other hand, Thomas (1999), Tanzi (1999), and others argue that it is not appropriate to measure the informal economy precisely using the above-mentioned statistical discrepancy, which does not necessarily have theoretical foundations as a measure of the informal economy.[4] By analyzing the Japanese experience during the period 1937-1949, however, this paper presents a theoretically convincing case where the size of the black markets that emerge from price controls corresponds precisely to the positive statistical discrepancy between aggregate expenditure and aggregate income.

Third, this paper sheds light on an alternative role performed by large-scale money finance in the presence of black markets. From the perspective of the government, on the one hand, direct underwriting of public bonds by a central bank can serve as a legitimate instrument for covering a financial shortage *indirectly* by the resources held by illegitimate agents operating in black markets. Among those in black markets, on the other hand, the newly issued bank notes can be used as an instrument to conceal illicit income. One important consequence of such mutual benefits between a government and illegal dealers is that even large-scale direct underwriting

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[3] See Frey and Pommerehne (1982), Schneider (2005), and Georgiou (2007) for a survey of this field.

[4] In addition, econometric studies including Gartaganis and Goldberger (1955) and Adams and Janosi (1966) point out that statistical discrepancies in peacetime periods reflect various kinds of measurement errors in addition to underground economic activities.

may have limited impacts on prices to the extent that those outside the formal economy are willing to hold the newly issued bank notes. This paper also demonstrates that given such strong demand for bank notes from underground dealers, high cash/deposit ratios proposed by Cagan (1958), Guttman (1977), and Bhattacharyya (1990), and high currency demand proposed by Feige (1989) can be also employed as alternative measures or proxies for the scale of an informal economy.

Fourth, our historical exploration provides possible policy implications for currency reforms. As Rogoff (2016) and others discuss, a fundamental economic reason for abolishing central bank notes is that they facilitate black market transactions. In the Japanese case, however, the emergence of black markets driven by the strict price controls necessitated the issuance of bank notes to the government by the BoJ; economic agents in the formal economy, private and public, were forced to finance part of their expenses from those in black markets in any case. Without any careful attention to this reverse causality, repealing central bank notes might not result in the disappearance of black markets, but a privately created sophisticated currency would legally take over the alternative role performed by central bank notes in connecting a formal economy to black markets.

This paper is organized as follows. Section 2 offers a brief description of the price controls implemented during and after the war, and presents a simple model of the effects of price controls on national accounts. Section 3 interprets the Japanese national accounts of the 1930s and 1940s using the framework presented in Section 2. Section 4 concludes the paper.

2. Price controls in practice and theory

2.1. A brief history of the price controls and black markets during and after the war

A fundamental problem faced by the Japanese economy during and after World War II was stagnant production. According to the EPA (1964), real gross national expenditure had been sluggish in the 1940s; measured in 1934-1936 constant prices, it was 13.4 billion yen in 1930, 16.6 billion in 1935, 22.1 billion in 1939, 20.1 billion in 1944, 10.9 billion in 1946, and 16.2 billion in 1950. Among the possible factors responsible for the prolonged stagnant production, a shortage of imported goods was the most crucial. In particular, production by munitions factories, which were

heavily dependent on imports of intermediate goods from the Allies, declined substantially because of a series of economic blockades imposed by the Allies starting in the late 1930s. Even after the war, the General Headquarters of the Allied Powers (the occupation army in Japan) imposed strict restrictions on imports with exceptions for humanitarian purposes. It was after these import restrictions were lifted for heavy oil in 1947 and for other commodities in 1948 that the Japanese economy started to recover.

Given such a serious shortage of materials and products, the government was forced to prioritize the distribution of scarce resources; namely to munitions industries during the war, and to heavy industries including coal and steel during the postwar reconstruction. At the same time, the government had to implement strict price controls so that excess demand resulting from wide-ranging rationing might not lead to rising prices.[5] For this purpose, the wartime government legislated the Temporary Import/Export Grading Measures Law (TIEGML), the Temporary Funds Adjustment Law (TFAL), and the Material Mobilization Plans (MMP) in 1937, Total National Mobilization Law (TNML) in 1938, and the Productive Capacity Expansion Plans (PCEP) in 1939.

Initially under the TIEGML in 1937, the TNML in 1938, and later by the Price Control Order enacted in 1939, the government set official prices at extremely low levels for most final and intermediate goods. Accordingly, especially in intermediate goods markets, producers had a strong incentive to sell their own goods in black markets at higher prices, and to retain illegal earnings off the books. At the same time, because of strict rationing, producers were forced to purchase goods through undercover dealings. Consequently, expensive intermediate goods obtained from black markets increased production costs, but producers had to disclose as if they had sold all intermediate and final goods at the cheap official prices. Then, producers in official markets were forced to carry considerable losses, for which they were often compensated by government subsidies such as the subsidies to offset price differentials and the loss compensation. In addition, consumers had to purchase expensive goods from black markets in the final years of the war.

The police launched a crackdown on illegal transactions in late 1938, but since 1941, it had weakened such control gradually, partly because of a shortage of officers and partly because of the

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[5] Nakamura (1983) describes in detail the legislation process of economic controls for the years 1937-1945.

frequent involvement of military personnel in undercover transactions. According to Kikuchi (1947) and Miwa (2015), as a consequence of ineffective material allocations under the MMP, munitions factories were often rationed unnecessarily, and they disposed of their excess supplies of goods into illegal markets. In addition, Kikuchi (1947) documents that after munitions factories were enforced to achieve extremely demanding production targets by the Munitions of War Act in late 1943, they started to purchase a large amount of raw materials from illegal dealers. Nishida (1994) also points out that munitions factories purchased consumption goods from illegal dealers on behalf of their managers and employees in the period 1943-1945. In this way, munitions factories emerged as both sellers and buyers in black markets in the final years of the war.

While there are few time-series data for black market prices during the wartime period,[6] Morita (1963) reports effective wholesale/retail price indexes, which reflected both official and black market transactions. The effective indexes, often called the Morita indexes, were compiled by the BoJ in the final years of the war, and were employed in estimating nominal expenditure by the USSBS (1946) and the EPA (1964).[7] As reported in Table 1, the effective-to-official price ratio increased from 1.08 in 1940 to 1.45 in 1944 for wholesale prices, and from 1.07 in 1940 to 1.93 in 1944 for retail prices.[8] The two ratios indicate that the transaction of retail goods tended to rely more on black markets than that of wholesale goods.

Basically, the strict price controls were maintained even after the war. The Price Control Order was replaced by the Price Control Law in 1946, while the MMP was switched to the Material Supply and Demand Planning Program in 1945, which was reformulated as the Priority

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[6] Mizoguchi (1995) reports the black-to-official market price ratios of several consumption goods for the first quarter of 1944; for example, 7.45 for rice/wheat, 3.12 for vegetables, 4.73 for fish, 5.25 for meat, and 5.56 for seasonings.

[7] As Morita (1963) explains, the effective wholesale price index was computed as the nominal amount of transactions by drafts divided by the quantity of commodity transactions, while the effective retail price index was computed as the nominal amount of transactions by cash divided by the quantity of commodity transactions. While these effective price indexes (the Morita indexes) were recognized as far from perfect measures among experts including even Yuzo Morita, there was not any alternative to the Morita index as a measure of wartime transaction prices. Accordingly, the USSBS (1946) first used the Morita indexes in compiling the wartime national accounts, and the EPA (1964) later employed them for the same purpose.

[8] Before most final and intermediate goods were regulated heavily by the Price Control Order in 1939, the BoJ official price indexes included not only regulated prices, but also unregulated ones. Thus, the BoJ official price indexes and the effective price indexes (the Morita indexes) were close to each other under price controls in the late 1930s.

Production System in 1946. In the aftermath of the war, the government concentrated material and financial resources in heavy industries, in particular coal and steel. As in the wartime period, the government offered subsidies to offset price differentials for heavy industry products. According to the Bank of Japan (1966), the black-to-official market price ratio was fairly high for production goods; it was 7.2 in 1946, 5.3 in 1947, 2.9 in 1948, and 1.7 in 1949. The government lifted price controls as well as resource rationing by the early 1950s, at which time, black markets disappeared completely.

2.2. A simple model of the effects of price controls on the national accounts

This subsection demonstrates that if official and black market prices exist simultaneously, then there emerges a positive statistical discrepancy between aggregate expenditure and aggregate income in the national accounts. The situation described in Section 2.1 may be simplified as follows. In corporate accounting, producers disclose as if they sold all final and intermediate goods at official prices, while the purchases of intermediate goods from underground dealings are recorded at black market prices. The margins earned by selling to underground dealers are off the books. On the other hand, consumers purchase some consumption goods from black markets.

Let us formalize below the possible effects of price controls on the national accounts. Here, it is assumed that the purchases of goods are valued at transaction prices, and the sales of goods are valued at official prices. In addition, black market margins are not reported at all. Here, P_{inter}^{om}, P_{final}^{om}, P_{inter}^{bm} and P_{final}^{bm} denote official and black market prices for intermediate and final goods respectively. For intermediate goods, V_{inter}^{om} and V_{inter}^{bm} are traded in official and black markets. For final goods, V_{final}^{om} and V_{final}^{bm} are traded in each market. The transactions are summarized as follows.

	Official markets	Black markets
Intermediate goods	$P_{inter}^{om} V_{inter}^{om}$	$P_{inter}^{bm} V_{inter}^{bm}$
Final goods	$P_{final}^{om} V_{final}^{om}$	$P_{final}^{bm} V_{final}^{bm}$

According to the above valuation rule, the nominal aggregate expenditure on final goods Y_n^E is computed as follows. Note that a variable with a lower subscript n denotes a nominal variable.

$$Y_n^E = P_{final}^{om} V_{final}^{om} + P_{final}^{bm} V_{final}^{bm} = P_{final}^{om} \left(V_{final}^{om} + V_{final}^{bm} \right) + \left(P_{final}^{bm} - P_{final}^{om} \right) V_{final}^{bm} \tag{1}$$

On the other hand, the nominal aggregate income, measured as value added Y_n^{VA}, is calculated as

$$\begin{aligned} Y_n^{VA} &= P_{inter}^{om} \left(V_{inter}^{om} + V_{inter}^{bm} \right) + P_{final}^{om} \left(V_{final}^{om} + V_{final}^{bm} \right) - \left(P_{inter}^{om} V_{inter}^{om} + P_{inter}^{bm} V_{inter}^{bm} \right) \\ &= P_{final}^{om} \left(V_{final}^{om} + V_{final}^{bm} \right) - \left(P_{inter}^{bm} - P_{inter}^{om} \right) V_{inter}^{bm} \end{aligned} \tag{2}$$

Finally, the unreported margin in black markets Y_n^{bm} corresponds to

$$Y_n^{bm} = \left(P_{final}^{bm} - P_{final}^{om} \right) V_{final}^{bm} + \left(P_{inter}^{bm} - P_{inter}^{om} \right) V_{inter}^{bm}. \tag{3}$$

As equations (1) and (2) imply, aggregate expenditure increases by the amount of expenditure on final goods in black markets, while aggregate income decreases by the amount of expenditure on intermediate goods in illegal transactions. Then, the statistical discrepancy between aggregate expenditure and aggregate income is equal to the unreported illegal margin.

$$\begin{aligned} SD_n &= Y_n^E - Y_n^{VA} \\ &= \left(P_{final}^{bm} - P_{final}^{om} \right) V_{final}^{bm} + \left(P_{inter}^{bm} - P_{inter}^{om} \right) V_{inter}^{bm} \\ &= Y_n^{bm} \end{aligned} \tag{4}$$

In this way, a part of aggregate income leaks from formal markets into black markets, equal to the amount of the statistical discrepancy SD_n, or the unreported margins earned by illegal dealers Y_n^{bm}.

Given nominal aggregate expenditure and nominal aggregate income given by equations (1) and (2), the GNE and GNI deflators are defined as follows.

$$\begin{aligned} P^{GNE} &= \frac{P_{final}^{om} \left(V_{final}^{om} + V_{final}^{bm} \right) + \left(P_{final}^{bm} - P_{final}^{om} \right) V_{final}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \\ &= P_{final}^{om} + \left(P_{final}^{bm} - P_{final}^{om} \right) \frac{V_{final}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \end{aligned} \tag{5}$$

$$\begin{aligned} P^{GNI} &= \frac{P_{final}^{om} \left(V_{final}^{om} + V_{final}^{bm} \right) - \left(P_{inter}^{bm} - P_{inter}^{om} \right) V_{inter}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \\ &= P_{final}^{om} - \left(P_{inter}^{bm} - P_{inter}^{om} \right) \frac{V_{inter}^{bm}}{V_{final}^{om} + V_{final}^{bm}} \end{aligned} \tag{6}$$

That is, $P^{GNE} > P^{om} > P^{GNI}$ holds. If $P^{om}_{final} = P^{om}_{inter} = P^{om}$ and $P^{bm}_{final} = P^{bm}_{inter} = P^{bm}$, then the real share of black markets can be computed from these prices.

$$\frac{V^{bm}_{inter} + V^{bm}_{final}}{V^{om}_{final} + V^{bm}_{final}} = \frac{\dfrac{P^{GNE} - P^{GNI}}{P^{om}}}{\dfrac{P^{bm}}{P^{om}} - 1} \qquad (7)$$

There are two remarks on the above accounting. First, the nominal size of aggregate income remains unchanged by introducing government subsidies to offset the price differentials. Such a subsidy is a transfer from a government to private corporations. That is, an increase in corporate profits by government subsidies is offset exactly by an increase in public deficits at the aggregate income level. Second, it is assumed that only black market margins are unreported in the above setup. However, if the sales of goods in black markets themselves are unreported, then the size of the statistical discrepancy dictated by equation (4) underestimates the size of black markets.

2.3. Macroeconomic financial shortages and money finance by a central bank

As demonstrated in Section 2.2, a positive statistical discrepancy reflects not accidentally any disturbing effect of measurement or aggregation errors, but inevitably a possible flow of funds in the presence of black markets. It follows from such a positive statistical discrepancy that public and/or private agents in a formal economy are subject to a financial shortage.

Let us consider the above point within a general framework. Given a positive statistical discrepancy $SD_{n,t} > 0$, aggregate expenditure exceeds aggregate income in nominal terms as follows.

$$C_{n,t} + G_{n,t} + \left(\Delta K^{private}_{n,t} + \Delta K^{public}_{n,t} \right) + NX_{n,t} + NI_{n,t} > Y^{NNI}_{n,t}, \qquad (8)$$

where $Y^{NNI}_{n,t}$, $C_{n,t}$, $G_{n,t}$, $\Delta K^{private}_{n,t}$, $\Delta K^{public}_{n,t}$, $NX_{n,t}$, and $NI_{n,t}$ denote net national income, private consumption, government consumption, net private fixed investment, net public fixed investment, net exports, and net income transfers from foreigners at time t respectively. Any stock variable is measured at the end of each period.

Equation (8) implies that the net national savings $S^{national}_{n,t}$ is less than the sum of net investment and net exports.

$$\left(\Delta K_{n,t}^{private} + \Delta K_{n,t}^{public}\right) + NX_{n,t} + NI_{n,t} > S_{n,t}^{national} = Y_{n,t}^{NNI} - \left(C_{n,t} + G_{n,t}\right) \qquad (9)$$

That is, if a positive statistical discrepancy is present, then public and/or private agents in a formal economy cannot cover their investment or exports sufficiently through the net national savings.

How do they fund such a macroeconomic financial shortage resulting from the income leakage into black markets? There are potentially two ways to reflux resources from black markets back to a formal economy. As the first channel, private agents in a formal sector barter directly with illegal dealers by exchanging inventories held by firms and durables held by households for resources from black market dealers. For large-scale illegal transactions, they may use housing and land as a medium of exchange. On the other hand, undercover dealers hold physical assets or immovable properties as a means of store of value.

As discussed in the introduction, central bank's direct underwriting of public bonds is the inevitable fiscal instrument for a government, because (i) a government cannot obtain any more resources from the formal economy suffering from an income leakage, (ii) a government cannot deal directly with illegitimate agents, but it can deal with a central bank, (iii) bank notes newly issued to a government ultimately flow into black markets because the total expenditure made by those in a formal economy exceeds the total income received by them, and (iv) undercover dealers eventually hold new issues of bank notes to conceal illicit income by exploiting their uninscribed nature.[9]

In this way, black market dealers lend their concealed resources $\mu SD_{n,t}$ $(0 < \mu < 1)$ *indirectly* to a central bank by holding bank notes, or barter their hidden resources $(1-\mu)SD_{n,t}$ directly with private agents in a formal economy. Their choice between the two or how μ is determined may depend on inflation rates and tax surveillance. With low inflation or strong surveillance, illegal dealers may prefer to hold bank notes.

Note that a flow of funds differs completely between a standard monetary model without any black market and the current setup with black markets. In a standard model, $C_{n,t} + G_{n,t} + \left(\Delta K_{n,t}^{private} + \Delta K_{n,t}^{public}\right) + NX_{n,t} + NI_{n,t} = Y_{n,t}^{NNI}$ always holds. As shown in Figure 1-1, a

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[9] Most of the public bonds were issued as uninscribed during and immediately after the war, but their coupons and principals needed to be cashed at financial institutions where identification was required of bond holders.

government funds government consumption, net public investment, and interest payments $(i_t B_{n,t})$ in excess of tax revenues $(T_{n,t})$, or $G_{n,t} + \Delta K_{n,t}^{public} + i_t B_{n,t} - T_{n,t}$ by issuing bank notes $(\Delta M_{n,t})$ and/or public bonds $(\Delta B_{n,t})$ to households.

$$G_{n,t} + \Delta K_{n,t}^{public} + i_t B_{n,t} - T_{n,t}$$
$$= \Delta M_{n,t} + \Delta B_{n,t}$$
$$= Y_{n,t}^{NNI} - C_{n,t} - \Delta K_{n,t}^{private} - NX_{n,t} - NI_{n,t} + i_t B_{n,t} - T_{n,t}$$

In this case, the entire new issue of bank notes is eventually absorbed by household savings.

On the other hand, once a part of aggregate income leaks into black markets, illegal dealers rather than households eventually hold the bank notes newly injected by direct underwriting up to $\Delta M_{n,t} = \mu SD_{n,t}$, while households invest in newly issued public bonds up to

$$\Delta B_{n,t} = Y_{n,t}^{NNI} - C_{n,t} - \Delta K_{n,t}^{private} - NX_{n,t} - NI_{n,t} + i_t B_{n,t} - T_{n,t} + (1-\mu) SD_{n,t}.$$

As shown in Figure 1-2, the new issues of bank notes are finally held not by those in the formal economy, but by those in black markets. Conversely, a government can finance resources *indirectly* from black markets without dealing directly with illegal dealers.

Let us next consider a money market. Money demand from those in a formal economy $(M_{n,t}^{formal})$ is proportional to nominal aggregate expenditure $(Y_{n,t}^E)$. As in Cagan (1956), Marshallian $k \left(= \dfrac{M_{n,t}^{formal}}{Y_{n,t}^E}\right)$ is usually formulated as $\dfrac{M_{n,t}^{formal}}{Y_{n,t}^E} = m(i_t)$, where $m(i_t)$ is decreasing with respect to the nominal rate of interest. With additional money demand from those in black markets, the observed Marshallian $k \left(= \dfrac{M_{n,t}}{Y_{n,t}^E}\right)$ then exceeds $m(i_t)$.

$$\frac{M_{n,t}}{Y_{n,t}^E} > m(i_t) \qquad (10)$$

That is, from the viewpoint of a government, bank notes serve as a necessary instrument for financing fiscal expenses *indirectly* from black markets, while bank notes are a convenient means for illegal dealers to conceal illicit income. Given such mutual benefits between a government and those in black markets, money finance has limited impacts on prices to the extent that money demand from illegal dealers is strong, and Marshallian k is accordingly high.

2.4. Institutional details of money finance, subsidies, and barter in black markets

2.4.1. Direct underwriting of public bonds by the BoJ

Let us briefly describe some institutional details of the large-scale money finance by the BoJ, and the government subsidies to offset price differentials in corporate sectors during the wartime and postwar periods. Finance Minister Takahashi Korekiyo initiated the large-scale money finance by requesting the BoJ to underwrite new issues of public bonds directly in November 1932. Even after the assassination of Takahashi in 1936, the government continued such money finance throughout World War II.

The BoJ's underwriting was initially introduced not as a fiscal instrument for the government, but as a macroeconomic stimulus measure. While the BoJ directly underwrote public bonds during the years 1932-1936, it resold to the private banks more than 90% of what it purchased from the government. This implies that the government eventually financed its own deficit by borrowing not from the BoJ, but from the private banks.[10] As analyzed in detail by Shibamoto and Shizume (2014), the above monetary policy together with suspension of the gold standard indeed worked effectively to stimulate the economy mainly through a marked depreciation of the yen.

However, the direct underwriting by the BoJ had been employed as a powerful fiscal tool since the Sino-Japanese War began in 1937. Even after 1937, the BoJ continued to resell most of their direct purchases of public bonds to the private banks, but the private banks financed the bond purchases from the BoJ not with deposits from private savings, but with credit provided directly by the BoJ. This was equivalent to the government receiving credit indirectly from the BoJ via the private banks.[11] Since February 1942, the upper limit on the issue of BoJ notes had been determined solely by the Minister of Finance.[12]

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[10] See Shima (1983).

[11] The BoJ provided funds to the private banks, which in turn put up the public bonds as collateral at the BoJ. Because the lending rate charged by the BoJ was lower than the yield on the long-term public bonds, the private banks were willing to purchase the public bonds from the government by receiving inexpensive credit from the BoJ.

[12] Japan suspended the gold standard in December 1931, but the outstanding BoJ notes had been constrained by the amount of specie reserves up to January 1942.

Even in the aftermath of the war, the BoJ kept underwriting public bonds directly from the government. While the General Headquarters prohibited the BoJ from underwriting long-term public bonds in November 1945, the BoJ was still allowed to underwrite short-term public bonds. After the Public Finance Act was legislated in March 1947, the BoJ could not underwrite any public bonds in principle.

However, the BoJ underwrote the short-term bonds issued by the Reconstruction Finance Bank (RFB), which was founded as a public financial institution in January 1947. The RFB was not classified as a governmental body, and the BoJ was able to underwrite the RFB short-term bonds even under the Public Finance Act. By underwriting the RFB bonds, the BoJ issued bank notes to the value of 39.6 billion yen in 1947, and 37.2 billion yen in 1948, which accounted for about 30% of the total issuance in those years. However, the RFB was not allowed to issue any additional bonds from April 1949 under the direction of the General Headquarters. In this way, the BoJ developed direct underwriting of public and quasi-public bonds from November 1932 to March 1949.

2.4.2. Government subsidies to offset price differentials

During the wartime period, producers in munitions industries always carried enormous losses as a result of their purchases of expensive intermediate goods in black markets, and their sales of cheap final goods in official markets. A substantial fraction of such losses was compensated for by the subsidies and loss compensation from the government. According to Nakamura (1974), for example, Japan Coal Company was founded as a public institution to control coal markets in 1939. Japan Coal Company purchased coal from all domestic mines at cost prices, and sold them to final users through private coal companies at official prices, which were much cheaper than the cost prices. In 1944, the official price was about half of the cost price.

The corporate losses resulting from the strict price controls were even larger for heavy industries after the war. The losses were initially financed from the Reconstruction Finance Bank, which was backed by the BoJ's underwriting as mentioned above, and were later subsidized or compensated for by the government. Miwa and Ramseyer (2004), employing the accounting data

of Hokkaido Colliery and Steamship Company, document that the official coal prices were updated extremely slowly despite ongoing high inflation, and they equaled only around 40% of the cost prices in early 1948.

In this way, most losses resulting from such large price differentials were eventually covered by the government subsidies and the loss compensation. Accordingly, these losses were transferred from private companies to the government, which in turn financed these subsidies mainly by letting the BoJ underwrite public bonds. The subsidies and loss compensation paid to heavy industries accounted for 17.8%, 23.8%, and 30.2% of general account expenditure in 1947, 1948, and 1949 respectively. By the order of the General Headquarters, however, the government could not pay any subsidy or compensation for corporate losses from early 1949.

3. The wartime and postwar national accounts under the strict price controls

3.1. On construction of the national accounts

Let us interpret the wartime and postwar EPA national accounts along the framework presented in Section 2. The EPA (1964) compiled the annual national accounts from 1930 to 1951 with 1934-1936 as the base years.[13] Unfortunately, data for 1945 are not available in the EPA national accounts, but nominal GNE of 1945 can be approximated using other data sources.[14] In addition, data on the value of outstanding BoJ notes, the value of outstanding public debts including the public bonds, and the wholesale/retail price indexes are available from the Bank of Japan (1966).

There are three issues related to the EPA national accounts. First, the expenditure account was constructed using transaction prices recorded by the Morita index rather than official prices.[15]

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[13] Okawa et al. (1974) construct the Japanese national accounts for the years 1885-1940. Fukao et al. (2015) present a more comprehensive version of the Japanese national accounts for the period 1874-2008. Jean-Pascal et al. (2016) present a brief history of the Japanese national accounts.

[14] Regarding GNE of 1945, real GNE can be computed from real gross domestic product which was estimated by Mizoguchi and Nojima (1993), while the GNE deflator (P_t^{GNE}) can be chosen such that $\dfrac{P_{1945}^{GNE}}{P_{1945}^{WPI}} = \dfrac{1}{2}\left(\dfrac{P_{1944}^{GNE}}{P_{1944}^{WPI}} + \dfrac{P_{1946}^{GNE}}{P_{1946}^{WPI}}\right)$ holds, where the wholesale price index (P_t^{WPI}) is available from the Bank of Japan (1966). Thus, the nominal GNE of 1945 can be inferred from the calculation of the real GNE and the GNE deflator.

[15] See Mizoguchi and Nojima (1993).

For example, the consumption expenditure series from several production side statistics were first valued at the official prices recorded by the retail price index. Then, these series were adjusted by the effective retail price index (Morita index) explained in Section 2.1, which reflected both official and black market prices. As shown in Table 1, the Morita indexes (the effective prices) and the GNE deflator indeed behave similarly in relation to the official prices (the wholesale/retail prices). In this way, the underestimation of expenses driven by the official prices was corrected to some extent by using the effective price indexes to measure transaction prices in the expenditure account. For the postwar data, black market prices were surveyed directly by the BoJ, and were considered explicitly in constructing the expenditure account.

Second, the EPA national accounts computed aggregate income independent of the expenditure account. On the one hand, employee compensation was aggregated from several surveys of wages and the labor force. On the other hand, corporate income was aggregated from corporate tax return data with due consideration to differences between business and taxation accounting. In the taxation data, black market margins were unlikely to be included. Note that the computation of corporate income differs entirely between the EPA national accounts and the recent versions of the Japanese national accounts. In the latter accounts, corporate income is never aggregated directly from corporate tax returns, but it is instead computed as a residual by subtracting the estimated employee compensation from aggregate value added.[16]

Third, while the Japanese government and private corporations developed military and economic activities in the overseas territories during the wartime period, the interior economy was almost completely separated from the economies of the overseas territories in terms of income transfers. As documented in detail by Hara (1976), under the strict capital controls coupled with the fixed exchange rate system, the income transfers to/from the overseas territories were constrained tightly. The relative size of the net income transfers was much less than one percent of nominal GNE during the wartime period. Most overseas military and industry activities were

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[16] According to Yamamoto (2011), France, England, Finland, Germany, Norway, and Spain follow the same method used currently by the Japanese government. In Canada, the US, and Australia, on the other hand, corporate income is aggregated from corporate accounting data together with corporate tax return data. Fujiwara and Ogawa (2016) compute aggregate corporate income from tax return data for the current Japanese economy.

financed within each territory through the bank notes that were issued intensively by the reserve banks and the central banks in the occupied territories.[17] Accordingly, the size of aggregate income of the interior economy was not influenced substantially by the scale and scope of the economic activity in the overseas territories.

3.2. Interpretations of largely positive statistical discrepancies

Let us first examine the relative magnitude of the statistical discrepancy of the EPA national accounts. All nominal macroeconomic variables are expressed below in terms of the ratio relative to nominal GNE. As shown in Figure 2, the sum of net investment and net exports, computed from the expenditure account, exceeded the net national savings, calculated from the income account, during the years 1937-1949 by more than 5% of nominal GNE. The period in which largely positive discrepancies were observed exactly corresponds to the period in which the Japanese economy had been strictly subject to the price controls.

During the wartime period, the discrepancy ratio peaked at 11.8% in 1938, and it declined gradually to 6.4% in 1941. Then, the ratio increased again gradually to 10.9% in 1944. Such wartime movements in the discrepancy ratio can be interpreted broadly as reflecting the scale and scope of black market activities. The ratio was high immediately after the government controls were implemented in 1937. A reason for this immediate increase was that ineffective rationing helped to create black markets from the very beginning of rationings and price controls (see Miwa (2015)).[18] From late 1938, stronger surveillance on illegal transactions by the police contributed to a decline in the ratio. However, the ratio began to increase again because there was less manpower in the police and heavier involvement of military personnel and munitions factories in uncover dealings.

During the postwar period, on the other hand, black markets were most active in 1946, after

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[17] Hattori and Oguro (2016) estimate the amounts of seigniorage generated from direct underwriting of the Japanese public debts by the central banks in the colonial territories and the reserve banks in the occupied territories. Saito (2017) analyzes how the war expenditures in the Japanese occupied territories were financed through the local reserve banks and the colonial central banks during the Pacific War.

[18] According to USSBS (1947), the Japanese government was never able to establish an efficient over-all control of rationing and prices, and to effectively crack down on illegal transactions in comparison with the Office of Price Administration.

which they gradually contracted in size. Accordingly, the discrepancy ratio declined from 19.4% in 1946 to 5.9% in 1949. In 1949, the government lifted most of the economic control instruments. Consequently, black markets disappeared by the early 1950s.

Let us next examine the behavior of the GNE and GNI deflators together with the official prices that were recorded in the wholesale/retail price indexes. All price indexes and deflators were standardized using the base years 1934-1936. As equations (5) and (6) imply, the official prices should be between the GNE and GNI deflators. As shown in Table 2 and Figure 3, however, the official prices were between both deflators only in 1939. For both the wholesale and retail prices, the official prices were above the GNE deflators in 1937 and 1938, and below the GNI deflators for the years 1940-1949.

A major reason for the above deviation from the theoretical prediction is that the two deflators and the BoJ official price indexes differ substantially in coverages and weights in particular in the wartime data. As mentioned in Section 2.1, the former deflators were based on the Morita indexes, which were constructed in quite an ad hoc manner. On the other hand, the latter indexes were computed as a simple average of a certain commodity basket.

Another possibility is that either deflator might have been subject to some biases. In particular, the GNI deflators would have been too high because the real share of intermediate goods procured from black markets ($\frac{V_{inter}^{bm}}{V_{final}^{om} + V_{final}^{bm}}$) would have been underestimated substantially.

Such underestimation might have occurred when firms had been reluctant to report transactions with illegal dealers in filing corporate tax returns. Accordingly, a substantial portion of purchases of intermediate goods from black markets might have been completely off the books. Given the possibility that the value of transactions of intermediate goods in black markets was heavily underestimated, the EPA national accounts offer a lower bound for the size of black markets.

In the light of the above inconsistency between the GNE/GNI deflators and the official price indexes (wholesale/retail price indexes), equation (7) cannot be employed for deriving the real share of black markets ($\frac{V_{inter}^{bm} + V_{final}^{bm}}{V_{final}^{om} + V_{final}^{bm}}$). Thus, the share is approximated under the assumption that

$P^{om} \approx \dfrac{P^{GNE} + P^{GNI}}{2}$. The black-to-official market price ratios ($\dfrac{P^{bm}}{P^{om}}$) are available from the Bank of

Japan (1966) for the postwar period between 1946 and 1951, but they are not obtainable for the wartime period.

As reported in Table 3, the real share of black markets ranged between 3.5% and 8.7% for the postwar period. Given that the black-to-official market price ratios are close to one, the ratios of 2.4% in 1950 and 29.1% in 1951 are meaningless. As mentioned above, the EPA national accounts are likely to underestimate greatly the real share of intermediate goods transactions in black markets. Thus, the real share of the black markets reported in Table 3 should be interpreted as an extreme lower bound.

3.3. Money finance under strong money demand from illegal dealers

Let us next consider the financial side of the national economy. Figure 4 depicts the time series of net public and private savings, which aggregate to the net national savings. During the wartime period, the public sector was suffering chronically from large-scale deficits, while the private sector was forced to save under explicit and implicit pressures from the government. However, the largely positive statistical discrepancies imply that the formal aggregate economy still suffered from a severe financial shortage despite the enormous private savings. For the postwar period, on the other hand, both public and private sectors, with almost zero net savings, faced a severe financial shortage in 1946. From 1947 through 1949, the public sector had improved its financial position substantially, but the private sector had been stagnant at zero savings. Consequently, the formal economy continued to suffer from a financial shortage immediately after the war.

How did the BoJ compensate for such severe financial shortages in the wartime and postwar periods? As discussed in Section 2.3, the macroeconomic financial shortage, which is represented by the statistical discrepancy $SD_{n,t}$, was financed from black market income partly by money finance $\mu SD_{n,t}$, and partly by barter transactions between those in the formal economy and those in black markets $(1-\mu) SD_{n,t}$. As mentioned previously, those in the formal economy used

durables in households, inventories in firms, and even secondhand homes[19] to barter for goods in black markets. Figure 5 depicts the time series of μ, or the change in the amount of BoJ notes relative to the statistical discrepancy $\dfrac{\Delta M_{n,t}}{SD_{n,t}}$. For the years 1937-1942, μ was relatively low, between 14.2% and 41.7%, but it soared to 53.9% in 1943 and 91.9% in 1944. That is, the economy-wide financial shortage was covered mainly by the BoJ in the final years of the war. In 1946, 1947, and 1948, on the other hand, μ was relatively high, above 40%, but it fell to zero in 1949.

As discussed in Section 2.3, the new BoJ notes eventually flowed into black markets. Thus, in effect, illegal dealers lent resources *indirectly* to the BoJ by holding the BoJ notes as an instrument with which to conceal illicit income. In this way, money demand expanded from the constant needs of illegal dealers.[20] Figure 6 depicts the strength of money demand using the time series of Marshallian k ($= \dfrac{M_{n,t}}{Y_{n,t}^{E}}$). Marshallian k started to increase steadily from 1937, and sharply from 1942. It was 13.1% in 1942, 16.1% in 1943, 23.8% in 1944, and 48.4% in 1945.[21] Because the official discount rate, a representative short-term interest rate, was constant at 3.3% for the years 1937-1945 (see Table 1), only the strong money demand from black markets was responsible for the rapid increase in Marshallian k. In the aftermath of the war, Marshallian k declined quickly from 19.7% in 1946 to 10.5% in 1949.

The BoJ notes held by black market participants circulated outside the deposit (credit) creation mechanism. Accordingly, the ratio of the BoJ notes relative to the outstanding deposits of commercial banks[22] increased dramatically.[23] As shown in Figure 6, the ratio was below 15% before 1942, but it rose quickly to around 50% in 1945 and beyond 90% in 1947. That is, a

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[19] When the Price Control Order was enacted in 1939, house rents were heavily controlled, but the prices of housing and land were outside the scope of the Order. In 1939, newly built houses were targeted by the price controls, but secondhand homes were not. Consequently, the owners of secondhand homes had a strong incentive to sell own houses instead of renting them at cheap rents. According to Ono (2007), old houses were traded actively as a type of speculation in black housing markets during the years 1943-1944.

[20] Feige (1989) and others attribute high currency demand to underground economic activities.

[21] Nominal GNE in 1945 is approximated according to the method described in footnote 15.

[22] The data of outstanding deposits of commercial banks are available from the Bank of Japan (1966).

[23] Cagan (1958), Guttman (1977), and Bhattacharyya (1990) propose high cash/deposit ratios as a proxy for the underground economy.

substantial fraction of the BoJ notes stayed out of the banking system in the final years of the war and in the immediate aftermath.

One seemingly puzzling phenomenon was that prices increased relatively slowly despite quite active money finance during the wartime period. For the years 1938-1945, the wholesale and retail price indexes, both of which can be used to represent official price, rose by an average of 14.9% and 13.1% per year, respectively. Even using transaction prices that reflected both official and black market prices, the GNE deflator increased by 29.6% per year. Let us see what would have happened to prices in the absence of strong money demand from black market dealers. If Marshallian *k* had been constant at 10% during the war, then the GNE deflator would have soared by an average of 61.7% per year.[24] As depicted in Figure 7, the GNE deflator would have been multiplied by 29.0 instead of 6.2 for the years 1938-1945.

3.4. Circulation of the BoJ notes

It is difficult to obtain precise information regarding how the BoJ notes circulated in black markets under the strict price controls, but there was one precious occasion where the BoJ notes, which had been handed over from one illegal dealer to another, came to light in the formal economy. This occurred when the BoJ forced holders of the notes to exchange old bills for new bills in February 1946.[25]

In December 1945, the government suggested that the BoJ might collect the old bills in exchange for the new bills. Their policy purpose was to capture black market income as precisely as possible and to impose capital levies on it as much as possible. Surprised by the intention of the government and the BoJ, illegal dealers rushed to trade any cash on hand for physical materials and food, and they in turn refused to sell their inventories for the old bills. Consequently, most

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[24] A counterfactual GNE deflator can be computed by $P_t^{GNE} = \dfrac{M_{n,t}}{m(i_t)Y_{r,t}^{GNE}}$ where $Y_{r,t}^{GNE}$ is real GNE.

[25] More precisely, the government officially announced the Emergency Financial Measure on the evening of Saturday, February 16th. The measure included the following provisions. First, the old bills would cease being legal tender after March 2nd. Second, deposits at financial institutions using the old bills could be made until March 7th (later revised to 9th). Third, withdrawals from deposits using the new bills were severely restricted.

black markets disappeared until the exchange for the new bills was completed in March 1946.

According to the Ministry of Finance (1986), the amount of outstanding BoJ notes decreased dramatically from 61.8 billion yen on February 18th 1946 to 15.2 billion yen on March 12th following the official announcement on February 16th. The BoJ eventually collected 50.3 billion yen in old bills, of which 9.0 billion yen were collected from the rural districts of Southern Kanto, Tokai, and Kinki, while 8.1 billion yen were collected from the urban districts of Tokyo and Osaka. These statistics indicate that illegal dealings were most active in the agricultural and commercial sectors. After the new bills began to circulate, the amount of outstanding BoJ notes began rising again to 136.3 billion yen as of June 1947, and 230.5 billion yen as of June 1948. The majority of the new bills were owned within the commercial sector rather than the agricultural sector. The Ministry of Finance (1986) mentioned that the new bills continued to be held by illegal dealers by citing the popular phrase "the new rich with the new bills" (新円成金, shin-en narikin).

4. Conclusion

The economic situation addressed by this paper is quite ironic in the sense that the BoJ's direct underwriting was necessitated by the emergence of black markets under the strict price controls. In response to a severe material shortage since 1937, the Japanese government initiated a controlled economy in terms of quantities and prices, and allocated scarce resources preferentially to munitions industries during the war and to heavy industries in the aftermath. The price controls induced a part of aggregate income to leak into black markets, and created a serious financial shortage in the formal economy. Given shrinking formal income, the government could neither impose more taxes on those in the formal sectors nor issue more public bonds/money to them. Thus, the only feasible instrument with which to cover a large fiscal expenditure was for the BoJ to underwrite public bonds directly from the government. The income leakage into black markets created a significant need for the BoJ notes in black markets, where illegal dealers were willing to hold the notes to conceal illicit income. Then, the price impact of the BoJ's direct underwriting had been weakened to the extent that money demand from black markets was strong.

In this way, the government could finance fiscal expenses *indirectly* from black markets through the BoJ's underwriting of public bonds for the 13 years from 1937 to 1949.

One important lesson for currency reform available from the above historical explorations is that black market transactions were not created by the BoJ notes, but their emergence necessitated the notes as a fiscal tool for obtaining once-leaked resources from black markets. That is, those in the formal economy, private and public, were forced to finance expenses from black markets in any case. Given such a reverse causality from black markets to central bank notes, the abolition of central bank notes, as proposed by Rogoff (2016) and others, might not necessarily result in the disappearance of black markets. Suppose that in a currency reform, any uninscribed nature is stripped from central bank notes, say by attaching inscriptions to each digital currency account, and forcing all bank-note holders to exchange paper currency for digital currency. Then, such digital currency issued by a central bank would not circulate in black markets. However, privately created sophisticated digital currency with an uninscribed nature might take over the role performed previously by central bank notes to reduce the friction between formal and black markets. It would be extremely difficult to separate money as an absolute evil to evade taxes from money as a necessary evil to connect black markets to formal ones.

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TABLE 1: Comparison with the Morita index
(standardized as of 1936)

| | BoJ | | Morita index | | | | EPA | |
| | official price | | (3) effective wholesale price | | (4) effective retail price | | (5) GNE deflator | |
	(1) wholesale	(2) retail		relative to (1)		relative to (2)		relative to (1)
1936	100.0	100.0	100.0	1.00	100.0	1.00	100.0	1.00
1937	121.4	109.4	118.9	0.98	108.6	0.99	105.8	0.87
1938	128.1	125.3	125.7	0.98	120.3	0.96	117.3	0.92
1939	141.5	140.4	145.4	1.03	134.8	0.96	144.2	1.02
1940	158.4	163.1	170.7	1.08	175.0	1.07	183.7	1.16
1941	169.7	165.0	184.2	1.09	204.1	1.24	206.7	1.22
1942	184.6	169.8	235.9	1.28	265.6	1.56	251.0	1.36
1943	197.5	180.2	266.5	1.35	312.3	1.73	291.3	1.48
1944	223.8	201.7	325.0	1.45	390.0	1.93	355.8	1.59

TABLE 2: Deflators, price indexes, and official discount rates
(1934-1936 as base years)

	GNE deflator	GNI deflator	wholesale price index	retail price index	official discount rate
1930	1.03	1.02	0.89	1.01	5.4%
1931	0.90	0.89	0.75	0.89	5.4%
1932	0.93	0.95	0.83	0.89	5.3%
1933	0.98	1.01	0.95	0.95	4.0%
1934	0.97	0.96	0.97	0.97	3.7%
1935	1.01	1.03	0.99	0.99	3.7%
1936	1.04	1.07	1.04	1.04	3.4%
1937	1.10	1.03	1.26	1.14	3.3%
1938	1.22	1.08	1.33	1.30	3.3%
1939	1.50	1.35	1.47	1.46	3.3%
1940	1.91	1.77	1.64	1.70	3.3%
1941	2.15	2.01	1.76	1.72	3.3%
1942	2.61	2.38	1.91	1.77	3.3%
1943	3.03	2.76	2.05	1.87	3.3%
1944	3.70	3.30	2.32	2.10	3.3%
1945			3.50	3.08	3.3%
1946	43.70	35.24	16.27	18.93	3.4%
1947	109.40	93.44	48.15	50.99	3.7%
1948	191.40	165.98	127.90	149.60	4.5%
1949	233.30	219.48	208.80	243.40	5.1%
1950	243.00	241.83	246.80	238.10	5.1%
1951	295.30	286.83	342.50	309.50	5.3%

TABLE 3: Real share of black markets for the postwar period

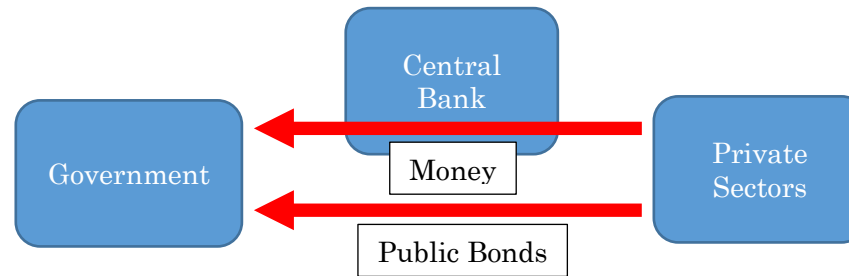|	black-to-official ratio	real black market share
1946	7.2	3.5%
1947	5.3	3.7%
1948	2.9	7.5%
1949	1.7	8.7%
1950	1.2	2.4%
1951	1.1	29.1%

FIGURE 1-1: Money finance in a standard model

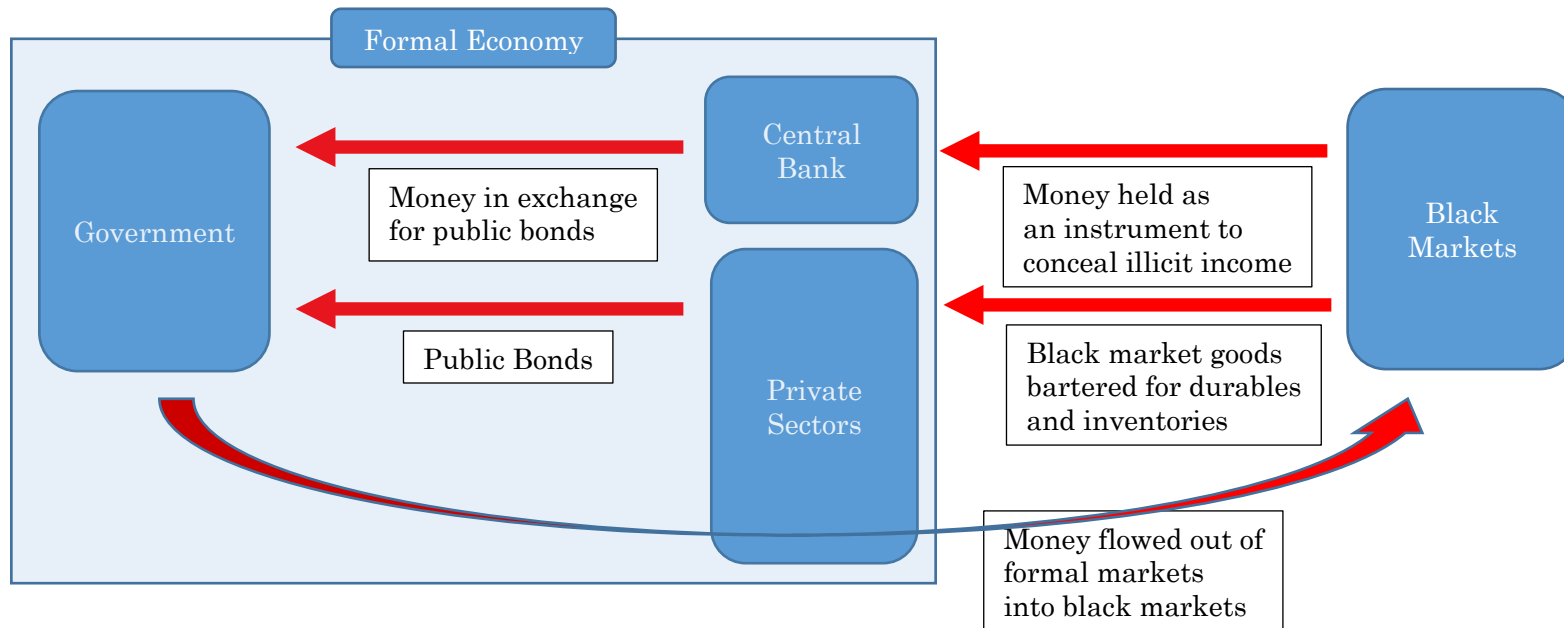# FIGURE 1-2: Money finance in the presence of black markets

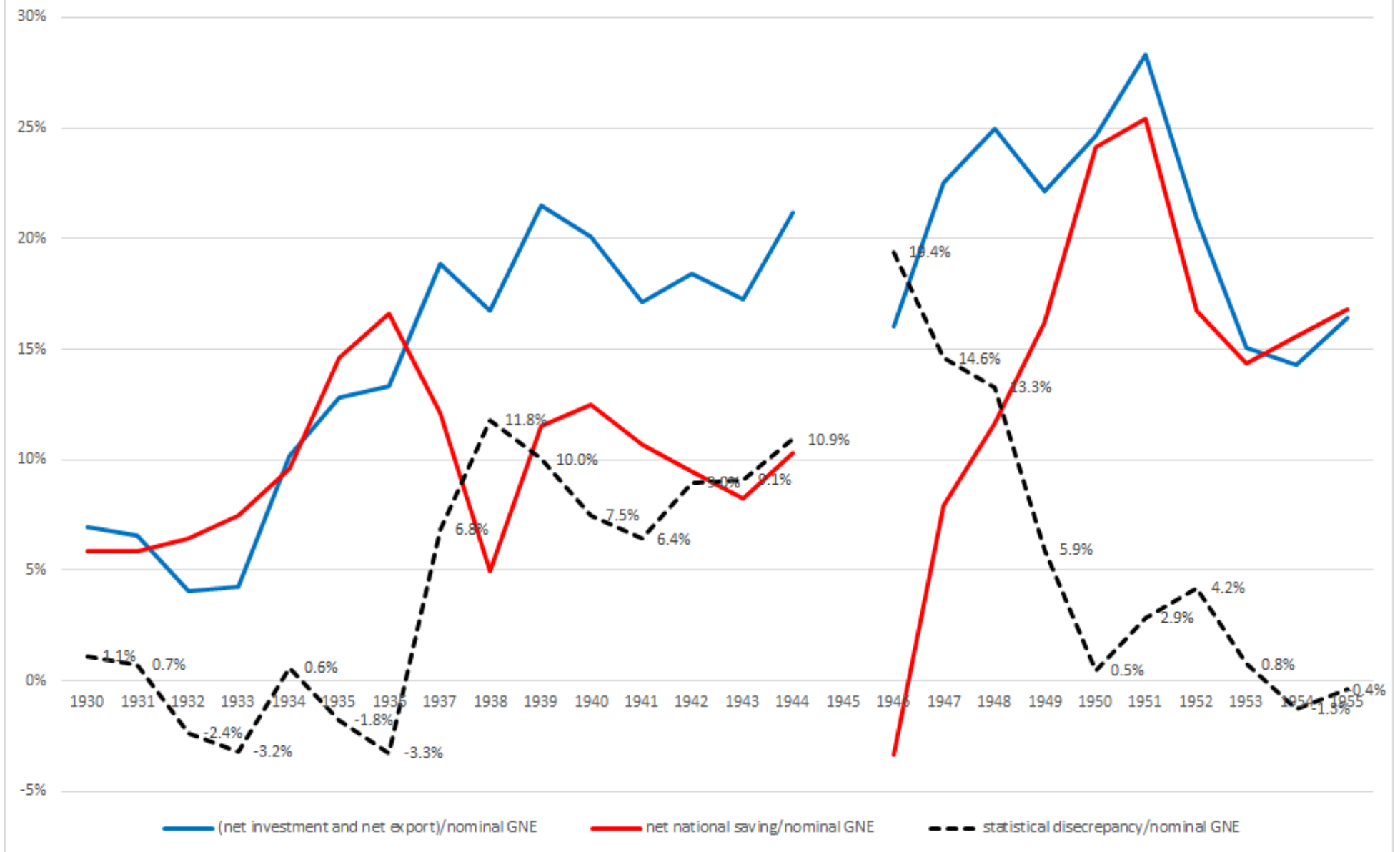Figure 2: Net investment, net national saving, and statistical discrepancy

Figure 3: A comparison among GNE deflator, GNP deflator, and wholesale price index in logarithm (base years: 1934-1936)
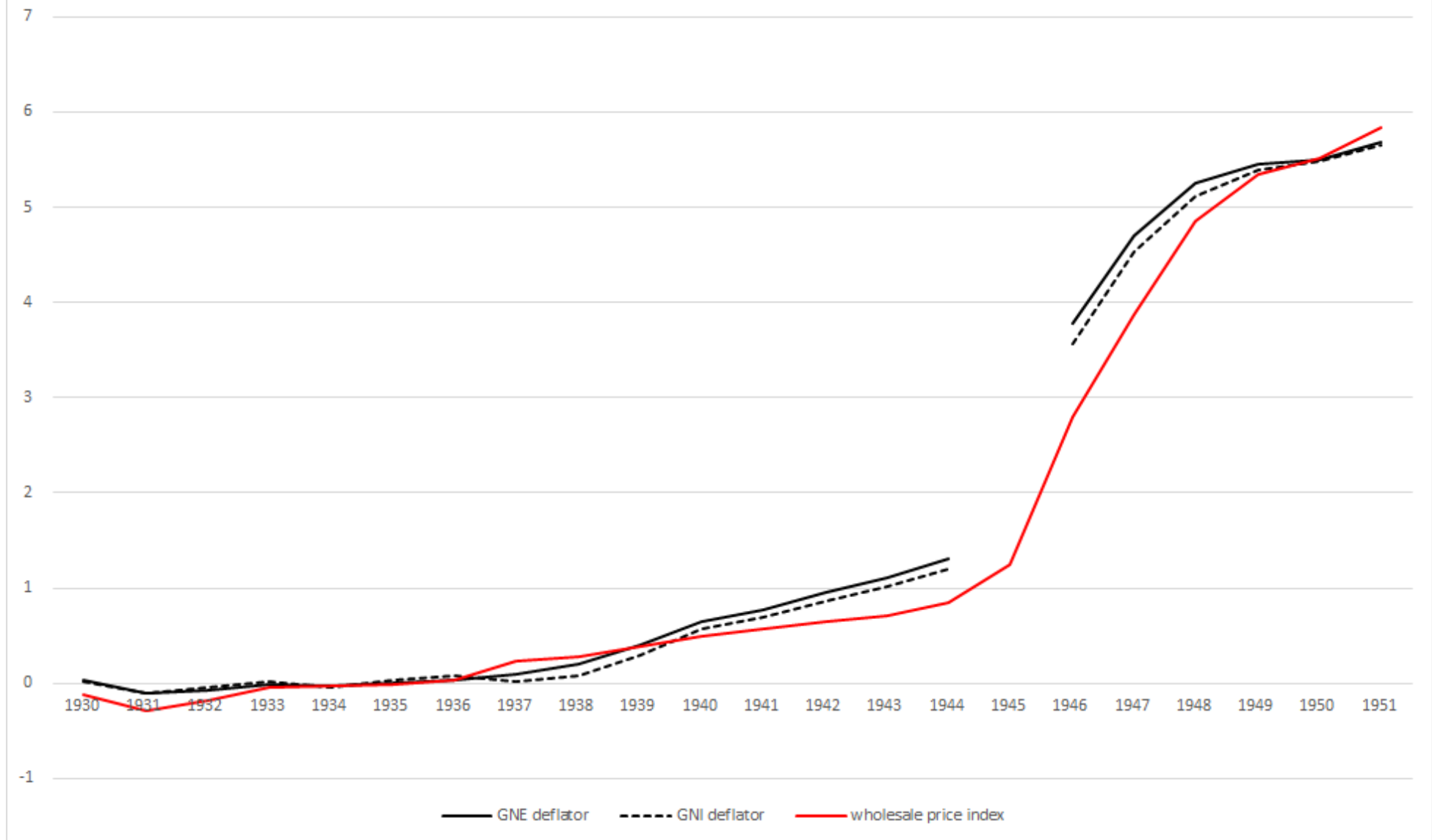
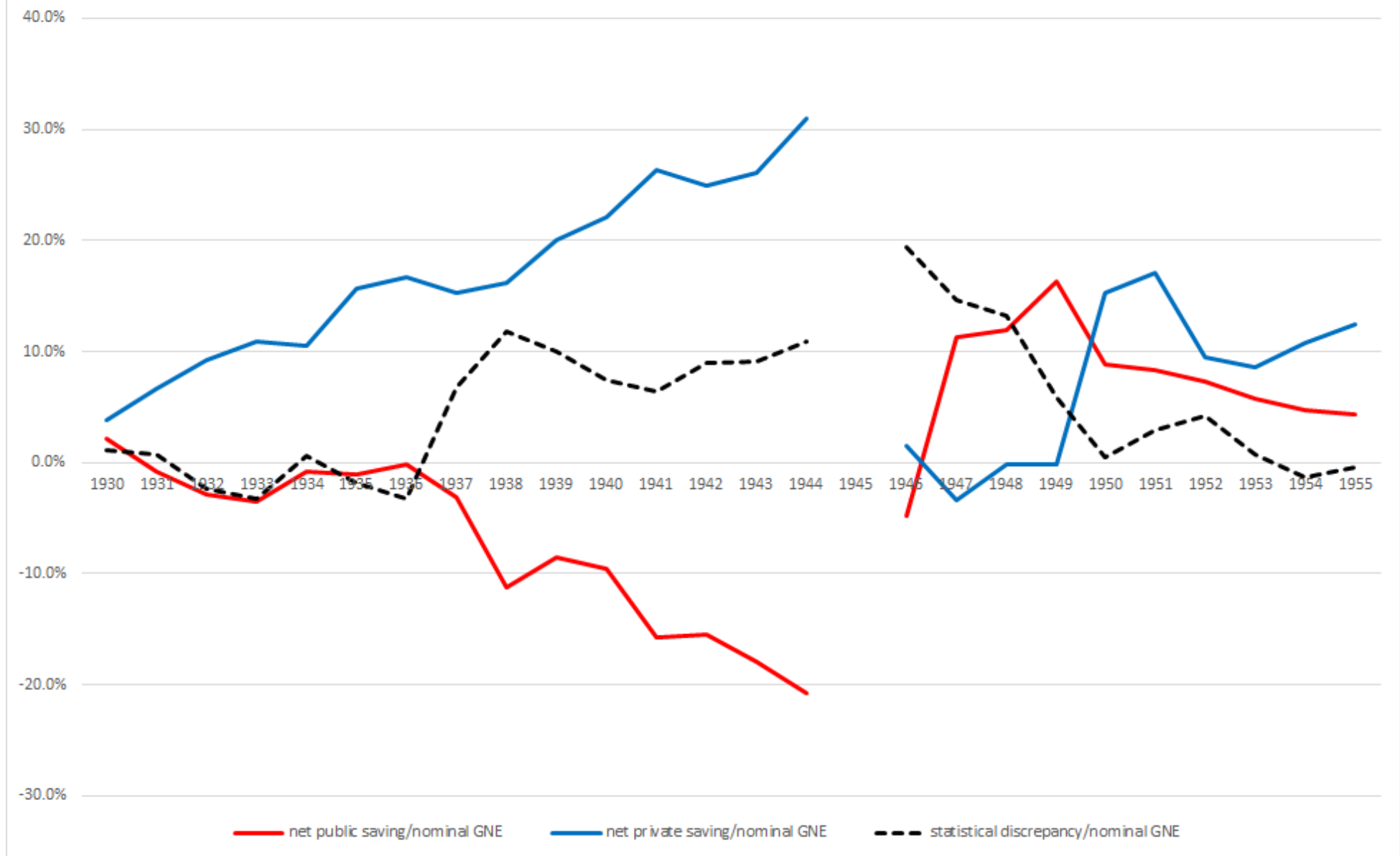Figure 4: Net public and private saving

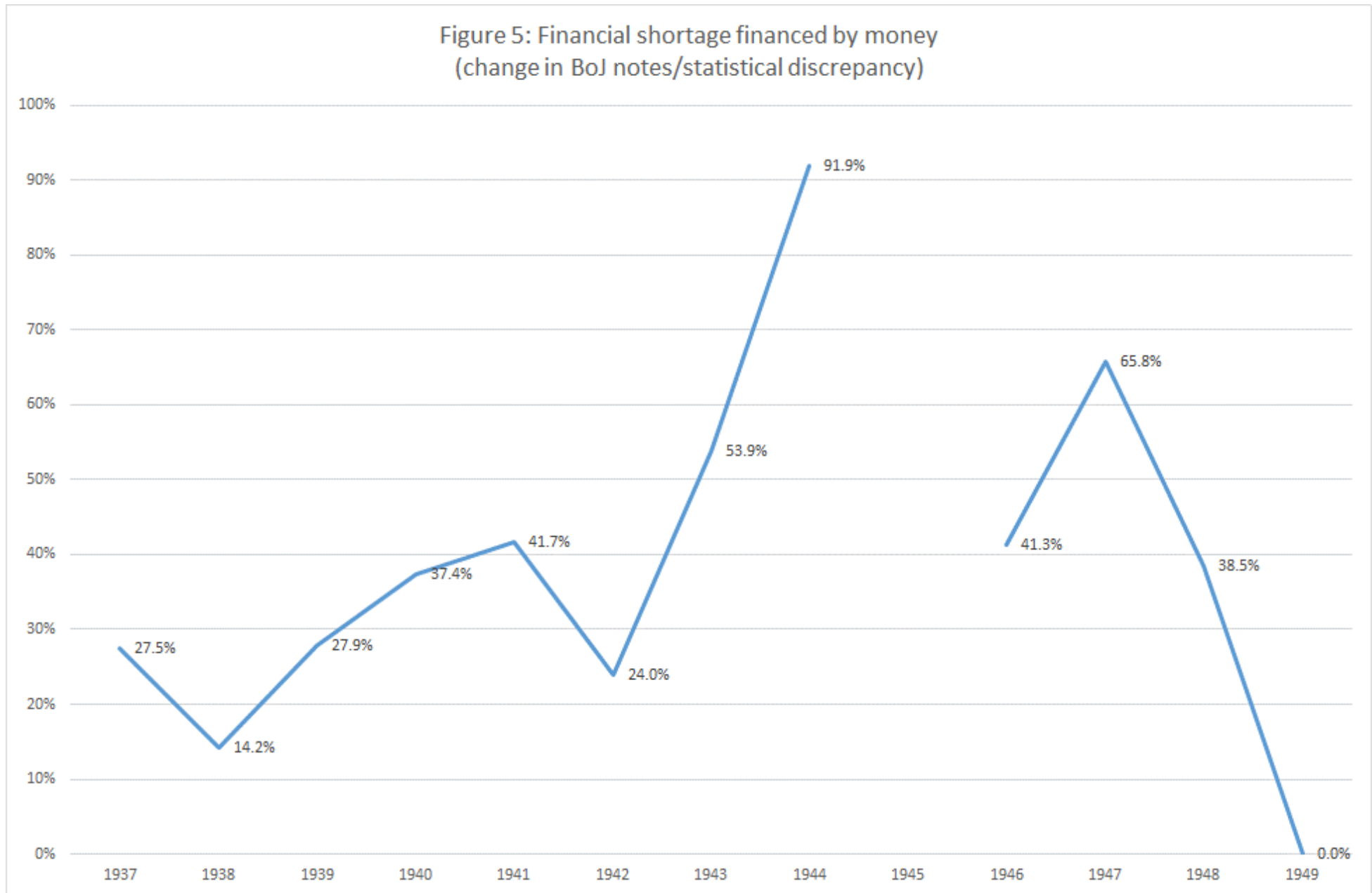Figure 5: Financial shortage financed by money
(change in BoJ notes/statistical discrepancy)

Figure 6: Marshallian k and BoJ notes/Deposits

Figure 7: Actual and hypothetical GNE deflators in logarithm