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An Assessment of Weymark's Measures of Exchange Market Intervention: The Case of Japan

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Abstract

This paper assesses the validity of the index of foreign exchange market intervention proposed by Weymark (1997, JIMF). We construct the Weymark index for Japan and then compare it with Japanese public intervention data to evaluate its performance. The results suggest that research using the Weymark index should be interpreted with caution.

Key words: Exchange market intervention, Japanese exchange market
JEL classification: F31, F37, E58

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1 Introduction

Data unavailability makes it difficult for researchers to investigate official intervention in the foreign exchange market. In general, most studies have used changes in foreign reserves as a proxy for intervention flows. Some researchers have considered more variables as measures of intervention. They have examined changes in nominal exchange rates and foreign reserves, as well as nominal interest rates. Hence, low volatile exchange rates, high volatile reserves, or high variable interest rates may indicate a high degree of official intervention.[1] These individual measures, however, represent very inaccurate proxies, since there are other reasons for the changes of these variables. In many cases, changes in exchange rates, foreign reserves, and nominal interest rates are not caused by official intervention. Moreover, investigating each variable independently may encounter a problem of inconsistency, since changes in these variables may indicate contradictory results.

Weymark (1997) proposed an alternative approach to measurement of the degree of exchange market intervention in a small open economy. By constructing an index of intervention activity that is based on observed data, Weymark (1997) used the index to measure bilateral and multilateral interventions for Canada over the period 1975–1990. As commented by Sarno and Taylor (2002), "...Weymark's measure may represent a plausible alternative to measure changes in international reserves." This approach has been applied in a number of studies,[2] however, no assessment of the performance of Weymark's measure has yet been made.

In this paper, we follow Weymark's methodology to construct an intervention index for Japan in the period from April 1990 to January 2005. We then compare the Weymark index with the Japanese public intervention data and assess how well the index performs. The remainder of the paper is as follows. Section 2 provides a brief overview of Weymark's measure of intervention. Section 3 describes the data. The empirical results and robustness issue are discussed in Section 4. Section 5 gives a caveat. Section 6 contains some concluding remarks.

2 Weymark's Index

Weymark (1997) first presented the following formula for calculating exchange market

[1]See Calvo and Reinhart (2002).

[2]For instance, see Jeisman (2005) and Kohlscheen (2000).

pressure (EMP):

$$\text{EMP}_t = \Delta e_t + \eta \Delta r_t \tag{1}$$

where e_t is the logarithm of the exchange rate expressed in terms of the domestic currency cost of one unit of foreign currency, $\Delta e_t = e_t - e_{t-1}$ is the percentage change in the foreign exchange rate, Δr_t is the percentage change in official foreign reserves expressed as a proportion of the money base, and $\eta = -\partial \Delta e_t / \partial \Delta r_t$ is the elasticity. EMP can be interpreted as the exchange rate change that would have been required to remove the excess demand for a currency without intervention from the central bank. The intervention index proposed by Weymark (1997) is:

$$\omega_t = \frac{\eta \Delta r_t}{\text{EMP}_t} = \frac{\Delta r_t}{(1/\eta)\Delta e_t + \Delta r_t}. \tag{2}$$

It is worth noting that $-\infty < \omega < \infty$, and the interpretation of ω_t is as follows:

1. $\omega = 0$ indicates a perfect floating exchange rate regime.
2. $\omega_t = 1$ indicates a fixed exchange rate regime.
3. $0 < \omega_t < 1$ indicates a managed floating exchange rate regime. The degree of intervention is higher when $\omega_t \to 1$.
4. $\omega_t > 1$ indicates that the central bank actively depreciates (appreciates) the domestic currency with respect to its free float value when the excess demand for domestic currency is positive (negative). That is, intervention reverses the exchange rate movement.
5. Finally, $\omega_t < 0$ indicates that the central bank undertakes contractionary intervention in response to an excess demand for domestic currency and vice versa.

For the case of a managed float, Weymark (1997) noticed that $1 > \omega_t \geq 0.7$ represents a significant amount of exchange market intervention.

The elasticity η needs to be estimated from a structural model. In this paper, we use the same structural model as in Weymark (1997). The details regarding the structural model and estimation strategy are provided in the Appendix.

3 Data and Index

3.1 Data

Monthly data for Japan from January 1990 to January 2005 were obtained from the IMF's International Financial Statistics. We matched the period with the data of the foreign exchange intervention by choosing 1990 as a starting year. To construct the Weymark index, we need the following data series. The nominal exchange rate is the bilateral rate of Yen against the US dollar ($e_t = \ln(\text{Yen/US dollar})$). The call money rate is used as the domestic interest rate (i_t). The domestic price level is measured by the consumer price index. M2 is used as the domestic money stock (m_t). Finally, output (y_t) is measured by real GDP. Real GDP is available on a quarterly basis and we transform the series into monthly basis by the DP algorithm.[3] Foreign reserves are the total reserves minus gold. See Table 1 for a definition of the data series and sources. The results of the Augmented Dickey–Fuller test are reported in Table 2. Clearly, all the variables are first-difference stationary except for price levels and interest rates.

The official intervention data of Japan is available from the Ministry of Finance Web page (http://www.mof.go.jp/english/e1c021.htm). The historical data, from April 1991 to March 2000, were released in July 2001. Since then, the data have been updated, such that historical data from April 1991 until June 2005 are available. The data include the following information: (a) the date of intervention, (b) the yen amount and direction (sold/bought) of intervention for the day, and, (c) currencies that are involved in intervention.

3.2 Index

Since official intervention data is not available in many countries, Weymark (1997) used the change in foreign reserves (expressed as a proportion of the money base) for Δr_t. Following Weymark (1997), we construct the index for the case of Japan. We call it the Weymark index.

Notice that the Weymark index is supposed to measure the proportion of exchange market pressure relieved by exchange market *intervention*. Using changes in foreign reserves as a proxy of exchange market intervention, what the Weymark index measures is the proportion of exchange market pressure relieved by the total changes in foreign reserves, rather than by exchange market intervention alone. Since the change in foreign reserves could be caused by factors other than exchange market intervention (e.g., the interest earned on Japan's holding of U.S. bonds), the Weymark index is not an accurate measure of the proportion of exchange market pressure relieved by exchange market intervention unless *all* the changes in foreign reserves are caused by intervention. Fortunately, because data on exchange market intervention are available in Japan, we can further

[3]This is a state-space modeling approach to estimation of unobserved high-frequency data. We use the procedure `DISTRIB` in RATS to produce monthly real GDP. This approach has the attribute of allowing the high-frequency data aggregate to match exactly the low-frequency data.

construct the "true" Weymark index by using the data on exchange market intervention for Δr_t, which exactly measures the proportion of exchange market pressure relieved by exchange market intervention alone.[4] In the next section, we compare the Weymark index with the "true" Weymark index.

4 Empirical Results

4.1 A Comparison with Japanese Intervention Data

Figure 1 plots the changes in JP/US exchange rates, the changes in Japanese foreign reserve, the Weymark index, and the true Weymark index. We also report the Weymark index and the true Weymark index in Table 3 and Table 4. Since the index can take extremely large absolute values, we follow Jeisman (2005) by replacing extremely large values of the index by 2 when it is larger than 2 and –1 when it is smaller than –1.

It turns out that the Weymark index and the true Weymark index move very differently in the sample period we investigate. The correlation of these two indexes is *negative* (–0.1875). Table 5 summarizes the distribution of the Weymark index and the true Weymark index for Japan. It is clear that the Weymark index overestimates the degree of intervention in Japan. The Weymark index suggests that Japan has conducted significant intervention in the foreign exchange market (average of the Weymark index is 1.03), while the true Weymark index suggests that Japan has not conducted significant intervention in the foreign exchange market (average of the Weymark index is 0.38). To see the relation between the two indexes, we consider the following regression model:

$$\text{Weymark Index}_t = \text{constant} + \beta \cdot \text{True Weymark Index}_t + \varepsilon_t. \quad (3)$$

If the Weymark index measures the proportion of exchange market pressure relieved by exchange market intervention precisely, the constant term should be close to zero and β should be close to one. The regression results are summarized in Table 6. The constant term is significantly different from zero while β is significantly *negative*, which reflects the negative correlation of these two indexes. This means that the Weymark index for Japan does not precisely measure the proportion of exchange market pressure relieved by exchange market intervention.

Why do these two indexes move so differently? In all months (166 months) during the sample period, the foreign reserve fluctuates irrespective of whether official intervention

[4] As in construction of the Weymark index, we use the intervention volume expressed as a proportion of the monetary base for Δr_t.

is actually conducted or not. That is, Δr_t is not equal to zero for all t in the Weymark index. As a result, the Weymark index is *always* different from zero. Moreover, when the exchange rate does not fluctuate very much (i.e., $(1/\eta)\Delta e_t$ is relatively small in absolute value), the Weymark index tends to be close to one, even if no intervention is conducted during the period. That is why the Weymark index suggests that Japan has significantly intervened in the foreign exchange market during the sample period we are using. In many months (101 months) of the sample, however, no intervention was conducted. Hence, the true Weymark index is equal to zero for almost two thirds of the entire sample period. That is, the true Weymark index suggests that Japan has not intervened as often in the foreign exchange market during the sample period. Therefore, according to the comparison of Weymark index and the true Weymark index, it may be concluded that the Weymark index does not measure intervention activities very precisely in the case of Japan. Although our current exercise is just a case study, this result should cast doubt on the usefulness of the Weymark index. However, we should take this result cautiously, but will mention some caveats later.

It is worth noting that most intervention activities in Japan are believed to be sterilized. Weymark (1997) considers the possibility of sterilized intervention and proposes to modify the Weymark index (if necessary) to incorporate sterilized interventions as follows. In order to see the effect of sterilized intervention, a risk premium, δ_t, is incorporated in equation (7) of the Appendix:

$$i_t = i_t^* + E(e_{t+1}|\Omega_t) - e_t + \delta_t.$$

First, Weymark (1997) pointed out that as long as the risk premium is *exogenous* (i.e., independent of the policy authority's choice of $\bar{\rho}$ in equation (10) of the Appendix), our estimate of η and the resulting Weymark index are appropriate for measuring exchange market pressure and intervention activity when intervention is sterilized. In this case, nothing changes in terms of comparison between the Weymark index and the true Weymark index we have conducted above.

If the risk premium is not *exogenous*, we can, for instance, suppose the risk premium is endogenous as $\delta_t = k\Delta r_t$ where $k \in [0, 1]$ represents the fraction of period t intervention that is sterilized.[5] It can be shown that the sterilized Weymark index η^s is formulated as[6]

$$\eta^s = (1 + kb_2)\eta.$$

Hence, the Weymark index we construct using η above may underestimate the intervention activity when intervention is sterilized ($|\eta^s| > |\eta|$). However, notice that if we use η^s

[5]This was the example given by Weymark (1997).

[6]See Weymark (1997) for derivation.

instead of η in the comparison between the Weymark index and the true Weymark index, the difference between these two indexes would be *larger*. Because $(1/\eta^s)\Delta e_t$ is even smaller than $(1/\eta)\Delta e_t$ in absolute value, it is more likely that the Weymark index is close to one even when the true Weymark index is zero. In other words, the correlation of these two indexes becomes even more negative when we use η^s instead of η.

Moreover, in 1995, the Bank of Japan started to guide overnight call rates below 0.5 %, which is known as "the zero interest rate" policy. Under this policy, it does not matter whether the intervention was sterilized or nonsterilized. This is simply because the interest rate does not move at all. Since the zero interest rate policy might affect the performance of the Weymark index, we will discuss it further in Section 5.

In sum, as long as we follow what Weymark (1997) proposed, our results would not change qualitatively even when intervention activities are sterilized.

4.2 Robustness

In order to check the robustness of the results, we use alternative measures of some variables to estimate η. We replace the consumer price index with producer price index (PPI) and GDP deflator (GDPD). The estimated η's are –11.05 and –9.16 for PPI and GDPP, respectively. We also replace real GDP with industrial production and obtain an estimated $\hat{\eta} = -10.27$. None of these new figures of $\hat{\eta}$ alters our main findings.

Furthermore, we use quarterly data to investigate whether data in a lower frequency may change our results. We find that the results are similar to those on the monthly basis. The coefficient on the true Weymark index in equation (3) is again negative, although insignificantly so.[7]

5 Caveat

We have shown that the Weymark index and the true Weymark index move very differently in the case of Japan. This may not be surprising if a nonnegligible portion of the change in the foreign reserve is caused not by the foreign exchange intervention activities, but by other economic movements such as interest receipts on official portfolio holdings, valuation changes on existing reserves, and so on. However, it does not necessarily mean that what Weymark (1997) proposed is wrong. On the one hand, if the structural model underlying the Weymark index is *correctly* specified in the case of Japan, our result may cast doubt on the usefulness of the Weymark index. On the other hand, if the struc-

[7]Results for quarterly data are available upon request.

tural model is *misspecified*, our result may suggest that we need to choose a structural model underlying the Weymark index very carefully when we apply the Weymark index to different countries. In this section, we argue the possibility of misspecification and its implication as a caveat to our results.

5.1 Calibration of the Elasticity

What is important in the Weymark index is to estimate η from the structural model. As Weymark (1997) pointed out, the calculated index values will always be model dependent. Weymark (1997) used the small open economy model for the case of Canada. In this paper, we use the same small open economy model for the case of Japan as in Weymark (1997). However, the small open economy model may not be well suited for investigating Japanese data. While it is beyond the scope of this paper to find the model correctly specified for Japan, it is worthwhile to point out that a different value of η that might be obtained from other models could lead to different results. To see this, we conducted a simple calibration using a grid search of η, from –11.0 to –0.01. We generated 100 different values of η and then computed the correlation between the Weymark index and the true Weymark index.[8] We plotted the correlation against η in Figure 2. A threshold value of η, making the correlation zero, is –0.84123. Therefore, any structural model that yields the estimates η above this threshold value leads to a positive correlation.

The maximum positive correlation is about 0.7245 when $\eta = -0.01$. The minimum negative correlation is about –0.1924 when $\eta = -9.1317$. It is not surprising that the correlation tends to be larger when η is small in absolute value. When $|\eta|$ is small, $(1/\eta)\Delta e_t$ is relatively larger in absolute value. As a result, both the Weymark index and the true Weymark index would be driven mainly by a common component, $(1/\eta)\Delta e_t$. That is why the correlation tends to be larger when $|\eta|$ is small.

This calibration suggests that the accuracy of the Weymark index may depend on the value of η. That is, the correlation between the Weymark index and the true Weymark index could substantially vary across different values of η. Since the value of η is model dependent, this suggests that we have to choose the structural model very carefully when we apply the Weymark index to different countries.

[8] The results are similar when 1000 or 10000 different values of η are generated. They are available upon request.

5.2 Time-Varying Elasticity

Following Weymark (1997), we have so far assumed that η is time invariant throughout the sample period in Japan. However, it may be worthwhile to consider a possibility that η is time varying in the case of Japan.

The time-invariant η implies that the efficacy of foreign exchange intervention has not changed throughout the sample period. It is, however, argued that the foreign exchange intervention becomes less effective after 2001 than before for some reasons. While we set aside exploration of why the efficacy of the intervention might have declined, we simply estimated η for the period 1990:1–2000:12 and for the period 2001:1–2005:1 separately. The results are $\eta = -11.410$ for 1990:1–2000:12 and $\eta = -10.308$ for 2001:1–2005:1. Using these values of η, we reconstructed the Weymark index and the true Weymark index. The resulting correlation is still negative (–0.191).

Another possibility is that, due to the zero interest rate policy, there may be some structural break in the money demand function, which can lead to the time-varying η. For instance, Nakashima and Saito (2002) argued that a structural break of the money demand function happened in June 1995. We used the estimated parameters of the money demand function before and after the structural break respectively in Table 3 of Nakashima and Saito (2002) to calculate η. The results are $\eta = -10.371$ before 1995:5 and $\eta = -2.920$ after 1995:6. The resulting correlation of the Weymark index and the true Weymark index is still negative (–0.184).[9]

5.3 Is the Weymark Index Useless?

It is not our intention to claim that the Weymark index is useless. Rather, one of our goals in this paper is to clarify how to use the Weymark index in order to maximize its usefulness.

One of the reasons for the negative correlation is that the Weymark index tends to be close to one when the true Weymark index is in fact equal to zero. To see this more clearly, we excluded the sample period when the true Weymark index is equal to zero. In this subsample where the true Weymark index is not equal to zero, the average of the Weymark index is 0.963 and that of the true Weymark index is 0.983.[10] Therefore, on average, the Weymark index provides an accurate measure of the degree of the intervention activities in the case of Japan *when there really is intervention* .

[9] We concentrated on the period 1991:4–2001:3 to match the sample period of Nakashima and Saito (2002).

[10] The correlation is positive (0.058).

This observation may give us a hint in applying the Weymark index to different countries. It is relatively easy to know whether a country intervenes in the foreign exchange market, but in many countries, no detailed data are available regarding how much intervention is conducted. Therefore, if it is the case that we know in which period a country intervenes in the foreign exchange market but we do not know by how much the country intervenes, the usefulness of the Weymark index might be maximized in assessing the degree of intervention activities.

6 Concluding Remarks

An important issue in the empirical literature on official intervention is the difficulty of obtaining official intervention data. Many efforts have been made to estimate unobservable intervention activity. Among numerous measures of official intervention, the index proposed by Weymark (1997) is arguably a plausible measure. In this paper, we construct both the Weymark index and the true Weymark index for Japanese intervention activity. The true Weymark index is computed by plugging in the official intervention data of Japan.

Our result is striking. The correction between the Weymark index and the true Weymark index is negative. The Weymark index suggests a strong intervention of Japanese monetary authority while the true Weymark index suggests that Japan has not intervened as often in the foreign exchange market during the sample period we investigate. This result may cast a doubt on the usefulness of the Weymark index if the structural model underlying the Weymark index is correctly specified in the case of Japan. If the structural model is misspecified, our result may suggest that we need to choose a structural model underlying the Weymark index very carefully when we apply the Weymark index to different countries.

Appendix

According to Weymark (1997), the structure of the representative small-open economy is described, in logarithms, as follows:

$$y_t - \bar{y} = \alpha[p_t - E(p_t|\Omega_{t-1})] + \nu_t^y, \tag{4}$$

$$p_t = ap_t^N + (1-a)p_t^T, \tag{5}$$

$$p_t^T = p_t^* + e_t \tag{6}$$

$$i_t = i_t^* + E(e_{t+1}|\Omega_t) - e_t, \tag{7}$$

$$m_t^d - p_t = b_1 y_t - b_2 i_t + \nu_t^m, \tag{8}$$

$$m_t^s = m_{t-1}^s + \Delta d_t + \Delta r_t, \tag{9}$$

$$\Delta r_t = -\bar{\rho}_t \Delta e_t, \tag{10}$$

where y_t is real domestic output with potential level of output, $\bar{y}$. p_t is the domestic price level while p_t^T and p_t^N are prices for traded and nontraded goods, respectively. i_t is the domestic interest rate level. e_t is the exchange rate expressed in terms of the domestic currency cost of one unit of foreign currency. m_t^d and m_t^s are money demand and supply, respectively. Δd_t and Δr_t denote change in domestic credit and foreign exchange reserves, where both d_t and r_t are expressed as a proportion of the money base. ν_t^y and ν_t^m represent stochastic disturbances of output and money demand, respectively. Finally, Ω_t denotes the information set at time t. All variables with asterisks are the foreign counterparts of the relevant domestic variables.

Equation (4) represents the equilibrium condition for the goods market. Equation (5) defines the domestic price index. Equation (6) is the purchasing power parity, and equation (7) is the uncovered interest rate parity. Equation (8) denotes the real domestic money demand function, while equation (9) describes the supply of money as depending on the inherited money base, m_{t-1}^s, the change in domestic credit, Δd_t, and the change in foreign exchange reserves, Δr_t. Finally, equation (10) indicates how the central bank changes the foreign exchange reserves in response to contemporaneous changes in the exchange rate.

As mentioned in Section 2, the Weymark index is calculated as follows:

$$\omega_t = \frac{\Delta r_t}{(1/\eta)\Delta e_t + \Delta r_t}, \tag{11}$$

where $\eta = -[b_2 + (1-a)(1+\alpha b_1)]^{-1}$. Thus, we need to estimate b_1, b_2, and α in order to construct ω_t. Following Weymark (1997), the parameter, a, is simply computed as the average ratio of the value of imports to GDP.

We obtain model-consistent estimates of b_1, b_2 and α from equations (4) and (8), where $E(p_t|\Omega_{t-1})$ is estimated by $E(p_t|\Omega_t) = \delta_0 + \sum_{j=1}^{3} \delta_{1j} p_{t-j}$. The potential output $\bar{y}$ is derived using the Hodrick–Prescott (HP) filter.[11] For data found to be I(1), estimation is undertaken using first differences. The estimation results are reported in Table 7. All of the parameters are correctly signed but statistically insignificant. This may due to the small sample span we examine.

[11] Rather than using HP filter to derive $\bar{y}$, we have also followed Weymark (1997) to estimate η by 2SLS and obtained $\hat{\eta} = -13.59$.

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Table 1: Data

Variable	Description	Data Code in IFS
e_t	Yen/US exchange rate	158..AE.ZF...
i_t	Call Money Rate	15860B..ZF...
r_t	Total Reserves minus Gold	158.1L.DZF...
p_t	Consumer Price Index	15864...ZF...
m_t	Money plus Quasi-Money	15835L..ZF...
im_t	Imports of Goods and Services, SA	15898C.CZF...
y_t	Real Gross Domestic Product	15899BVRZF...

Table 2: Augmented Dickey–Fuller Test

Variable	Level	First Difference
i_t	-2.91	-3.53
p_t	-4.59	-3.62
m_t	-0.26	-7.21
y_t	-0.29	-3.00
$m_t - p_t$	1.38	-6.51

The critical values for 1%, 5% and 10% significant levels are –3.481623, –2.883930, and –2.578788, respectively.

Table 3: Weymark Index and “True” Weymark Index: 1991:04–1998:03

Date	Index	True Index	Date	Index	True Index
1991: 04	1.03	0.00	1994: 10	0.96	0.94
1991: 05	1.03	0.81	1994: 11	1.05	1.12
1991: 06	1.00	1.00	1994: 12	1.04	0.00
1991: 07	0.98	0.00	1995: 01	1.01	0.00
1991: 08	1.01	1.45	1995: 02	0.94	0.87
1991: 09	1.25	0.00	1995: 03	0.92	0.95
1991: 10	0.93	0.00	1995: 04	-1.00	0.87
1991: 11	0.96	0.00	1995: 05	1.14	0.89
1991: 12	1.94	0.00	1995: 06	1.05	1.85
1992: 01	1.00	0.61	1995: 07	1.06	2.00
1992: 02	1.04	0.80	1995: 08	1.09	1.23
1992: 03	1.03	0.62	1995: 09	0.99	0.99
1992: 04	0.98	0.99	1995: 10	1.07	0.00
1992: 05	1.12	1.26	1995: 11	1.02	0.00
1992: 06	1.08	1.14	1995: 12	1.13	0.00
1992: 07	1.04	0.82	1996: 01	0.93	0.00
1992: 08	1.06	-1.00	1996: 02	0.97	0.97
1992: 09	1.16	0.00	1996: 03	1.02	0.00
1992: 10	1.07	0.00	1996: 04	1.07	0.00
1992: 11	1.07	0.00	1996: 05	1.08	0.00
1992: 12	0.99	0.00	1996: 06	1.04	0.00
1993: 01	1.00	0.00	1996: 07	0.62	0.00
1993: 02	2.00	0.00	1996: 08	0.97	0.00
1993: 03	0.97	0.00	1996: 09	1.06	0.00
1993: 04	0.89	0.95	1996: 10	1.06	0.00
1993: 05	1.50	0.93	1996: 11	0.95	0.00
1993: 06	1.00	1.00	1996: 12	1.15	0.00
1993: 07	0.96	0.84	1997: 01	0.91	0.00
1993: 08	0.96	0.98	1997: 02	0.90	0.00
1993: 09	1.03	1.62	1997: 03	1.03	0.00
1993: 10	1.06	0.00	1997: 04	1.85	0.00
1993: 11	0.78	0.00	1997: 05	1.12	0.00
1993: 12	1.09	0.00	1997: 06	1.16	0.00
1994: 01	1.01	0.00	1997: 07	1.10	0.00
1994: 02	0.70	0.83	1997: 08	0.92	0.00
1994: 03	0.99	0.97	1997: 09	1.05	0.00
1994: 04	0.88	0.98	1997: 10	0.94	0.00
1994: 05	1.04	1.30	1997: 11	1.10	0.00
1994: 06	1.40	0.89	1997: 12	0.96	0.95
1994: 07	1.01	1.07	1998: 01	1.02	0.00
1994: 08	1.01	0.99	1998: 02	1.01	0.00
1994: 09	0.93	0.87	1998: 03	1.05	0.00

Table 4: Weymark Index and "True" Weymark Index: 1998:04–2005:01

Date	Index	True Index	Date	Index	True Index
1998: 04	1.00	1.00	2001: 09	1.00	1.00
1998: 05	1.09	0.00	2001: 10	1.24	0.00
1998: 06	1.16	0.87	2001: 11	0.63	0.00
1998: 07	1.06	0.00	2001: 12	1.20	0.00
1998: 08	1.07	0.00	2002: 01	0.99	0.00
1998: 09	1.15	0.00	2002: 02	0.98	0.00
1998: 10	1.11	0.00	2002: 03	0.94	0.00
1998: 11	1.11	0.00	2002: 04	1.05	0.00
1998: 12	1.11	0.00	2002: 05	1.07	0.94
1999: 01	0.99	1.02	2002: 06	0.95	0.91
1999: 02	1.06	0.00	2002: 07	1.01	0.00
1999: 03	1.02	0.00	2002: 08	1.09	0.00
1999: 04	1.03	0.00	2002: 09	1.07	0.00
1999: 05	1.13	0.00	2002: 10	1.06	0.00
1999: 06	1.00	1.00	2002: 11	1.02	0.00
1999: 07	0.82	0.91	2002: 12	1.05	0.00
1999: 08	1.06	0.00	2003: 01	1.01	0.94
1999: 09	0.77	0.91	2003: 02	0.38	0.95
1999: 10	1.20	0.00	2003: 03	1.03	1.22
1999: 11	1.08	0.95	2003: 04	1.01	0.00
1999: 12	0.99	0.98	2003: 05	0.96	0.99
2000: 01	0.95	1.31	2003: 06	1.06	1.13
2000: 02	0.84	0.00	2003: 07	1.02	1.01
2000: 03	0.97	0.91	2003: 08	1.07	0.73
2000: 04	1.01	1.01	2003: 09	0.88	0.94
2000: 05	0.98	0.00	2003: 10	0.88	0.93
2000: 06	0.97	0.00	2003: 11	1.02	1.03
2000: 07	1.06	0.00	2003: 12	0.88	0.95
2000: 08	1.05	0.00	2004: 01	0.98	0.99
2000: 09	1.03	0.00	2004: 02	1.04	1.06
2000: 10	1.04	0.00	2004: 03	0.84	0.93
2000: 11	1.10	0.00	2004: 04	1.14	0.00
2000: 12	1.08	0.00	2004: 05	1.08	0.00
2001: 01	0.98	0.00	2004: 06	1.08	0.00
2001: 02	0.91	0.00	2004: 07	1.07	0.00
2001: 03	1.06	0.00	2004: 08	1.09	0.00
2001: 04	1.04	0.00	2004: 09	1.08	0.00
2001: 05	1.06	0.00	2004: 10	1.13	0.00
2001: 06	1.10	0.00	2004: 11	1.14	0.00
2001: 07	1.03	0.00	2004: 12	2.00	0.00
2001: 08	1.08	0.00	2005: 01	1.00	0.00

Table 5: Distribution of the Weymark Index and the "True" Weymark Index

Range	Percentage of WI	Percentage of TWI
$\omega \geq 1$	66.87%	12.65%
$1 > \omega \geq 0.9$	23.49%	17.47%
$0.9 > \omega \geq 0.7$	6.63%	7.23%
$0.7 > \omega \geq 0.5$	1.81%	1.20%
$0.5 > \omega \geq 0.0$	0.60%	60.84%
$\omega < 0$	0.60%	0.60%

Table 6: Regression Results

Variable	Estimate	Std Error
Constant	1.063***	0.020
True Weymark Index	-0.087**	0.035

Table 7: Estimation Results

Parameter	Estimate	Std Error
$\hat{b}_1$	0.10	0.39
$\hat{b}_2$	0.0002	0.005
$\hat{\alpha}$	0.18	0.21
$\hat{\eta}$	-10.97	

Figure 1: Exchange Rate, Reserves and Weymark Index

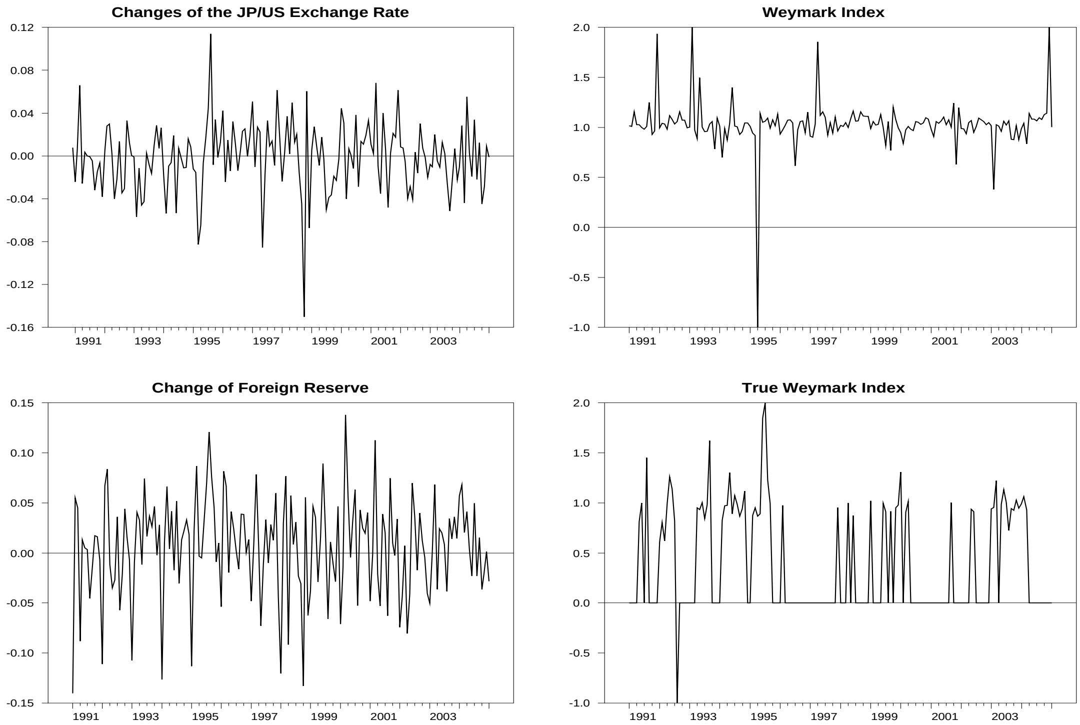

Figure 2: Calibration Results