



Research Article

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An empirical analysis of the relation of U.S. dollar exchange rate and American trade balance

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ABSTRACT

From the empirical perspective, the factors that affect U.S. trade balance is not only the U.S. dollar exchange rate, but also the inertia of U.S. trade balance, American relative commodity prices, relative output, etc. What's more, the inertia of U.S. trade is the main factor that can influence the U.S. trade balance. It's in vain to adjust U.S. trade balance deficit through the depreciate of U.S. dollar in a short time. It seems more appropriate to use mixed policy except exchange rate.

Key words: U.S. dollar exchange rate; U.S. trade balance deficit; quarterly panel data

INTRODUCTION

Under the adverse situation that the constantly downturn of American economy, the high unemployment, budget deficit and trade deficit, America believes in the monetary policy of U.S. dollar depreciation more through which America attempts to improve its trade balance. Since 2008, Fed has strengthen the efforts to carry out the quantitative monetary easing policy, which has led to the depreciation of U.S. dollar and even the U.S. Dollar against the yen has hit a 15-year low. The continuing depreciation of the dollar has increased the pressure on the increase of international commodity prices, initiated serious asset bubbles, caused the global economy turmoil, slow the pace of global economic recovery and led to the international community complaint. However, can the depreciation of dollar improve the America trade balance? What's the impact on the America trade balance and how is the impact? The study has used the quarterly panel datum from 1989 to 2009 between America and 19 trade partner countries or regions to carry out static and dynamic measurement regression analysis in order to answer the questions above.

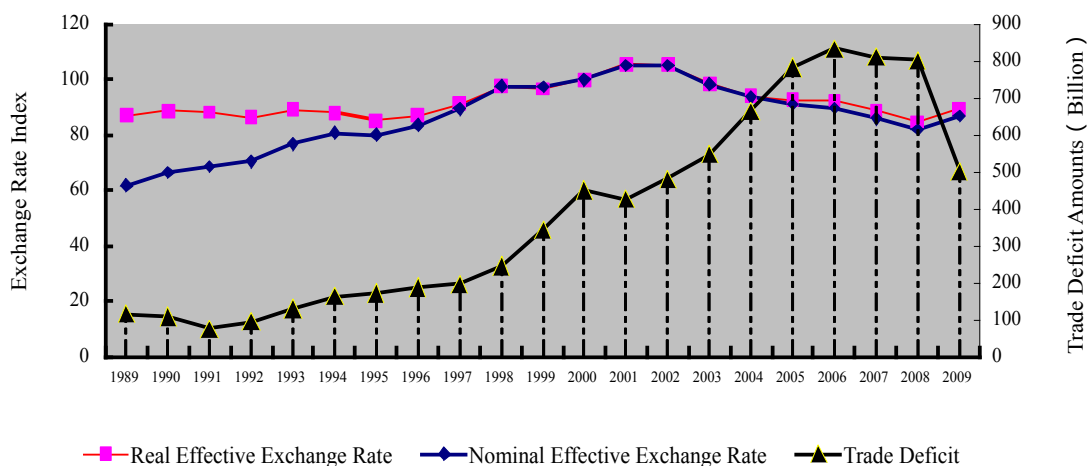
For a long time, many scholars has do a lot studies in terms of the compact of dollar exchange rate changes on America trade balance. For example, Krugman and Baldwin (1987), HelkieHooper (1987), Moffett (1989) did some studies from which they made conclusions that the exchange rate depreciation conducive to improving the U.S. trade balance. But the process for it to improve is not easy. Bahmani-Oskooee (1989)'s current account showed a "W-curve" effect after he found the depreciation of dollar.. It became worse for two time and improved for five time, then it became worse again and got better finally. Bahmani-Oskooee and Rath (2004) paid more emphasis on the improve effect of the actual depreciation of the dollar on the U.S. trade balance must be in the long term and in a short term, there was no concrete conclusion on the exists of the "J-curve". At the same time, there was a large number of scholars who held the opposite view. Rose and Yellen (1990) used the empirical measurement method to make a conclusion that the U.S. real exchange rate changes had no significant effect on the U.S. trade balance. Bahmani-Oskooee and Brooks (1999) thought that aggregate analysis is not enough to estimate the relationship between exchange rate and trade balance and we should use bilateral datum to do empirical analysis. They made a conclusion through some American bilateral datum and the ARDL model that the U.S. real exchange rate has no effect on the U.S. trade balance in short term [1-6]. The study from the Chinese scholar Yang Rong (2005) shows that

from June, 2003 to March, 2005, the dollar against major currencies had different degree of devaluation, but the U.S. trade deficit became worse instead of improving[7]. The main reason is that America did not meet Marshall-lerner condition during this period. Different scholars made different conclusions from their own research results. Public opinions are divergent and it is unable to agree. So it seems extremely urgent to do further exploration and clarification of this question.

2. General situation of U.S. Dollar Exchange Rate Changes and American Trade Balance in 1989-2009

The U.S. trade balance has been showing a continuing deficit since 1989. It increased from 117.04 billion dollar in 1989 to 834.55 billion dollar in 2006. The deficit increased by nearly seven times and decreased then. Burdened by the subprime mortgage crisis, the decline was more obvious in recent years (Shown in Figure 1). At the same time, the annual average dollar nominal effective exchange rate index which chose year 2000 as the base year increased from 61.85 in 1989 to 105.19 in 2002, it decreased from 2002 to 82.1 in 2008 and increased to 86.9 in 2009. Dollar exchange rate takes direct standard method, so in this period, dollar nominal effective exchange rate appreciated, then devalued and appreciated again. The annual average dollar nominal effective exchange rate index which went through the price adjustment and chose year 2000 as the base year also went through a process like this. It went up from 87.07 in 1989 to 105.40 in 2002, then it was adjusted to 84.9 in 2008 and went up to 89.4 in 2009. In these decades from 1989 to 2009, the changing trend of the dollar nominal effective exchange rate and the real effective exchange rate was almost consistent[8,9].

Graph1. Dollar Nominal Effective Exchange Rate and Real Effective Exchange Rate Index and Trade Deficit Changes



Source: International Financial Statistics (IFS) database.

To do a further observation, let's see the relatively America's trade balance during the appreciation of dollar. In 1989-1991, 2000-2001 and 2008-2009 the three periods, dollar appreciated gradually, but the trade deficit shrunk. Especially in 2009, dollar appreciated compared to 2008, but the deficit decreased dramatically. In the period from 1991 to 2000, dollar appreciated continuously for 10 years and its deficit increased by four times. During the time that dollar was depreciating from 2002 to 2006, the trade deficit increased instead of decreasing. In 2006 to 2008, when the dollar was depreciating, its trade deficit decrease for a little. It is easy to see from the above analyzes, there is not a good synchronization and correlation between the direction of dollar exchange rate fluctuations and its trade balance fluctuations.

3. Empirical Test

3.1 Model setting

To test the effects of dollar exchange rate movements on U.S. dollar trade balance through empirical test, I refer to Bahmani-Oskooe and Brooks (1999)'s two countries' log-linear mode and made some necessary expansion to establish Log-linear econometric model as follows.

$$\ln TB_{jt} = a + b \ln Y_{U.S.t} + c \ln Y_{jt} + d \ln RER_{jt} + \varepsilon_t \quad (1)$$

In this model, TB_j , $Y_{U.S.}$, Y_j , RER_j represents respectively the ratio of America's imports and export from its trade partners j , America's real output, trade partner or region j 's real output, the real exchange rate of the U.S. dollar against its trade partner or region j 's real exchange rate.

In order to establish quarterly panel data model and according to the relationship between the real exchange rate and the nominal exchange rate below, $RER_j = R_{jt} P_t / P_{jt}$. R_{jt} is the exchange rate using indirect quotation, P_t is the American price level, P_{jt} is its trade partners' price level, put which into (1), we can get the model below,

$$LnTB_{jt} = a + bLnY_{U.S.t} + cLnY_{jt} + d(LnR_{jt} + Ln P_t / P_{jt}) + \varepsilon_t \quad (2)$$

In this model, trade balance index TB_{jt} is referred to the method that used to research "J-curve" in study of Bahmani-Oskooee and Brooks(1999). It is represented by the ratio of America's import and export with its trading partners or regions j. America's real output $Y_{U.S.t}$ is represented by Y_t . We use America and its trading partners quarterly industrial added value index to replace Y_t and Y_{jt} , and use America and its trading partners quarterly consumer price index to replace P_t and P_{jt} . Assume that America's output index and its trading partner country or region j's output index against the America's bilateral trade balance elasticity is consistent, model (2) can be represented as the form below,

$$LnTB_{jt} = a_0 + a_1 Ln Y_t / Y_{jt} + a_2 Ln P_t / P_{jt} + a_3 Ln R_{jt} + \varepsilon_t \quad (3)$$

The independent variable and the dependent variable in model (3) becomes relative value, and we must choose natural logarithm when doing econometric analysis. As for the expectation of each sign of the coefficient in model (3), the first circumstance is that according to Keynesian's international trade theory, with the increase of America's output, its purchasing power will improve and the import will increase, too. So we can expect that $a_1 > 0$. The second circumstance is that if it is the increase of America's substitute products imports that cause the increase of America's domestic revenue, the exports would decrease. So we can get that $a_1 < 0$, from which we can make a conclusion that parameter a_1 's estimated symbol is uncertain. Similarly, if America's general commodity price levels are relatively higher than the foreign which means the U.S. exports lack of competitiveness so that the imports would increase. However, if America's general commodity price levels are relatively lower than the foreign which means the U.S. exports is full of competitiveness so that the exports would increase and the imports would decrease, so $a_2 > 0$. If dollar depreciate, the value of R_{jt} would decrease, so that the competitiveness of the America's goods price would improve. It will cause a higher export and a lower import (Quantity effects), so $a_3 > 0$, which means the Marshall - Lerner condition is established.

3.2 Panel data sources, instructions and handling

This paper uses quarterly panel data of the United States and its trading partner's countries or regions from 1989 to 2009 to do the regression analysis. The above datum all comes from the International Financial Statistics IFS database. Choosing the 19 America's trading partners' samples is according to their trading amount with America over America's total trade weight. We must see if the weight is large and significance to America and is representative. This 19 countries or regions are Germany, France, Italy, the Netherlands, Canada, Japan, Mexico, China, Britain, South Korea, Singapore, Hong Kong, Malaysia, Switzerland, Brazil, Thailand, Australia, India and Sweden.

The original datum are taken from IFS International Financial Statistics database, in which except for Chinese datum the America's domestic consumer price index, the industrial added value index, domestic consumer price index of U.S. trade partner country or region j and the industrial added value index are unified expressed as the index based on 2000 year. China's consumer price index is represented by CPI growth rate that is translated into index based on 2000 year. Bilateral exchange rates quarterly data of America and its trading partners is the quarterly average exchange under indirect quotation. U.S. dollar against the Australian Dollar and the U.S. dollar exchange rate against the pound is a direct quotation in the IFS quarterly data, which is converted into indirect quotation here. America's bilateral exchange rate with the Netherlands, Germany, France and Italy was EUR at the beginning of the first quarter of 1999. We translated them into dollars against the guilder, mark, franc, lira exchange rate. The translating process is performed below. U.S. dollar against the euro exchange rate after the first quarter of 1999 multiplied by the average exchange rate for the fourth quarter of 1998 (1 euro = 2.2135 guilders, 1 euro = 1.9571 marks, 1 euro = 6.56248 francs, 1 euro = 1936.91 liras). And translate all bilateral exchange rates into the index

based on 2000 year. Because each variable quarterly data has been adjusted seasonally in the IFS, in this article I choose its natural logarithm form.

3.3 Model estimation results and analysis

Next, we use a static panel data model and dynamic panel data model analysis to compare the impact of the U.S. dollar on its total trade balance.

1 Static model estimates

We use Static panel data model to estimate model (3). Firstly, we test the quarterly panel datum from 1989 to 2009 using Hausman test. The test results show that, Hausman test rejects the null hypothesis at the 1% level of significance. Fixed effects model is better than the random effects model. Select a fixed effects model to do regression analysis. The result is represented as table 1.

Table1. The impact of U.S. dollar on the U.S. trade balance estimation results

Dollar exchange rate	0.5733*** (16.43 0.000)
American domestic and foreign relative price	0.6085*** (16.91 0.000)
American domestic and foreign Relative output	0.09861*** (3.42 0.001)
Constant term	-4.15491*** (-15.71 0.000)
Model evaluation	F = 104.02; Prob > F= 0.0000 Rho=0.9728 R-Sq: Inner set=0.5800; Between groups=0.5648; total=0.5513

Note: The value in parentheses is respectively *t* and *P*. *, **, *** respectively represent the 10%, 5%, 1% significant level.

From the point of view of the independent variable coefficient size, symbols of fixed effect estimation results, the regression coefficients of dollar exchange rate changes, relative prices of U.S. goods changes and American relative output changes on the U.S. trade balance is respectively 0.5733, 0.6085 and 0.0986 that are all positive. It is consistent with the first expectations, which means that they are all the factors that can affect the changes of the U.S. trade balance and the influence is very significant.

The regression coefficients of dollar exchange rate changes, relative prices of U.S. goods changes and the U.S. trade balance changes is positive, which means the depreciation of dollar and the decrease of relative prices of U.S. goods changes do benefits to the devaluation of America's deficit. So in the period from 1989 to 2009, the relationship between dollar exchange rate and the U.S. trade balance of Marshall - Lerner condition is established. However, the regression coefficients of American relative output over the U.S. trade balance are positive. It means that the increase of the relative output of the United States will bring about the increase of total income so that the imports will go up which is bad to improve the trade balance. But the Elasticity coefficient is not large and only 0.0986 that indicates the increase of relative output is not the main factor leading the U.S. trade deficit. From the point of view of the size of the regression coefficients, the elastic movements of dollar exchange rate changes over trade balance is 0.5733 is smaller than the elastic movements of relative prices of U.S. Goods changes over trade balance 0.6085, which indicates that the effect of exchange rate changes on the trade balance was mainly works by passing rates of import and export price and can also reveal the incomplete of dollar exchange rate passing indirectly.

2 The evaluation of dynamic model

The analysis of the static model does not consider the problem that U.S dollar can influence timeliness of the trade balance. In order to reflect the dynamic impact on the US trade balance with the changes of the dollar exchange rate, relative prices of commodities and the relative output, the text further estimate the form (3) using dynamic panel data model. Similarly, we made the Hausman test for panel data from 1989 to 2009. Test results show that Hausman test declines to the original assumption under the 1% significant level that fixed effects model is superior to the random effects model. Using the fixed effects model to estimate regression analysis, the results are shown in table 2.

Table2. The impact of U.S. dollar on the U.S. trade balance dynamic results

U.S. trade balance lagged for one period	0.7454*** (61.88 0.000)
Dollar exchange rate	0.1947*** (9.68 0.000)
U.S. dollar lagged for one period	-0.0113**

	(-2.35 0.019)
American domestic and foreign relative price	0.1987*** (9.96 0.000)
American domestic and foreign relative output	0.0379** (2.52 0.012)
Constant Term	-1.3970*** (-9.62 0.000)
Model evaluation	F=996.74; Prob > F=0.0000 Rho=0.9321 R-Sq: Inner set=0.7784; Between groups=0.7072 Total=0.7069

Note: The value in parentheses is respectively t and P. *, **, *** respectively represent the 10%, 5%, 1% significant level.

According to the independent variable coefficient from table 2, symbols and t statistic, American previous trade balance situation, the dollar exchange rate changes in the current, the dollar exchange rate changes lag issue, the United States relative output change in relative prices of commodities and the United States to the United States trade balance changes of regression coefficients were 0.7454, 0.1947, 0.0113, 0.1987, 0.0379. And the t statistics is significant. This shows that they are all factors that affect the U.S. trade balance changes. Among them, America's previous trade balance situation is the main influence factors of the current U.S. trade balance changes, and the elasticity of 0.7454. It fully indicates that the current U.S. trade deficit mainly comes from the inertia increase of previous America's trade deficit. Estimation results can also be seen from table 2, the dollar exchange rate changes in the current and lag issue are significant influence on American trade balance. Looking from the coefficient of symbols, the dollar devaluation will improve the trade balance of the current period, and lag one period began to deteriorate. It suggests that there is no "J curve" effect. If we add the coefficient of the two phase and, in general, the dollar devaluation can improve the trade balance of the United States, but its influence coefficient is smaller than static model results (0.5733), only 0.1834 (0.1947 0.0113 = 0.1947).

The change of dollar exchange rate for the US trade balance changes of total regression coefficient (0.1834) is positive, and the change in relative prices of commodities for the United States trade balance changes of regression coefficient (0.1987) is also positive. It proves that dollar decline and the commodity prices decline are beneficial to the United States to reduce the deficit. It also proves that in 1989 ~ 2009 dollar trade relationship with the United States during the period of Marshall - Lerner condition is established. While the relative output to the United States trade balance changes of regression coefficient is positive. It indicates that the increase of the relative output and increased revenue will increase the import of the United States. But elasticity coefficient is not big, only 0.0379. It shows the relative output increase is not the main factor that led to America's trade deficit. Looking from the size of the regression coefficient, the dollar exchange rate movements in the United States trade balance changes the total elasticity 0.1834 is less than the United States of America's trade balance change in relative prices of commodities elasticity 0.1987. It also indirectly shows the dollar incompleteness again.

CONCLUSION

At this point, you can see, factors that affect the trade balance is not only the dollar exchange rate changes, the U.S. trade balance their own inertia, the United States relative commodity prices and the relative output are all factors that affect the trade balance. Moreover, America's trade balance of inertia is the most important factor of what affect the trade balance change.

In addition, we found that the dollar value of current would improve the trade balance, lag issue began to deteriorate. And there is no "J curve" effect. Because of the huge inertia of the U.S. trade deficit, the dollar to trade balance of payments adjustment exists a lag effect. Relying on dollar depreciation on short-term to adjust U.S. trade deficit much is futile. Even it makes America's trade balance improved, it often can lead to exchange rate overshoot, shake the confidence of the people who hold dollar-denominated assets. It leads to foreign capital inflows reduce and capital flight. It also makes US market interest rates rise, thereby affects the domestic consumption and investment, eventually will continue for the U.S. economy into recession. Thus, if the US authorities want to improve its worst international balance of payments, they should not only care for the dollar, but also pay attention to the currency of other policy combination. For example, take active export management policies; reduce the monopoly relative prices of export commodities, the cancellation of some countries or regions commodity export restrictions.

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REFERENCES

- [1].Bahmani-Oskooee,M..Ratha A. *Journal of Economics and Finance*.**2004**,28(1) :32-38.
- [2]. Stephane Dees, Matthias Burgert, Nicolas Parent. *Empirical Economics*. **2013**,45:789-816.
- [3]. Matthieu Bussiere. *Oxford Bulletin of Economics and Statistics*. **2013**, (75):731-758.
- [4]. Marwah, k and klein, I. R. *Canadian journal of Economics*.**1996**, (29):523-539.
- [5]. J. Lawrence Broz, Seth H. Werfel. *International Organization*. **2014**, (1):1-50.
- [6].Marwah, K. and Klein, L. R. *Canadian Journal of Economics*.**1996**,29 (3) : 523-539.
- [7].Robert M.Feinberg. *Review of Economics and Statistics*.**1989**,71(3):505-511.
- [8]. Pan Wei He *.International Business Research*. **2008**, (1): 51-55.
- [9].Wang Xiao Lei. *Modern Finance*.**2007**, (12): 88-95.