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Travel Shocks to the Chinese Economy: A Fractional Integration Approach

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Travel Shocks to the Chinese Economy: A Fractional Integration Approach

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Abstract

This paper examines the degree of persistence of China's travel "credit" and "debt" series in the balance of payments. This is an important issue because the travel component in the balance of payments of travel is one of the main indicators measuring the contribution of tourism to a country's economic activity, and knowledge of its persistence is critical to assess the potential impact of disrupting factors such as the COVID-19 pandemic. The analysis is carried out using a fractional integration framework, which provides evidence of mean reversion in the credit series, but not in the debt series. The policy implications of these findings are also discussed.

JEL Classification: C12; C13; C22; Z30

Keywords: China; travel; balance of payments; persistence; fractional integration

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1. Introduction

China was closed to travellers for the purpose of tourism until 1978, but the situation changed when Deng Xiaoping gave five talks addressing the strategic issue of using tourism as an option for China's economic development between October 1978 and July 1979 (Xiao, 2006). Inbound tourism was the starting point of tourism development, becoming a critical source of very much needed foreign exchange for national development and construction. The People's Republic of China (PRC) opened 122 cities and regions to foreign tourists, simplified entry and visa procedures, renovated facilities, trained personnel, etc., and in 1980 the authority to deal with foreign tour operators was decentralized (Choy and Gee, 1983). Since the 1980's, China's national tourism industry has developed substantially; according to the National Bureau of Statistics (NBS), in 2019, there were 145.3 million overseas visitors' arrivals¹ (31.9 million foreigners and 113.4 million visitors from Hong Kong, Macao and Taiwan), and foreign exchange earnings from international tourism reached US\$ 131.25 billion (NBS China, 2020).

By contrast, the growth of Chinese outbound tourism happened later. It boomed in the late 2000's, becoming one of the most important engines of the world tourism market growth (Quer and Peng, 2022). China overcame the barrier of 100 million outbound visitors in 2014, six years earlier than forecast by the World Tourism Organization (WTO, 2004), and in 2019 the number of China's outbound visitors totalled 169.21 million, of which 102.37 million visited Hong Kong, Macao and Taiwan (NBS China, 2020).

Because of the intense growth in overseas tourism related consumption, the balance of payments of China's travel services experienced a reversal from surplus to deficit in the late 2000's, and the deficit grew all along the 2010's. In fact, overseas tourism was one of the main causes of the increase in the deficit of the balance of payments of China's total services.

¹ Additionally, in 2019 there were 6.0 billion domestic visitors.

Further, the rise in the number of tourists travelling abroad was an important factor in the recent trend in China's current account, with its surplus increasing only slightly despite a large growth in net exported goods (Santacreu, 2016).

In 2019 the added value of national tourism and related industries reached 4,498.9 billion yuan, accounting for 4.56 percent of GDP (NBS, 2021), but then the outbreak of the COVID-19 epidemic in early 2020, the subsequent borders' closure and the extension of China's COVID-zero policy until late 2022 drastically reduced the number of domestic and overseas tourists numbers.

In this paper, we examine persistence in China's travel "credit" and "debt" components of the balance of payments (BOP). The analysis is conducted using fractional integration methods, which do not impose the restrictive assumptions of the standard models based on the dichotomy between $I(0)$ stationary series and $I(1)$ non-stationary ones and yield estimates of the degree of persistence shedding light on whether the effect of shocks are transitory or permanent.

The layout of the paper is the following: Section 2 provides a brief literature review. Section 3 discusses the data and the methodology; Section 4 presents the empirical evidence, whilst Section 5 contains a discussion of the policy implications for China, and Section 6 offers some concluding remarks.

2. Literature Review

This section reviews the existing literature on long-span international tourism data, with a special focus on studies analysing persistence in the balance of payment and the current by means of fractional integration techniques, which are more flexible than classical models based on integer degrees of differentiation (Box-Steffensmeier and Tomlinson, 2000; Zivot and Wang, 2007). For instance, Cunado et al. (2008) used a long memory fractionally

integrated model and found a mean reverting pattern in US total number of international monthly arrivals. The statistical behaviour of international tourism arrivals in the US was confirmed a decade later in the aftermath of the September 11 terrorist attacks (Gil-Alana and Payne, 2018). Additional evidence in favour of persistence and mean reversion has been found in international tourism arrivals' series of some top tourism recipient countries such as Croatia (Gil-Alana et al., 2016), and Spain (Gil-Alana et al., 2019). Some recent research has found that the COVID-19 pandemic has increased the degree of persistence of the series, for instance, in Turkey (Yucel et al., 2022) and in a group of Southeastern European countries (Caporale et al., 2022).

Note that the long-run path of the current account balance has attracted much attention from academics, because a stationary current account is consistent with a finite external debt-to-GNP ratio, and hence with sustainability of external debts. Husted (1992) analysed the "long-run tendency" of the US current account balance estimating cointegrating regressions between US exports and imports of goods and services. He concluded that up to the end of 1983 the US current account tended toward zero, whereas since that time there was an apparent structural shift in the relationship between trade flows, resulting in a long-run tendency for a deficit in excess of \$100 billion.

Using various unit root and cointegration tests, some of which allowed for structural changes, Wu et al. (1996) tested the sustainability of the current account deficits in the US and Canada over the 1973-1994 period. They concluded that the real current account-deficits-to-GDP ratios were not sustainable. However, when Wu (2000) applied the panel data unit-root test of Im, Pesaran and Shin (Im et al., 1997) to 10 OECD countries over the 1977-1997 period, he found support for the mean-reverting property of the current account and thus for the intertemporal approach to the current account, the implication being that current account deficits in major industrial countries were sustainable.

More recently, Lin and Wang (2008) reported that, for most of the G7 countries, the BOP is trend stationary when the unit root tests are allowing for one structural break in the trend function. This result implies that the assumption of the Mundell-Fleming model about the equilibrium of BOP is appropriate, because if the BOP followed a random walk process, any shock or innovation would have a sustained effect and the future path of the BOP could not be predicted². Similarly, Kula et al. (2009) carried out unit root tests for 24 OECD countries and found that the BOP is mean reverting, which supports the assumptions of the Mundell-Fleming model.

Concerning China specifically, recent research by Yalta and Sivrikaya (2018) found that its current account balance was nonstationary over the full sample 1996:1-2017:2 and also the 1996:1-2007:3 and 2007:3-2017:2 sub-samples, before and after the global financial crisis, suggesting that the Chinese current account balance was not on a sustainable path. This is an important finding to assess global imbalances, since it meant that China's current account surplus (and US deficit) might decline even further, helping global imbalances to narrow. In another recent paper, Milesi-Ferretti (2023) found that the impact of the COVID-19 pandemic on tourism revenues was more severe on countries more dependent on foreign tourism.

The present paper contributes to the relevant literature by using a fractional integration framework to investigate the degree of persistence in China's travel "credit" and "debt" series, and its potential impact on the balance of payments.

3. Data and Methodology

In this paper, we use quarterly data on the balance of payments provided by the People's Republic of China's (PRC's) State Administration of Foreign Exchange (SAFE) between

² One of the key assumptions of the Mundell-Fleming model (Mundell 1962, 1963; Fleming 1962) is that the BOP is zero in equilibrium. This implies that the trade balance equals the net capital outflow. However, the assumptions of the Mundell-Fleming model are reasonable only if the BOP is mean reverting, such that it will return to its trend path over time.

1998:Q1 and 2022:Q4³, in US \$ millions (see Figures 1, 2 and 3). The balance of payments summarizes the economic transactions of a country with the rest of the world during a specific period of time (Samuelson and Nordhaus, 2010). We focus on the statistical behaviour of the Travel Services Credit and Debt series, which are linked closely to trends in China's inbound and outbound international tourism. In this regard, it is convenient to remember that the balance of payments of travel services was considered the best measure of economic tourism activity for several decades after the mercantilist Thomas Mun introduced invisible items (services) into the balance of payment (Miočić and Čavlek, 2015). Specifically, we analyse the amount spent by China's residents when they travel abroad ("debt", TRSDEBT), and the income generated from international tourist expenditure in China ("credit", TRSCREDIT). Additionally, we also examine the persistence of the credit and debt series in "Goods" and "Rest of Services"⁴, in order to assess the possible impact of the behaviour of TRSDEBT and TRSCREDIT on China's current account balance, and the policy implications of international travel expenditure persistence.

The model used belongs to the category of long memory or fractionally integrated processes. It can be specified as in the following equation:

$$(1 - B)^d x_t = u_t, \quad t = 1, 2, \dots, \quad (1)$$

where the operator B indicates a backshift function (i.e., $Bx_t = x_{t-1}$) and where u_t is an integrated of order 0 or $I(0)$ process, defined as a covariance or second order stationary process where the infinite sum of its autocovariances is finite. Thus, u_t may be a white noise process but also a weakly autocorrelated (ARMA) one.

The estimation of d is carried out using the Whittle function in the frequency domain as in the testing procedure developed by Robinson (1994), which has been shown to be the

³ The data were extracted from SAFE website (<https://www.safe.gov.cn/en/BalanceofPayments/index.html>) on 20 April 2023.

⁴ We calculate the "Rest of Services" series by subtracting the "Travel" component from "Services".

most efficient method in the Pitman's (1948) sense against local departures from the null. Another advantage of these tests is their limiting standard $N(0,1)$ behaviour, which holds even deterministic terms are included in the model or when testing values of the differencing parameter outside the stationary region.

4. Empirical Results

In equation (1) x_t stands for the errors in a regression model incorporating an intercept and a linear time trend:

$$y_t = \beta_0 + \beta_1 t + x_t; \quad t = 1, 2, \dots, \quad (2)$$

where β_0 and β_1 denote the unknown coefficients of these deterministic terms. In other words, the estimated model is:

$$y_t = \beta_0 + \beta_1 t + x_t; \quad (1 - B)^d x_t = u_t, \quad t = 1, 2, \dots, \quad (3)$$

and because of the quarterly frequency of the series under examination, we assume that u_t in (3) follows a seasonal AR(1) process of the form:

$$y_t = \rho y_{t-4} + \varepsilon_t, \quad (4)$$

where ρ is the seasonal AR coefficient, and ε_t is $NID(0, \sigma^2)$. In Table 1, we report the estimates of the differencing parameter d under three different scenarios: i) first, we consider the case with no deterministic components, i.e., assuming that β_0 and β_1 are both set equal to 0 a priori in Eq. (3); ii) then, we only include a constant, so $\beta_1 = 0$, and iii) finally, with both coefficients β_0 and β_1 freely estimated from the data along with d . We mark in bold in the table the values corresponding to the selected specification for each series based on the t -values of the estimated coefficients. These estimated values are reported in Table 2.

It can be seen from these two tables that the results are very heterogeneous across the series under study. Specifically, in panel i) the time trend coefficient is insignificant for TRSCREDIT and TRSDEBT series. For TRSDEBT, the estimate of d is higher, 0.88, and the

unit root null hypothesis cannot then be rejected, implying that shocks have permanent effects. Instead, the estimate of the differencing parameter is $d = 0.77$ for TRSCREDIT series, and the confidence interval is below 1, supporting mean reversion and transitory effects of shocks.

Table 1: Estimates of the orders of integration

i) Travel services series			
Series	No terms	With an intercept	With an intercept and a time trend
TRSCREDIT	0.64 (0.51, 0.79)	0.62 (0.51, 0.77)	0.63 (0.51, 0.77)
TRSDEBT	0.88 (0.76, 1.02)	0.88 (0.76, 1.02)	0.88 (0.76, 1.02)
ii) Rest of services series			
Series	No terms	With an intercept	With an intercept and a time trend
ROSCREDIT	0.90 (0.78, 1.09)	0.93 (0.80, 1.12)	0.91 (0.75, 1.13)
ROSDEBT	0.77 (0.67, 0.91)	0.80 (0.71, 0.95)	0.72 (0.57, 0.93)
iii) Goods series			
Series	No terms	With an intercept	With an intercept and a time trend
GCREDIT	0.75 (0.64, 0.94)	0.81 (0.71, 1.00)	0.72 (0.52, 0.98)
GDEBT	0.91 (0.75, 1.17)	0.93 (0.78, 1.20)	0.92 (0.71, 1.20)

Note: The values are the estimates of the differencing parameter d in Equation (3). Those in parenthesis are the 95% confidence intervals. In bold, the selected specification for each series.

When focusing on the Rest of Services (panel ii) series, a positive time trend is observed for ROSCREDIT and a negative one for ROSDEBT, and mean reversion seems to occur for ROSDEBT, but not for ROSCREDIT. Finally, for the Goods series (panel iii), we the time trends are statistically significant. However, while the slope coefficient is positive for GCREDIT, it is negative for GDEBT. The orders of integration are substantially different depending on the series. Thus, for GCREDIT the estimate of d is equal to 0.72 and 0.92 for GDEBT. Mean reversion occurs in the credit series (as in the case of the travel services ones), but not in the debt ones, and the seasonal component is particularly large in the case of GCREDIT.

Table 2: Estimated coefficients of the selected models

i) Travel services series				
Series	d (95% band)	Intercept (tv)	Time trend (tv)	Seas.
TRSCREDIT	0.77 (0.66, 0.90)*	38.585 (3.15)	---	0.495
TRSDEBT	0.88 (0.76, 1.02)	---	---	0.346
ii) Rest of services series				
Series	d (95% band)	Intercept (tv)	Time trend (tv)	Seas.
ROSCREDIT	0.91 (0.75, 1.13)	18.704 (2.48)	8.088 (3.05)	0.198
ROSDEBT	0.72 (0.57, 0.93)*	-22.867 (-2.73)	-8.196 (-7.63)	0.325
iii) Goods series				
Series	d (95% band)	Intercept (tv)	Time trend (tv)	Seas.
GCREDIT	0.72 (0.52, 0.98)*	157.60 (2.34)	80.515 (5.20)	0.730
GDEBT	0.92 (0.71, 1.20)	-165.242 (-2.57)	-65.467 (-3.16)	0.415

Note: The values in column 2 are the estimates of d and their associated 95% confidence intervals. Those in columns 3 and 4 are the intercept and the time trend coefficient and their corresponding t-values. The final column reproduces the values of the seasonal AR coefficient. *: Evidence of mean reversion at the 95% level.

5. Policy Implications

Travel services are the main cause of China's total deficit in the BOP services. The analysis of the long-term statistical behaviour of TRSCREDIT and TRSDEBT series has implications for the type of policies required in response to an exogenous shock. Moreover, since the service sector deficit offsets a large amount of the goods trade surplus, it also has implications for how to interpret the evolution of China's Total Current Account Balance in the long term (Jianwei et al., 2021).

The raw TRSCREDIT data show a period of rapid growth between 1998:Q1 and 2006:Q4, whereas growth was less intense from 2006:Q4 onwards (see Figure 1). These data are consistent with the fact that the number of foreigners' arrivals to China boomed until the mid 2000's, reaching more than 26 Million visitors in 2007 compared to 7.4 Million in 1997. Zhang et al. (2020) see the 1997-2007 period as "the rapid development stage" of China's

tourism industry, which was followed by “the new normal stage” in the aftermath of the 2008 Beijing Olympic Games.

On the other hand, the raw TRSDEBT volume shows a very substantial increase since the beginning of the 2010s. The amount of debt increased from less than US\$ 10.3 billion in 2010:Q1 to 69.1 billion in 2015:Q3. International outbound tourism has risen massively in recent years, with millennials being a key driver of this upturn (Mostafanezhad and Promburom, 2018; Kimber et al., 2019; Connell and McManus, 2019; Quer and Peng, 2022; Gao et al., 2022). Millennials were born during the period when China sped up its economic and social reforms, such as the Open-Door Policy and the Educational Reform. They are better educated (they are the first generation that speaks English), more affluent, and more adventurous than their parents and grandparents because they have enjoyed freedoms that the previous generations were mostly denied.

The time series behaviour of China’s travel debt services, with the booming of international outbound tourism during the 2010’s, differs from that of the credit and debt series for services and goods. The latter showed a significant increase much earlier, after China’s entry to WTO in December 2001 (Figures 2 & 3). In the case of the other services series, the pace of increase is similar for the credit and debt series, and the balance is close to zero all along the analysis period. Instead, international trade of goods shows a steeper growth of exports compared to imports, which results in a growing surplus.

Our results indicate that in the case of the travel services debt series the unit root null hypothesis cannot be rejected, which implies that shocks to this component have a permanent nature. This means that disruptive factors hindering international outbound tourism (such as COVID-19) might reduce the volume of travel debt series permanently, but it also indicates that the total amount spent by China’s residents abroad might remain at much higher levels after a shock fostering international tourism. Consequently, strong government measures

could be necessary in the event of an exogenous shock to return to the original path of travel debt series. On the contrary, our research shows mean reversion in the travel services credit series, which implies that the arrival of international tourists recovers to its previous levels after a shock without requiring stronger policy actions. For instance, the fact that the potential impact of shocks to RSCREDIT is temporary means that the arrival of international tourists to China's will increase again without implementing any other specific measure once travel restrictions linked to the Covid-Zero policy have been lifted.

It is noteworthy that our results support the existing literature suggesting persistence and mean reversion in international tourism arrivals (Cunado et al., 2008; Gil-Alana et al., 2016; Gil-Alana et al., 2019, etc.), but further research should be conducted to investigate the reasons causing mean reversion in international arrivals but not in departures.

We also find mixed results for the credit and debt series of goods and the rest of services. In the case of goods, mean reversion seems to take place in GCREDIT, but not in GDEBT (the same as for travel services). By contrast, we find mean reversion for the rest of services debt series, but not for the credit series. The fact that China's exports of goods can recover after a shock without needing any government measure is very relevant for the country's balance of payments. However, it is not sufficient to determine the behaviour of the balance of goods in the long term, since imports of goods might remain at much higher (lower) levels after a shock if the government does not implement specific initiatives to correct the its effects.

Finally, our research has important implications for policymakers because it suggests that specific measures might be necessary to recover from shocks affecting international outbound tourism, imports of goods and exports of other services. Nevertheless, as we obtain mixed results for the statistical behaviour of credit and debt series in each of the three main

components (travels services, goods and rest of services), the overall evidence regarding mean reversion in the balance of payments is unclear (Lin and Wang, 2008; Kula et al., 2009, etc.).

6. Conclusions

Tourism is a key sector in China with a big weight in the balance of services, but it is also very important for the rest of the countries that have become priority destinations for Chinese travellers, mainly other Asian countries, as well as the US and Europe. The COVID-zero policy applied in China during the pandemic reduced drastically the number of domestic and overseas tourist numbers. The major impact of this unexpected crisis underlined the need to analyse the long-term statistical behaviour of travel credit and debt series to evaluate the potential consequences of other disrupting factors.

We have applied fractional integration techniques finding that shocks have permanent effects in the case of China's travel services debt series, but not in the case of the credit series. Consequently, it might be necessary to adopt decisive policies to return to the previous path of international outbound tourism, whereas inbound tourism can recover without specific measures. We also find mixed results for the credit and debt series in goods and rest of services series. Therefore, it is not possible to reach unambiguous conclusions regarding the consequences of travel shocks for China's balance of payments. An additional finding is that mean reversion occurs for the goods credit series, which implies that China's exports of goods can recover without specific government policies.

Future work could examine data on Chinese international tourist arrivals and departures, as well as on the tourism credit and debt series for other countries. Further, nonlinearities and structural breaks could be incorporated into the analysis since they are closely interconnected with the concept of fractional integration (Diebold and Inoue, 2001; Granger and Hyung, 2004).

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Figure 1. BOP of Travel Services. 1988Q1 – 2022Q4 (in 100 million of US\$)

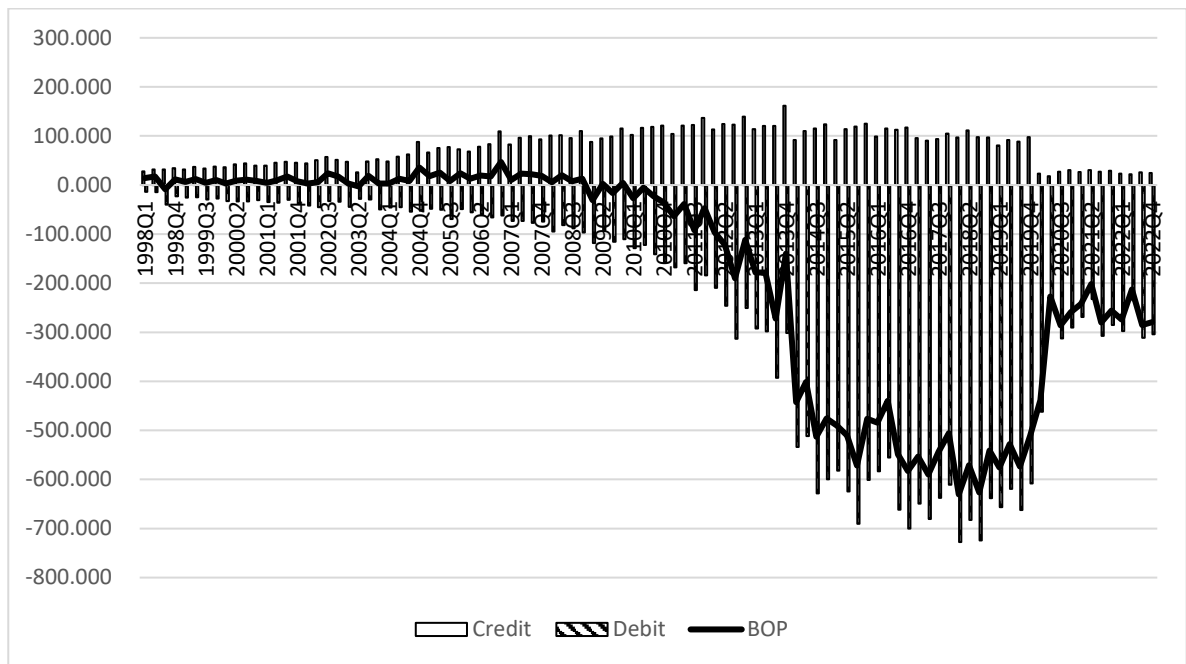


Figure 2. BOP of Rest of Services. 1988Q1 – 2022Q4 (in 100 million of US\$)

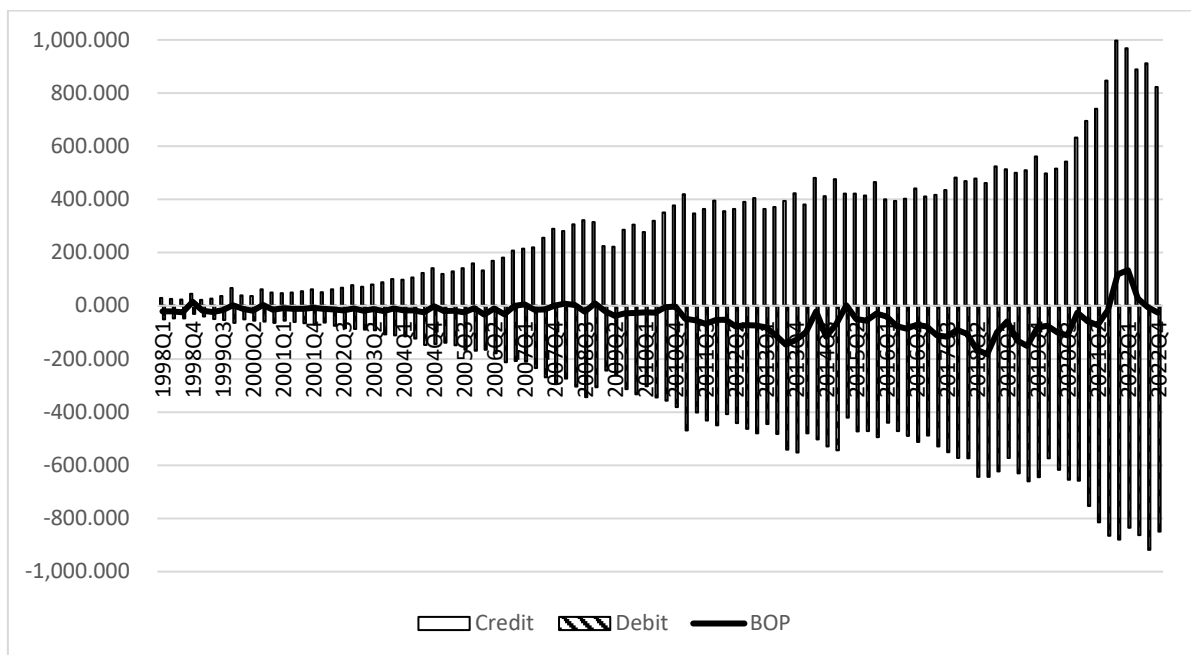


Figure 3. BOP of Goods. 1988Q1 – 2022Q4 (in 100 million of US\$)

