An analysis of financial globalization: excess saving in East Asia and Pacific region and its effect in US interest rate*

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The United States has witnessed its interest rate with secular deline. While the influencing factors for interest rate are various, a focus on global excess saving has driven the discussion to the global financial market. Data suggests that, instead of US itself, insdutrializing countries in East Asia and Pacific (EAP) area are major contributor to the global saving glut. In this study, a multiple linear regressio model is tested using 40-years data to examine the correlation between US interest rate and gross saving rate in EAP. The statistical result suggests that as EAP countries increase there saving rate, US interest rate tend to decrease in a significant degree.

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*Code and data are available at: https://github.com/melissazhangyz/financial_globalization.

1 Introduction

The interest rate in the United States of America serves as a key economic indicator, significantly impacting financial markets worldwide. As the largest economy, shifts in the US interest rate can resonate a variety of effects internationally (Iacoviello and Navarro 2019). However, historical data reveal a persistent decline since the last peak before Great Depression in 1980. This concern has led to extensive discussion among economists about the primal cause. Some scholars attribute this downward trend to a slowdown in technological innovation and a lack of technological breakthrough, such as the second and third industrialization (Caballero, Farhi, and Gourinchas 2017). Alternatively, examining this issue through the lens of economic dynamics provides another perspective, focusing on the equilibrium of the product, labour and monetary market.

Within the United States, several key economic indicators directly influence the setting of interest rates. Principal among these is the Gross Domestic Product (GDP). A higher GDP means increased productivity and heightened economic activity. More supply of goods usually drives up the prices, prompting the central bank to raise interest rates to temper inflation and stabilize the economy (Williamson 2018). Employment levels also play a critical role in influencing interest rates. High unemployment rate often implies underutilized economic capacity and can lead to decreased consumer spending, which even worsen the situation (Ribba 2006). In response, the central bank may lower interest rate to stimulate investment, and thereby supporting job creation and wage increases. Furthermore, saving rate is inversely correlated with interest rates. Higher aggregate savings within the economy typically increase the supply of loanable funds. Overheated fund market, consequently, is followed by excess saving, or a "saving glut" (Bofinger and Ries 2017). The invisible hand theorem of the money market states that interes rate would react by declining until reaching a new equilibrium level.

The "Global Saving Glut" has attracted more attention in the recent years with the famous speach given by Bernanke (2005) at the Federal Reserve Board. In his speech, Bernanke alerts that the huge current account deficit may cause unpredicted harm to the US economy. One plausible cause that he mentioned was the global saving glut. Within the past 50 years, the globe has exeprienced several huge financial crisis, including the 1980 great depression, 1998 Asian crisis and 2008 credit crisis. To hedge with the potential risk, more financial institutions started to adopt safer strategy by build up substantial reserves by buying US 10-year treasury (Bernanke 2005). The target on the US market was primarily due to the long term liquidity of US dollar and the perceived safety of US investments. This surge in savings contributed to what Bernanke terms a "savings glut," which has exerted downward pressure on the US current account, and finally its interest rates.

As Bernanke (2005) specifically mentioned in the speech, Asian market contributed significantly to the current account deficit of the United States. In 1998, multiple Asian economies was hit by speculative attack of the currency, including traumatic loss in the Hong Kong Hang Seng index and the Japanese Nikkei index. In the aftermath of their financial crisis, Asian economies significantly increased their holdings of US Treasury securities, a strategic move that aimed to bolster their US dollar reserves (Radelet et al. 1998). This massive purchase of US Treasuries by countries such as China, Japan, and South Korea has played a crucial role in keeping US interest rates at relatively low levels. Meanwhile, nations like China, Vietnam, and Japan have focused heavily on specializing and manufacturing goods

for export primarily to the US market (Ekanayake 1999). The long-term imbalance in trade has exacerbated the US current account deficit to a massive degree. However, whether the excess saving the excess export continue to affect the US interest rate is ambiguous.

In this study, I will conduct a data analysis to explore the correlation between US interest rate and the saving rate in East Asia and Pacific Area. In Section 2, I will discuss the source of data for my dependent and independent variables and the process of data cleaning. I will also conduct Exploratory data analysis in this section. In Section 3, I will explain in detail about the mutiple linear model I build to study the correlation in this paper. Then, I will present the result of the regression in table and in visualized figure in Section 4. Finally, I will discuss the limitation and future study in Section 5.

2 Data

2.1 Data sourcing

To study the US interest rate, we need to include both internal and external influence. The data regarding the domestic economic trend in the US is downloaded from the website of Federal Reserve Bank of St. Louis. FRED is a rigorous online data platform for primarily US economic data, which is widely used in academic study in economics. From there I downloaded Federal Funds Effective Rate, unemployment rate, real Gross Domestic Product (GDP), GDP growth rate and current account balance (Board of Governors of the Federal Reserve System (US) 2024).[1] In general, I get five raw dataset for each rate where each contains at least 60 obervations for the past 60 years' data. Then, I obtained the data for saving rate from the World Bank dataset. I download the gross saving rate in percentage of GDP for the countries of interest, including USA and East Asia and Pacific (EAP) area excluding high income countries (World Bank and OECD 2024). [2] The raw data contains 55 columns and 27 rows where each columns represent a country or economic region and each row represent a year. I use R programming language for this study (R Core Team 2023). The packages I use in this study includes "tidyverse" (Wickham et al. 2019), "readxl" (Wickham and Bryan 2023), "lubridate" (Grolemund and Wickham 2011), "parquetize" (Dotta and Chuche 2024), "modelsummary" (Arel-Bundock 2022), "kableExtra" (Zhu 2024), "patchwork" (Pedersen 2024), "broom" (Robinson, Hayes, and Couch 2023) and "gt" (Iannone et al. 2024).

I first combine the 5 dataset of the US data into one document. I filter for years after 1960 considering some data before was missing. For the world bank data, I omit data before 1982 due to the same reason. I round all the numeric data into 3 decimals only for simplicity. Finally, I generate two dataset for the forward study as shown in Table 1 and Table 2.

[1] Interest rate, unemployment rate are seasonally adjusted annual average rate. Real GDP is using 2017 USD as baseline discounting factor.

[2] Countries included are:Cambodia, Chin, Fiji, Indonesia, Kiribati, Korea, Dem. People's Rep, Lao PDR, Malaysia, Marshall Islands, Micronesia, Fed. Sts, Mongolia, Myanmar, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvaltu, Vanuatu and Viet Nam.

DATE	interest_rate	gdp_growth	real_gdp	unemployment_rate	current_account
1960	3.216	3.974	3500.272	5.542	3.172
1961	1.955	3.656	3590.066	6.692	4.213
1962	2.708	7.419	3810.123	5.567	3.799
1963	3.178	5.552	3976.142	5.642	4.947
1964	3.497	7.375	4205.277	5.158	7.468
1965	4.075	8.449	4478.555	4.508	6.158
1966	5.112	9.582	4773.931	3.792	3.809
1967	4.220	5.722	4904.864	3.842	3.483
1968	5.659	9.383	5145.914	3.558	1.532
1969	8.204	8.183	5306.594	3.492	1.604

Table 1: First ten rows of the cleaned dataset for domestic economy in US

Time	USA	World	UK	Brazil	Canada	China	France	Germany	India
1982	21.790	23.365	18.237	15.883	19.900	33.737	20.796	18.317	15.806
1983	19.795	22.836	18.880	14.217	20.052	33.096	20.388	18.884	15.355
1984	21.911	24.060	19.178	17.403	20.912	34.867	20.176	19.501	15.796
1985	20.366	23.845	18.694	20.113	20.534	35.279	20.194	20.298	16.798
1986	18.961	23.207	17.495	17.870	18.967	35.250	21.470	21.808	15.789
1987	19.621	24.075	17.734	22.637	20.167	37.220	21.380	20.974	16.983
1988	20.635	25.036	17.912	25.624	20.961	37.948	22.687	22.147	18.157
1989	19.749	24.652	17.626	35.807	20.138	35.851	23.216	23.153	20.144
1990	18.759	23.776	16.350	18.921	17.760	36.688	23.327	24.403	21.214
1991	18.814	22.925	15.663	18.663	15.142	38.485	22.961	23.717	21.760

Table 2: First ten rows of the cleaned dataset for saving rate

2.2 US Economy in the long run

The exploratory data analysis (EDA) of key economic indicators provides insights into the historical trajectory of the US economy since 1960 as shown in Figure 1. The interest rate, depicted in blue, demonstrates notable volatility, with a peak in the early 1980s at about 15% followed by a general downtrend to about only 5% this year. The visualization of the interest rate data echoes with our intuition that US has experienced secular decline in interest rate in the long-run since the 80s. In parallel, the real GDP, shown with blue bars, exhibits a steady ascent indicative of overall economic growth (inflation is controlled), while the GDP growth rate, overlaid in red, oscillates, underscoring the cyclical nature of economic expansion and contraction. The growth rate of GDP suggests that the economy is growing slower with a 0% or negative rate in the recent years, supporting the trend of interest rate.

The unemployment rate, charted in green, reveals the economy's response to various macroeconomic stimuli and policy changes, with peaks corresponding to economic downturns. The huge volitatily represents the economic and business cycle, which is natural to happen in a large economy like the US. Lastly, the current account balance, displayed in orange, has deepened into a deficit from the 1980s onwards, highlighting the growing gap between the value of goods and services the US imports versus exports. As observed, the cumulation of current account deficit is huge and rapid after 1980s from 0 to almost -1000 Billioin USD this year. The huge current account may easily end up with heavy debt of US central bank and economic recession.

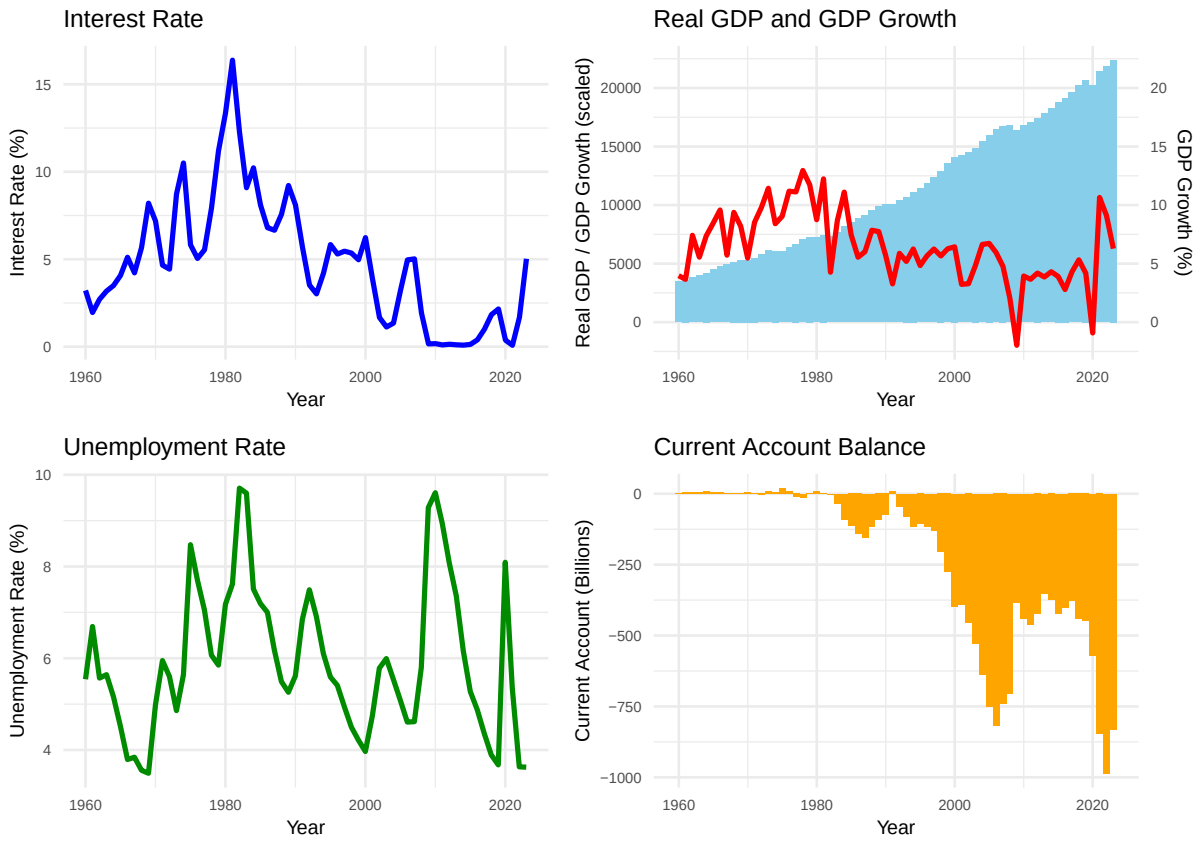

Figure 1: Major indicators of US economic development since since 1960

2.3 Global Saving Glut

When studying the trend of global excess saving, I discover distinctive trend in US and Eastern Asian and Pacific Area (excluding high income countries) as shown in Figure 2. From the 1980s to the present, the saving rate in the United States has demonstrated relative stability with minor drop, maintaining a level notably lower at around 20%. Conversely, the EAP countries exhibits a marked upward trend post-1980, reaching its zenith in the early 2000s before displaying a slight but notable retraction. Dur-

ing the period of time, gross saving rate in EAP countries rise ten percentage points from about 30% to almost 40% currently. The disparity between the two curves underlines not only the contrast in domestic saving behaviors but also the broader economic strategies in monetary policy. In conclusion, the main contributor of the "global saving glut" is not industrialized countries like the US. Oppositely, the industriailizing world are the net saver during the rapid globalization era after the cold war.

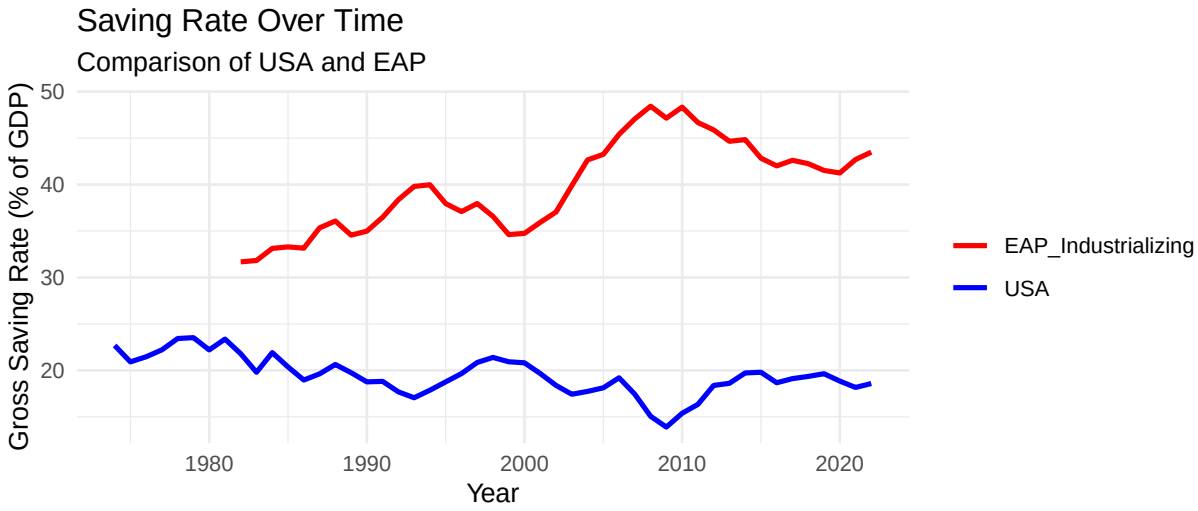

Figure 2: Gross Saving Rate in % of GDP in different countries around the world

3 Model

Combining our economic intuition and the result of exploratory data analysis, I have discovered negative correlation between US interest rate and gross saving rate in EAP industrialzing conutries. I build a multiple linear regression model to furthur study the degree and significancy of this correlation. The dependent variable of the model is the US effective interest rate. The independent variables include both domestic effect and international effect. There are three independent variables responsible for domestic effect accordingly to the three market connected with interest rate mentioned in **?@sec-introduction**. In specific, they are GDP growth rate, unemployment rate and gross saving rate in US. Regarding international effect, I only focus the effect from EAP market for the specific research question in this study. Therefore, the only independent variable here is the gross saving rate of EAP industrializing countries. The euqation of the model is:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \tag{1}$$

Where:

- X_1 represents the GDP growth rate in the US.

- X_2 represents the unemployment rate in the US.
- X_3 represents the saving rate in the US.
- X_4 represents the saving rate in the Eastern Asia and Pacific countries (excluding high-income countries).
- β_0 is the intercept of the model.
- $\beta_1, \beta_2, \beta_3,$ andβ_4 are the coefficients estimating the impact of each independent variable on the interest rate.
- ε is the error term, capturing the variation in interest rate not explained by the model.

The objective of the multiple linear regression analysis is to ascertain the coefficients for the intercept and predictors in a way that optimally aligns the model with the observed data, and to forecast the expected value of the US interest rate given different levels of economic indicators. The importance of each predictor's coefficient is evaluated using a t-test, which determines whether the estimated coefficient diverges significantly from zero.

4 Result

Table 3 summarizes the results of the multiple linear regression analysis using the past 41 years of data. In the table, we observe that the coefficient for the intercept is positive at 16.674, suggesting that the baseline level of the interest rate as what we observed in 1980 interest rate. The GDP growth is weakly correlated with interest rate positively, as shown with the coefficient of 0.247. This is to say that if the US GDP growth increase by 1 percentage point, the US interest rate is possibly increase by 0.247 percentage point accordingly. The coefficients for unemployment rate and US saving rate are also positive, recorded at 0.276 and 0.137 respectively. However p-values indicate they are not statistically significant at conventional levels. On the other hand, gross saving rate of EAP countries (excluding high income) has a negative coefficient of -0.461, which is statistically significant at the 0.001 level. More specifically, as EAP countries increase their gross saving rate by 1 percentage point, US interest rate is highly likely to decrease by 0.461 percentage point. The model's goodness-of-fit measures, including R-squared and adjusted R-squared, are moderately high, suggesting that a significant portion of the variability in the US interest rate is accounted for by the model.

	(1)
(Intercept)	16.674+
	(9.086)
gdp_growth	0.247+
	(0.142)
unemployment_rate	0.276
	(0.202)
USA_saving	0.137
	(0.287)
EAP_exclude	−0.461***
	(0.096)
Num.Obs.	41
R2	0.693
R2 Adj.	0.659
AIC	176.8
BIC	187.1
Log.Lik.	−82.424
RMSE	1.81

Note:

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

* Significance levels:

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Result of multiple linear regression model

Figure 3 provides a visualized figure for the result of the model. As red colour suggest significancy, only gross saving rate in EAP countries present significant correlation. Also, the coefficient of the saving rate in EAP countries is the only negative coefficient, indicating the inverse relationship as explained in economic theories. The positive correlation between unemployment rate and interest rate is not explained in theory. However, such positive sign may be caused by the cyclical change of unemployment rate instead of a long-term trend.

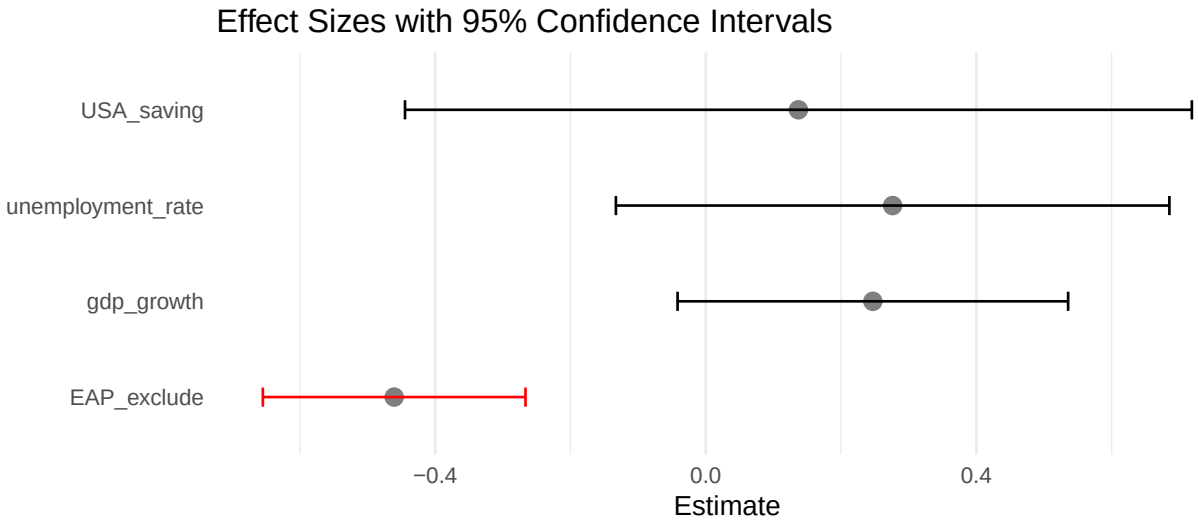

Figure 3: Visualization of coefficient of mutiple linear regression model

In general, the statistical analysis supports the hypothesis that saving rate in Eastern Asia and Pacific area is strongly correlated with the US interest rate. This further implies that the global financial market is more integrated during the part 40 years as financial markets started to perform huge influence on each other. While benefits of the integration may include more direct investment, lower transaction cost and less asymmetric information, potential risk of globalized financial market also occurred such as the credit crisis in 2008 which did not stop within the US border.

5 Discussion

5.1 Limitation

The study presented here is constrained by a limited dataset, covering only 40 years of economic indicators since 1980. This temporal boundary is primarily due to the availability of saving rates data from the World Bank, which only extends back to this year. Data prior to 1980 contains NA datas for EAP region. Additionally, the focus on the period post-1980 is intentional, as it aligns with the broader onset of globalization following the conclusion of the Cold War, marking a new era in international economic dynamics. As the globalization pattern continues, we will have more data in the future to run the model, which provides us with higher credibility.

5.2 Future study

This analysis is specifically designed to study the relationship between the United States and the East Asia and Pacific region, excluding high-income countries within that area. This selection was made

to scrutinize the economic interactions based on the hypothesis regarding savings and interest rates. However, this does limit the generalizability of the findings across other rapidly industrializing regions and their interconnections with other industrialized nations. Future studies could broaden this scope to include a more diverse array of emerging economies, which could offer a more global perspective on the savings glut hypothesis and its influence on international interest rates. Some potential exploration include Middle East and Arabian region, Latin American region and South African region. By incorporating a wider spectrum of industrializing regions, subsequent research might uncover varied and complex economic patterns that could further enrich our understanding of global financial trends.

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