Graphs

*Used quarterly data for all my graphs, trend lines might not be very smooth because graph uses quarterly data

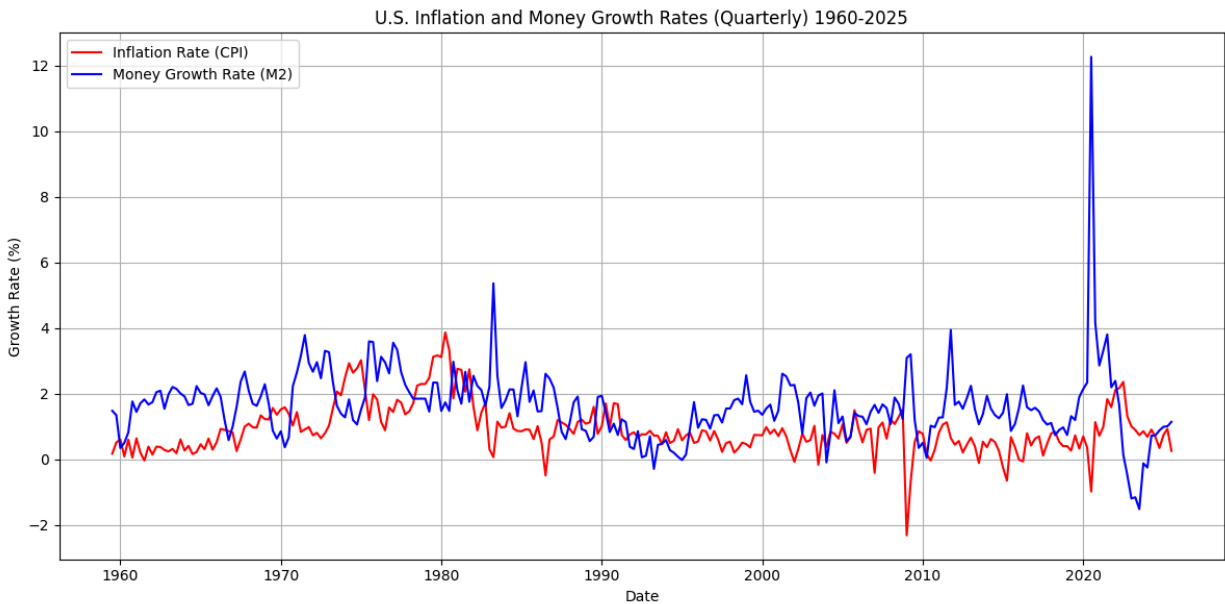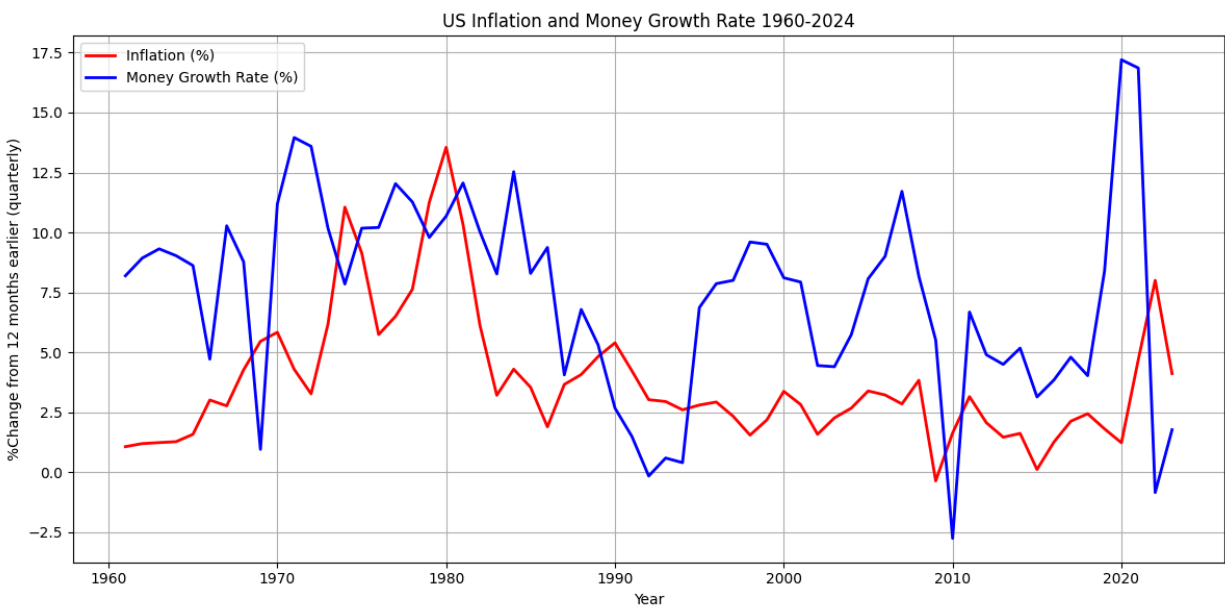**Figure 1: U.S Inflation and money growth rates (quarterly) percentage change per quarter**

Figure 2: U.S inflation and money growth rate % change from 12 months earlier (quarterly)

Both graphs show the relation of inflation and money growth rate from 1960 to 2024. Figure 1 graph displays the quarterly percentage change in the U.S. inflation rate, measured by the Consumer Price Index (CPI) and the money growth rate (M2) as a quarterly percentage change, While, Figure 2 displays the quarterly percentage change 12 months earlier (quarterly)

Figure 1 and 2 shows the relationship between money supply and inflation, explained by the Quantity Theory of Money (MV = PY). We can see that the inflation and money growth are related in the long term, inflation shows trend similar to money growth but lagging behind, this is because it takes time for the increased money growth to circulate the economy and affect prices.

There was a huge spike in the money growth rate in 2020, and I found out that the cause of this was largely because during the start of COVID-19, the US central bank attempted to combat the economic crises during covid19 by giving huge amounts of stimulus payments to its citizens amidst the economic recession to stabilize prices. And also the Fed bought long term financial assets to inject more money into the banking system, lower long term interest rate and stimulate the economy. This lead to a greater money supply in the economy and later on in the long term, causes inflation to rise.

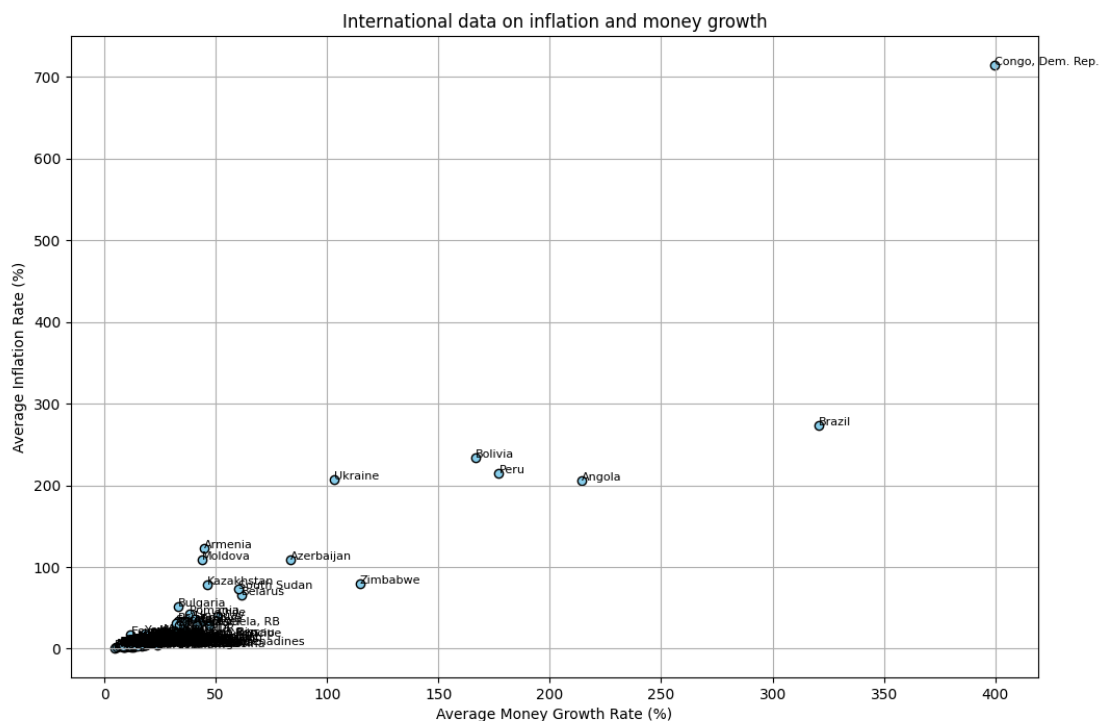**Figure 3: International data on inflation and money growth (averages)**

Figure 3 is a scatter plot showing the relationship between average inflation rates and average money growth rates for different countries.

At first glance, we see that the numbers doesn't make sense, with the inflation rate % going up to 700% and money growth rate % going up to 400%. However, it is correct, as this graph shows the average inflation rate over the years for each country, and some countries like democratic republic of congo experienced hyperinflation which on that specific year their country's inflation rate went up to 23,773% in one year, and when averaged gave a value of around 700%, other countries also experienced hyperinflation, such as Brazil, Bolivia, Angola, Ukraine, Zimbabwe. These countries causes the graph to span the inflation rate % up to 700% and money Growth rate % to 400%

This graph shows a positive correlation between average money growth rate and inflation, which shows that high/excess money growth rate leads to high inflation. Just like how in Zimbabwe, because the country is facing serious economic challenges, the government decided to print a huge amount of money, which then causes their citizens to lose confidence in the strength of their own currency, leading to hyperinflation.

Figure 4: The CPI and average hourly earnings (2006-2025)
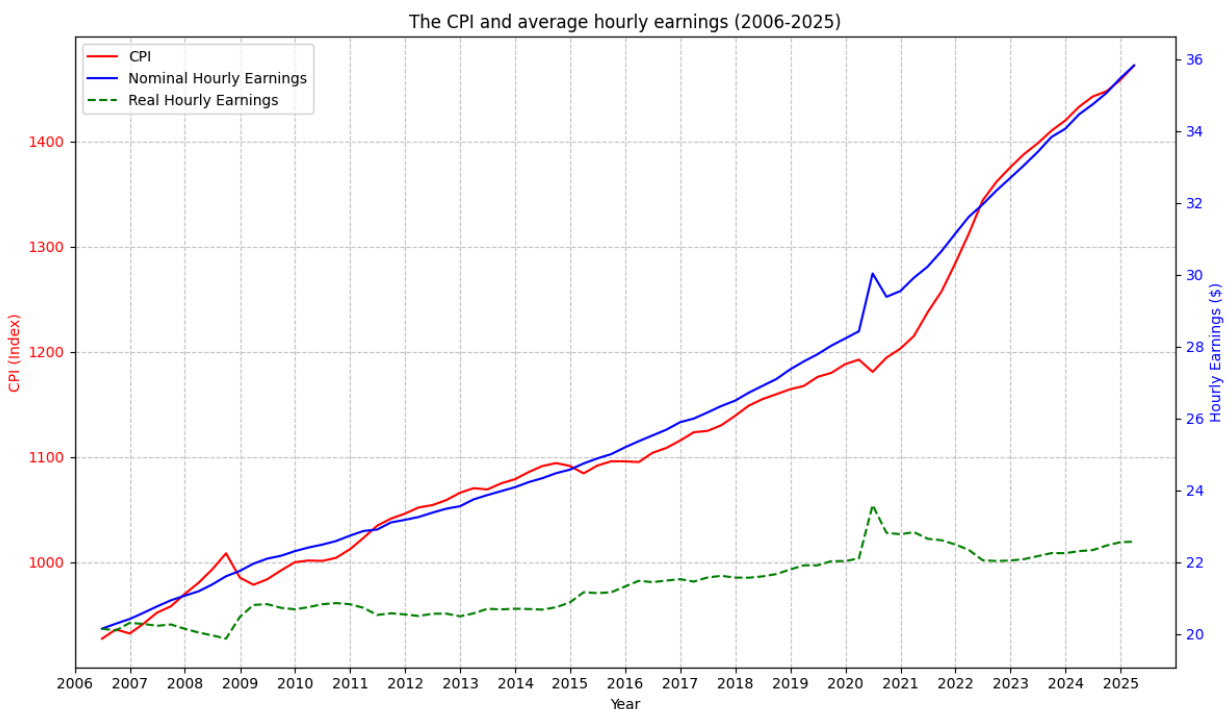

Figure 4 shows the relationship between the consumer price index, Nominal hourly earnings and Real hourly earnings.

Analyzing the graph, we see that the CPI and Nominal hourly earnings showing an uptrend graph, the explanation for the uptrend graph CPI is that it reflects the consistent increase in inflation over the years, and because of inflation too, we can see an uptrend on the nominal hourly earnings.

The real hourly earnings are calculated as Nominal Hourly earnings divided by the CPI. Unlike CPI and nominal hourly earnings, we see a steady slow increase for real hourly earnings. From 2009 to 2019 the wasn't much increase or fluctuation in the real hourly earnings, however, during the year 2020-2021, we see a sudden sharp increase in real hourly earnings because of the covid pandemic, causing shifts in employment. And after the year 2021, inflation accelerated quicker causing an increase in the real hourly earnings.

The graph shows that the CPI lags behind Real hourly earnings. And the reason for this is because real hourly earnings are indicators of the purchasing power of workers. When real earnings rise, workers are willing to buy more goods and services, increasing the CPI. And when real hourly earnings fall, they are less willing to buy goods and services.

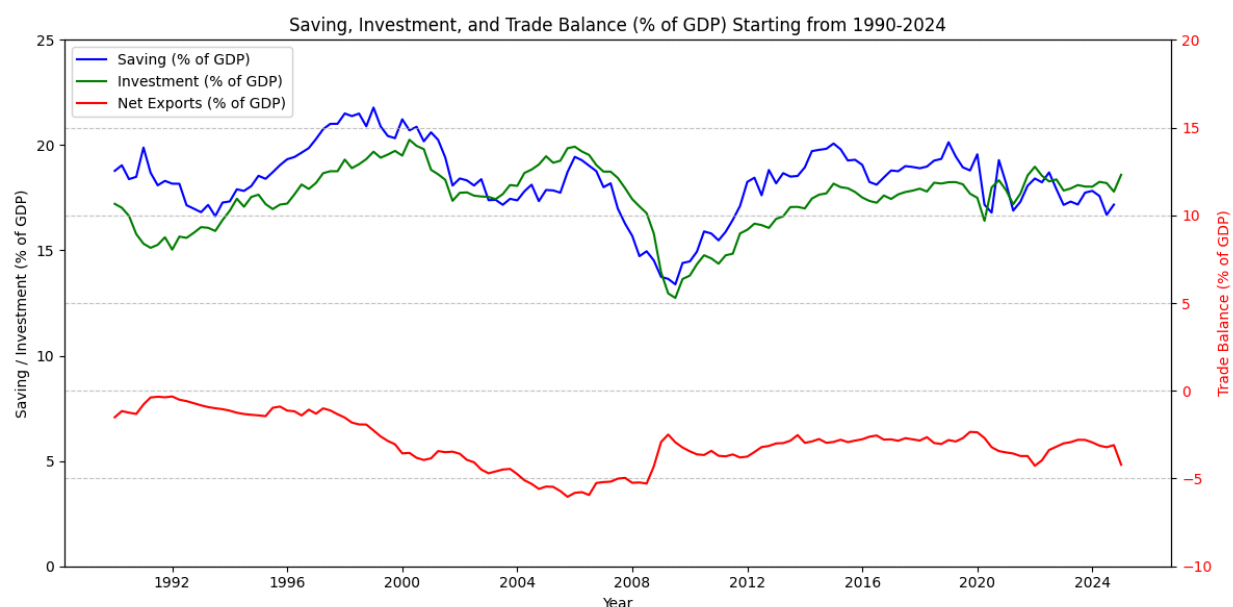**Figure 5: Saving, Investment, and Trade Balance (% of GDP) starting from 1990-2024**

Figure 5 shows the graph of US national savings, gross private domestic investment and trade balance as a percentage of GDP from 1990 to 2024.

We can see a similar graph of Savings and investments, both cycling in between the ranges of 12.5% and 20% of gdp. From, we see changes between when savings is above investments and when investments is above savings. when saving is above domestic investments, this means that when saving exceeds domestic investment, it causes a surplus. And on other period, when investment exceeds savings, it results in a deficit. And analyzing the trade balance, we see that when savings is above investments we see a higher value of trade balance as % of GDP than when investments is above savings. This is because trade balance = net exports, when there is surplus, net exports are higher and when there is deficit, net exports are lower. This graph is based on S - I = NX = Trade Balance.

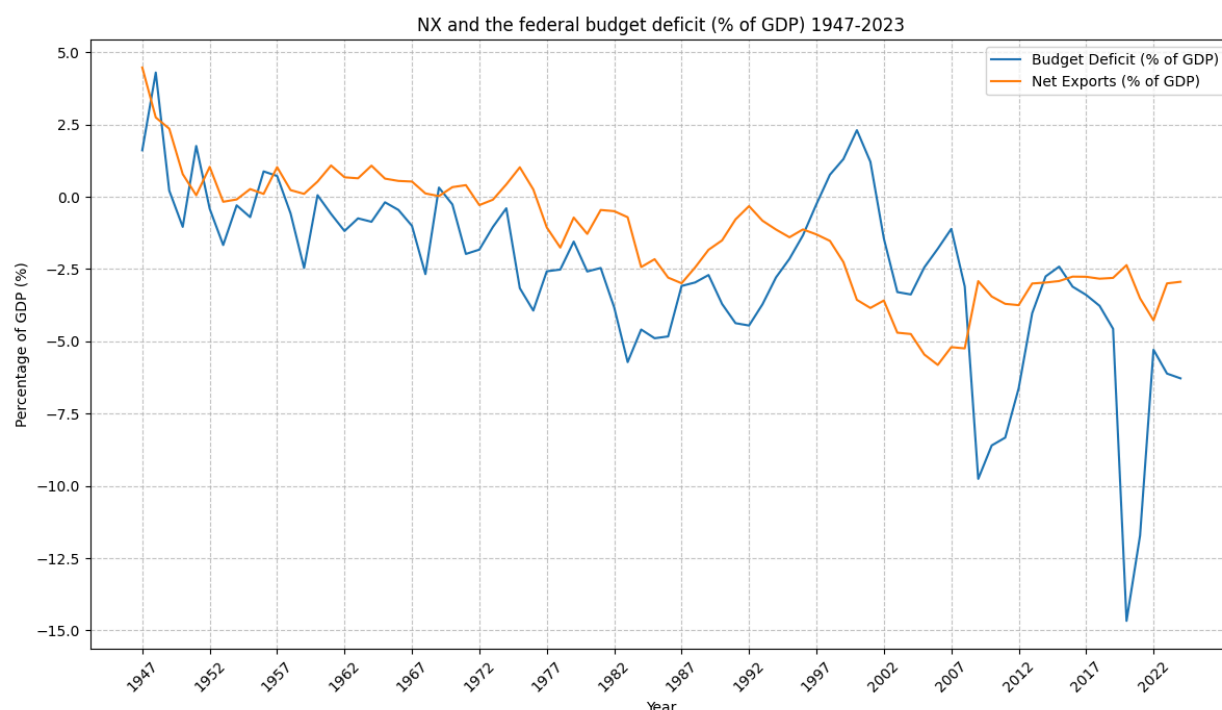**Figure 6: Net Exports and Federal budget deficit (% of GDP) 1947-2023**

Figure 6 shows the relationship between US net exports and the federal budget deficit. The federal budget deficit has fluctuated significantly, with large deficits during wartime (though not explicitly shown pre-1947, implied by post-war recovery), recessions (e.g., early 1980s, early 1990s, 2001, 2008-2009, 2020), and periods of significant tax cuts or spending increases

In 1947-1975 we see that net exports are above 0, indicating that there is trade surplus during those years, but after the 1970s, Net exports have remained below 0, indicating a trade surplus. When the budget deficit is above zero, it indicates that government spending exceeds revenue, and when its below 0 its indicating a budget surplus.

This graph explains the twin deficit hypothesis. The idea is that A budget deficit tends to increase the trade deficit (decrease net exports). Because a budget deficit leads to higher government borrowing, and government borrowing increases interest rates: Higher interest rates attract foreign capital (raising the currency value), which makes exports more expensive and imports cheaper.

In 2008, there was a financial crisis which led to the fall of Lehman brothers. Budget deficits surged due to stimulus spending and reduced tax revenues. Net exports initially improved (became less negative) as the recession suppressed import demand and investment. Later, as the economy recovered, the deficits showed varied patterns. This adds to the twin deficit hypothesis. And also in recent years, significant increases in the budget deficit (e.g., due to tax cuts and pandemic relief spending) have often been accompanied by a worsening or persistently large trade deficit, again lending some support to the hypothesis.

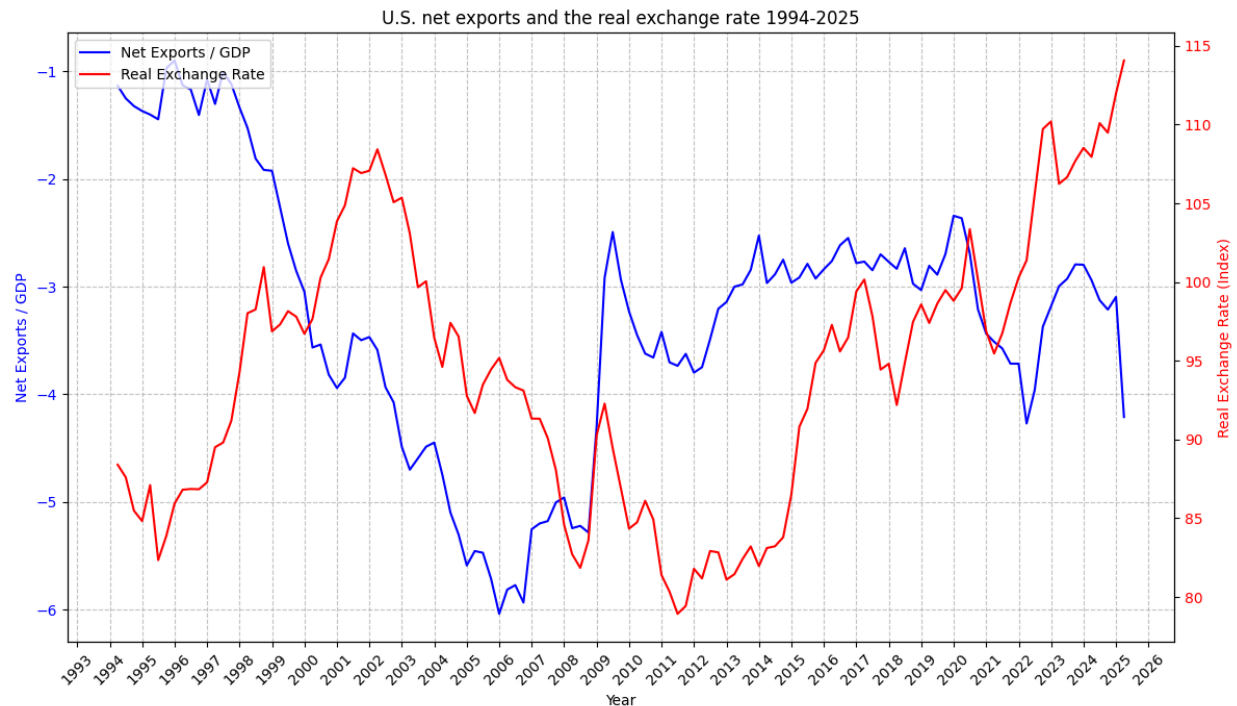**Figure 7: U.S net exports and the real exchange rate 1994-2025**

Figure 7: U.S net exports and the real exchange rate 1994-2025

Figure 7 shows a graph of Net Exports as % of GDP and Real exchange rate. Seen from the graph, net exports are generally negative, indicating a trade deficit. The deficit widened from the mid-1990s to around 2005-2006, narrowed somewhat, and then showed fluctuations with a tendency to widen again in more recent years. The real exchange rate shows significant fluctuations. It appreciated (rose) from the mid-1990s to the early 2000s, then depreciated until around 2011-2012, followed by another period of appreciation.

This result shows an inverse relationship between net exports and real exchange rate. When the real exchange rate goes up, net exports tend to fall. When real exchange rate increases, domestic good becomes more expensive for foreigners, so businesses will see it as its more profitable to sell inside the country and so exports tend to fall. And when real exchange rate decreases, domestic goods becomes cheaper for foreigners, so companies see it as a better profitability to sell goods outside, and so exports tend to rise.

Discussion

All the data I used in the input of the graph values are quarterly data, because I'm using quarterly data, the graph might seem very spread out and not smooth, this was a mistake in my part for not using monthly data instead.

What interests me most is the last graph, Figure 7, explaining the relationship of U.S net exports and the real exchange rate. At the year 2025, we can see the steep drop in net exports because of Trump's (the current president of the United States) development of the country's own financial strength and improving the supply of goods produced in the country. To accomplish this, he issued huge tariffs to a lot of countries. This in turn, makes businesses to focus more inside their own country, because of the greater profit potential in their own country than exporting to other countries. Which reduces net exports. And since net exports are reduced, we can see an increase in the real exchange rate of the country, as shown in the graph.

Figure 1, 2, and 3 proves the quantity theory of money. The Quantity Theory of Money provides a fundamental framework for understanding the long-run positive relationship between money supply growth and inflation. This is strongly supported by both the data for the U.S. (especially seen in Figure 2) and the international cross-sectional data (Figure 3). However, short-run complexities arise due to economic conditions and unexpected shocks (e.g., oil crises, pandemic-related disruptions), policy lags, and the role of inflation expectations.

Figure 4 explains the relationship of inflations and wages. Wages tend to adjust for inflation at the long term, because of contracts. The relationship between the Consumer Price Index (CPI) and average hourly earnings underscores the critical distinction between nominal and real income. Inflation directly impacts the purchasing power of wages. Real wage growth depends on nominal wage growth relative to inflation and is influenced by various factors. Periods of high inflation can lead to declining real wages if nominal wage growth doesn't keep pace, as seen post-2021.

And Finally in figure 7, it shows the relationship between the real exchange rate and net exports is generally inverse, as theory predicts. Appreciation (real exchange rate increase) tends to worsen the trade balance, while depreciation (real exchange rate decrease) tends to improve it, trade policies like tariffs can affect both net exports and the real exchange rate due to and fluctuations in exchange rate movements.