Inflation and Globalization

A STUDY OF GERMANY & USA

By
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ABSTRACT

This paper examines the trading relationship between United States of America and Germany, by investigating the exchange rates and interest rates. We test the presence of Covered Interest Arbitrage Parity and Relative Purchasing Power Parity. Furthermore, we also assess the impact of changes in interest and exchange rates, on the capital flows and currents accounts of both the nations. We segregate our study of the current accounts across three different time periods: 2003-2008, 2009-2014 and 2015-2017 to get a better understanding of the trends in trade between the two nations.

Keywords: *Interest Rate, Exchange Rate, Purchasing Power Parity, Covered Interest Arbitrage Parity.*

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I. INTRODUCTION

Germany is a high-income country in the globe. It has been the world's top exporter of goods and the United States' top European trade and investment partner. Despite the fact that its economic and commercial strategies are defined by the EU, it has a significant role in influencing EU policy. For the United States, the health and functioning of the German economy, as well as the government's policy initiatives, are important not just on a bilateral and regional level, but also on a worldwide level.

The Federal Republic of Germany's living standards have been steadily improving. Since 1950, GDP per capita has increased by a factor of six. This rise in wealth and status has aided in the formation of a highly stable middle class. German companies are globally competitive, and their workforce is often highly skilled. Exports are extremely important to the German economy. Exports of products and services contributed for 47 percent of Germany's GDP in 2008, more than three times the US' figure.

Outside of Europe, the United States is Germany's top commercial partner. In 2008, the United States accounted for 7.2 percent of German exports and 4.2 percent of Germany's imports. Germany, on the other hand, is the United States' largest European commercial partner and fifth largest trading partner globally, accounting for 4.5 percent of total US trade.

The United States and Germany have differences over the causes and appropriate policy responses to the global economic downturn. Obama Administration officials have criticized Germany for what some consider a relatively watchful response to the crisis. They have also taken aim at a perceived German reluctance to support common European approaches to fixing the banking sector, to join in coordinated cooperative spending programs, and to deal with the Central European financial crisis.

Indeed, many in Germany view profligate consumption and unregulated markets in the United States and UK as having been the cause of the global crisis. These critics argue that the downturn could have been avoided had others behaved as prudently as Germans by cutting wage costs and public expenditures.

Germany, according to US officials and lawmakers, bears blame for the downturn because it has amassed significant current account surpluses over the previous six years. These surpluses, when combined with those of China and Japan, allowed the rest of the globe to benefit from excess savings. According to this viewpoint, global economic imbalances necessitated the United States serving as the world's "consumer of last resort" in order to keep the global economy thriving.

Many experts in the United States have suggested that reducing Germany's massive current account surplus might be a critical component of the global rebalancing required to return the global economy to a more sustainable development path. Domestic demand in Germany must rise quicker than it has in the past as part of this process. German politicians often reject this line of reasoning, citing concerns that additional expenditure will impose long-term debt on a declining population and claiming that the fundamental aspects of their export-oriented and social market economy model are sound.

II. COVERED INTEREST ARBITRAGE PARITY

Our study in this section is aimed at verifying whether the concept of covered interest arbitrage parity holds in the case of Germany and the USA. The concept postulates that the interest differential in favour of the foreign monetary centre is equal to the forward discount on the foreign currency. This leads to the elimination of any arbitrage profits, if any.

To verify the concept, we found the forward rate and spot rate between USA and Germany, which was used to find the Forward Premium or Discount. This was then compared with the Interest Rate differential to find if the parity is observed in real life.
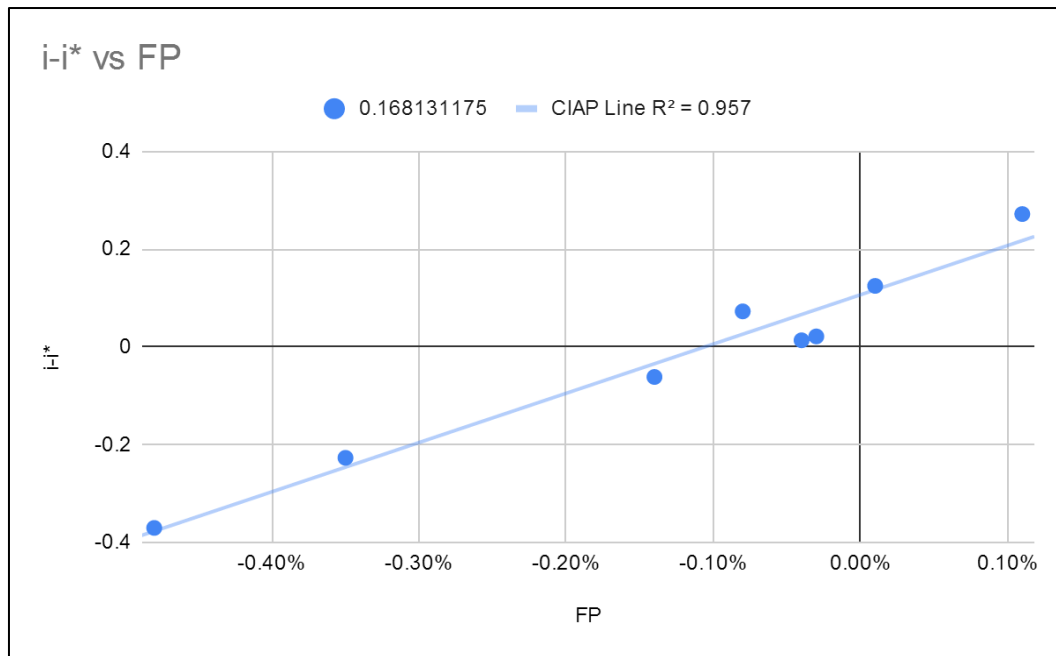
Fig. 1: Covered Interest Arbitrage Parity Scatter Plot

As we can see in the above figure, the line for best fit as derived from the available data shows that there exists a relationship that closely emulates the CIAP Line that would have existed according to theory. We can also see that the line of best fit has an R^2 of 0.957 which indicates that there exists a definite relation between the points.

The only reason the relation may not exist as per theory maybe because the theory talks about the entire monetary centre having a given interest rate but in real life, there exist different interest rates due to the existence of a risk structure among assets. Also, the number of observations may understate the relation.

RELATIVE PURCHASING POWER PARITY

In this section of the study, we are trying to test the existence of Relative PPP in the case of the USA and Germany. The theory asserts that prices and exchange rates change in a way that preserves the ratio of each currency's domestic and foreign purchasing powers i.e., the rate of change in exchange rate is equal to the difference in the two countries' inflation rate.
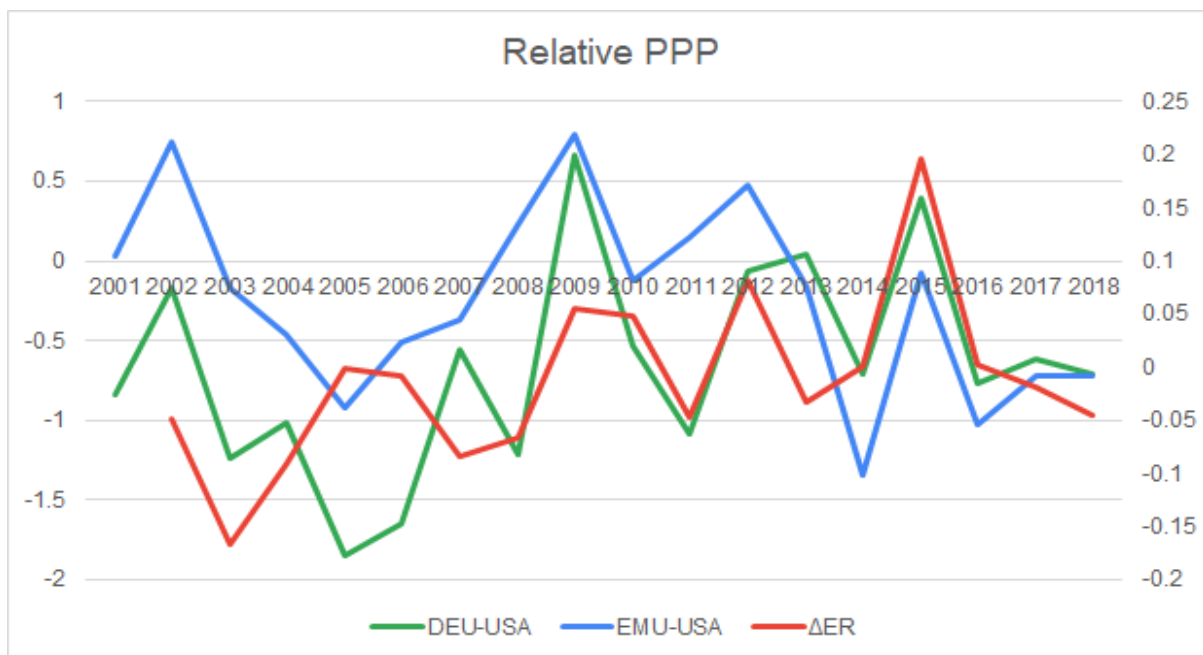

Fig. 2: Relative Purchasing Power Parity

The observation that can be derived from the following graph that is that inflation rates and exchange rates move together.

However, relative PPP is not an exact measure due to various factors such as exclusion of transaction costs, trade barriers, prevailing monopolistic and oligopolistic markets and most importantly, non-uniformity of basket of goods. This hence supplements the fact that although the inflation rates and exchange rates are moving together, there is an absence of a strong positive correlation between the two.

CAPITAL FLOWS

In this section, we will be trying to determine how Capital Flows are determined and factors that affect them. First, we will try to find the relation between interest rates and Capital Flows. Then, we will try to find the relation between Exchange Rates and Capital Flow. Finally, we will try to find the relation of Interest Rates and Exchange Rate together on Capital Flow.

For our analysis, we look at Germany as our home country and Net Capital Flows from USA to Germany i.e., the difference in the flow of capital from one country to another.

INTEREST RATES AND CAPITAL FLOW

We know that by theory, interest rate increases should cause capital flows to rise. This happens because any increase in interest rates would cause any rational investors to shift their investment. On taking a look at the data pertaining to the USA and Germany, we find the following:

Short Term Rates Correlation		Long Term Rates Correlation	
Correlation Lag 0	-0.2196389392	Correlation Lag 0	-0.4962754867
Correlation Lag 1	-0.1070480858	Correlation Lag 1	0.2621645833
Correlation Lag 2	-0.05779510293		
Correlation Lag 3	0.09431499184		

As we can see in the above table, there is a lag between the changes in interest rates and the changes in Capital Flows. But it can also be observed that the lag is larger in the case of Short-Term Interest Rate when we compare it to Long Term Interest Rates. We feel that this could be observed because in the short run, investors may not be sure whether the interest rates will rise further and hence they take some time to study the trends completely without showing haste. This also goes with the conclusion that Capital Flows to countries with low returns to capital unless the returns adjusted to risk are high enough (Kalemli-Ozcan S., Srensen B., Turan B., 2007)

EXCHANGE RATE AND CAPITAL FLOWS

According to theory, any depreciation of the home currency with respect to the foreign currency will cause capital to flow into the home nation. Keeping this in mind, we proceed to examine our data, and we find the following:

Correlation lag 0	0.006533628519
Correlation lag 1	0.1077946045
Correlation lag 2	0.1696830368
Correlation lag 3	0.004954679861

We find that changes in EUR/USD have a positive correlation with Capital Flows, but we can see that there is a lag in the transmission of Exchange Rate changes. This may be because expectations take time to adjust which may cause delays in changes in Capital Flow.

EXAMINING COMBINED EFFECT OF INTEREST RATES AND EXCHANGE RATES ON CAPITAL FLOWS

As we have seen, even the highest values of correlation between interest rates/exchange rates and capital flows in isolation are positive but too low to have any significant effect on the capital flows in the real world. Now we examine whether all short-term interest rates, long-term interest rates and exchange affect the capital flows significantly or not.

Multiple R	0.402570177

Therefore, when combined, only three variables account for approximately 40% of the changes in capital flows. This combined effect is higher than the total of the isolated effects of these variables. This can be explained by the possibility of inter-variability of the variables (change in one variable causing a change in the other variable), therefore these variables directly as well as indirectly affect the capital flows.

INTEREST RATES AND EXCHANGE RATES

The differences in the interest of two economies can be used to determine the exchange rates between those two countries. To do this, we have used the differential of both short term and long-term bonds of US and Germany. The combined effect of these two differentials can be seen as follows:

Multiple R	0.20464

	Coefficient
Intercept	0.792328
Short i – i*	0.03101
Long i – i*	-0.05081

Here,
i = German interest rates
i = US interest rates*
Spot Exchange rate is written as Euro/Dollar

Interest rate differentials of the long-term and short-term bonds account for approximately 20% changes in the Exchange rates. Moreover, the short-term interest rates show a positive correlation meaning that and increase in the differential would lead to the rise of the exchange rate. Therefore, an increase in the interest rates of a country would lead to the depreciation of that country's currency. The long-term interest rates differential, however, shows a negative correlation with exchange rate. Meaning that with an increase in the interest rate differential, the exchange rate would fall. Thus, an increase in a country's interest rate would lead to the appreciation of that economies currency.

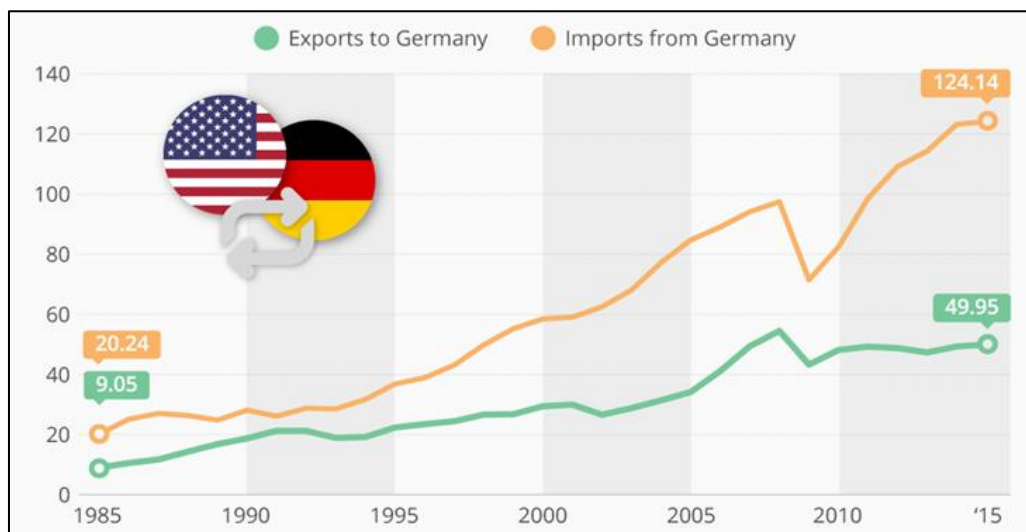## IMPACT ON TRADE DUE TO CHANGES IN EXCHANGE RATES

Fig. 3: Volume of imports and exports of trade goods from and to Germany ($US Billion)

EXCHANGE RATES AND TRADE

With the appreciation of the US Dollars, US exports decrease while the imports increase. This happens as exports become more expensive and their demand decreases. Conversely depreciation of US dollar causes the exports to rise (as exportable items become cheaper in the foreign market), and imports decrease (as importable items become more expensive in the domestic market).

EXCHANGE RATES AND ITS EFFECT ON CURRENT ACCOUNT (THROUGH TRADE)

With the appreciation of the US dollar, exports decrease and imports increase which will negatively affect the current account (deficit may be created or reduce the surplus). Conversely, a depreciation of the currency increases exports and decreases imports, thus having a positive effect on the current account (may create a surplus or reduce the deficit)

Note: However, with the depreciation of the currency if the imports do not fall by much (generally the case as short term preferences do not change easily) in comparison to the rise in exports, then the payment side will be heavier than the receipt side and we will not observe the above-mentioned relation.

Fig. 4: Imports and Exports of US and Germany

2003-2008:

The exchange rate steadily reduced during these years from 0.886034167 Euro/USD to 0.682674711 Euro/USD. This implies that Euro appreciated which consequently resulted in growing imports from the US while the exports to the US continued to rise but at a diminishing rate. This behaviour of the imports of the US that can be attributed to the J Curve theory is an economic theory which states that, under certain assumptions, a country's trade deficit will initially worsen after the depreciation of its currency—mainly because higher prices on imports will be greater than the reduced volume of imports. The J Curve operates under the theory that the trading volumes of imports and exports first only experience microeconomic changes. But as time progresses, export levels begin to dramatically increase, due to their more attractive prices to foreign buyers. Simultaneously, domestic consumers purchase less imported products, due to their higher costs.

2009-2014:

The aftermath of the Global Financial Crisis was a plunge in trade between the US and Germany. During this period, the exchange rates rose and the Euro depreciated. As the US economy started on the trajectory of recovery, the imports from Germany rose. Indeed, many in Germany view profligate consumption and unregulated markets in the United States and the UK as having been the cause of the global crisis. These critics argue that the downturn could have been avoided had others behaved as prudently as Germans by cutting wage costs and public expenditures.

Many officials and politicians in the United States think that Germany bears some of the blame for the downturn since it has run up massive current account surpluses in recent years. According to this theory, if the US had not decided to pursue an accommodative monetary policy in the 2001-2002 era, which led to the development of easy credit and the financial crisis, global aggregate demand would have fallen short of supply, and global unemployment would have risen. According to this viewpoint, global economic imbalances necessitated the United States serving as the world's "consumer of last resort" in order to keep the global economy thriving.

Many experts in the United States have suggested that reducing Germany's massive current account surplus might be a critical component of the global rebalancing required to return the global economy to a more sustainable development path.

2015-2017:

The exchange rose steeply in 2015 and 2016 and then stagnated at around 0.89 Euro/USD. This steep depreciation was a result of Brexit. Albeit, this surprisingly didn't result in an increase in imports of the US from Germany.

At the end of 2016, President elect Donald Trump, who has German ancestry, vowed in his election campaign to revamp the American economy by fending off imports and having more goods produced in the United States. Any attempt at hampering free trade by installing tariffs on imported goods would have a severe impact on both parties.

After President Trump's visit to G7 and NATO in 2017, tensions between him and the German Chancellor Angela Merkel arose. Merkel alleged that the times in which some international partners could be relied upon unreservedly were gone. Trump retorted by criticizing Germany's trade gap via Twitter. Indeed, there is a pretty hefty balance deficit with Germany. The United States imported goods worth some $114 billion from Germany in 2016, while exports were worth around $49 billion for the same year, according to the U.S. Census Bureau. All figures are on a nominal basis, i.e. not adjusted for inflation, according to the source.

Hence, the US President's vow to fend off imports had been actualized and the imports from Germany reduced.

III.   CONCLUSION

Our analysis showed that the relationship between the Forward Premium or Discount when compared with the Interest Rate differential closely emulates the CIAP Line that would have existed according to theory. We also found that the inflation rates and exchange rates move together, although not perfectly, owing to various factors such as exclusion of transaction costs, trade barriers, prevailing monopolistic and oligopolistic markets and most importantly, non-uniformity of basket of goods. As far as the impact of changes in interest rates on capital flows are concerned, a lag was observed, which was larger in the case of Short-Term Interest Rates. We feel that this could be observed because in the short run, investors may not be sure whether the interest rates will rise further and hence they take some time to study the trends completely without showing haste. Changes in the EUR/USD rate had a positive correlation with Capital Flows, but we observed a lag in the transmission of Exchange Rate changes.

In the period 2003-2008, the Euro appreciated which consequently resulted in growing imports from the US while the exports to the US continued to rise but at a diminishing rate. This behaviour of the imports of the US that can be attributed to the J Curve theory is an economic theory which states that, under certain assumptions, a country's trade deficit will initially worsen after the depreciation of its currency—mainly because higher prices on imports will be greater than the reduced volume of imports. In the aftermath of the Global Financial Crisis, there was a plunge in trade between the US and Germany. During this period, the exchange rates rose and the Euro depreciated. As the US economy started on the trajectory of recovery, the imports from Germany rose.

APPENDIX

Table A1: Covered Interest Arbitrage Parity

Year	Forward Premium	i-i*
2009	0.03%	0.168131175
2010	0.01%	0.124820825
2011	0.11%	0.271816675
2012	-0.08%	0.07267085
2013	-0.04%	0.0135
2014	-0.03%	0.02144165
2015	-0.14%	-0.0615083425
2016	-0.35%	-0.226964575
2017	-0.48%	-0.3703875

Table A2: Relative Purchasing Power Parity

Year	DEU-USA	EMU-USA	ΔER
2001	-0.84231	0.03116	
2002	-0.16523	0.74088	-0.04918
2003	-1.23587	-0.17486	-0.16613
2004	-1.01150	-0.46103	-0.09105
2005	-1.84584	-0.92315	-0.00155
2006	-1.64852	-0.50590	-0.00868
2007	-0.55433	-0.37036	-0.08343
2008	-1.21072	0.23171	-0.06565
2009	0.66828	0.79272	0.05445
2010	-0.53623	-0.11947	0.04890
2011	-1.08167	0.15138	-0.04727
2012	-0.06085	0.47221	0.08193
2013	0.03989	-0.15460	-0.03229
2014	-0.71543	-1.34655	0.00076
2015	0.39579	-0.08047	0.19626
2016	-0.76983	-1.02450	0.00264
2017	-0.62061	-0.72483	-0.01840
2018	-0.71042	-0.72475	-0.04531

Table A3: Capital Flows and Exchange Rates

Year	ER	K Flow
2001	1.11751	
2002	1.062551667	1769
2003	0.8860341667	25522
2004	0.805365	9952
2005	0.80412	15024
2006	0.7971408333	-60248
2007	0.7306375	147297
2008	0.6826747112	-81738
2009	0.7198433598	7334
2010	0.755044952	-6657
2011	0.7193552536	-24096
2012	0.7782936014	45508
2013	0.7531591818	17857
2014	0.7537307367	-46400
2015	0.9016589616	-24390
2016	0.904035128	-47446
2017	0.8873974211	66290
2018	0.8471863711	-45185

Table A4: Capital Flows and long- and short-term interest rate differential

Year	ER	Short i-i*	Long i-i*	KF
2002	1.06	1.59	0.17	1769
2003	0.89	1.18	0.06	25522
2004	0.81	0.54	-0.24	9952
2005	0.80	-1.33	-0.94	15024
2006	0.80	-2.07	-1.03	-60248
2007	0.73	-0.99	-0.41	147297
2008	0.68	1.67	0.32	-81738
2009	0.72	0.67	-0.03	7334
2010	0.76	0.50	-0.47	-6657
2011	0.72	1.09	-0.18	-24096
2012	0.78	0.29	-0.31	45508
2013	0.75	0.05	-0.78	17857
2014	0.75	0.09	-1.38	-46400
2015	0.90	-0.25	-1.64	-24390
2016	0.90	-0.91	-1.75	-47446
2017	0.89	-1.48	-2.01	66290
2018	0.85			-45185

Table A5: Trade Data

Year	Euro / 1 USD	US imports from Germany	US exports to Germany
2003	0.886034167	69681503	28830851
2004	0.805365	79143125	31411580
2005	0.80412	86873024	34175632
2006	0.797140833	91215230	41313147
2007	0.7306375	96631596	49611212
2008	0.682674711	99758479	54672137
2009	0.71984336	72632756	43220925
2010	0.755044952	84129523	47994836
2011	0.719355254	100675925	48939215
2012	0.778293601	109216636	48372035
2013	0.753159182	114338453	46862995
2014	0.753730737	125532375	49028160
2015	0.901658962	127170567	49641402
2016	0.904035128	116266723	49164593
2017	0.887397421	119991393	53497508

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