In this essay I will undertake three investigations into the validity of Relative Purchasing Power Parity (RPPP). RPPP extends the idea of Purchasing Power Parity to national economies and looks to account for the influences of exchange rates and inflation rate differentials.

If RPPP holds then for some time period *Δt* the following equilibrium between exchange rates and inflation is observed:

*ΔS = πh - πf*

*S* = Spot exchange rate

*πh*= Inflation rate in home country

*πf* = Inflation rate in foreign currency

To calculate the above as percentages from our raw data I will use the following equation:

*(log(St) - log(St-1 )) \* 100 = ((log(Ph,t) - log(Ph,t-1)) - (log(Pf,t) - log(Pf,t-1))) \* 100*

*Ph,t* = Price in home country at time *t*

*Pf,t-1* = Price in foreign country at time *t-1*

I have gathered historic Consumer Price Index (CPI) and spot exchange rate data from (FRED,2020) and will investigate the validity of RPPP under various economic situations. In order to analyse validity I will be using the notion of an RPPP score, this is calculated by re-arranging our first equation as follows:

*RPPP score* = *ΔS - (πh - πf)*

RPPP score will be used in conjunction with statistical analysis and is primarily to aid visualisation though conceptually speaking a score of 0 would be a perfect RPPP equilibrium.

For the purposes of our investigations the home country will always be the USA, therefore the home currency is the US dollar and exchange rates are direct quotations. Both the CPI and spot rate data are annual averages and *Δt* is one year (Hazell,2020).

Investigation 1: RPPP for the USD against Exchange Arrangement Currencies

Exchange arrangement currencies such as the East Caribbean Dollar, the CFA Franc and the Euro present a conceptual barrier to the validity of RPPP. The issue comes from the fact that one exchange rate is used for comparison against several countries, each with their own inflation rates.

There are many influences upon the inflation rate some of which, such as money supply and base interest rates, are directly controlled by the central bank and will apply universally to all countries within the currency. However, there are some influences such as NON-TRADEABLE economy will lead to some inter-country variations in inflation and purchasing power.

Figure 1 shows the RPPP scores when *ΔS* = USD/EUR and *πf* is France or Germany.

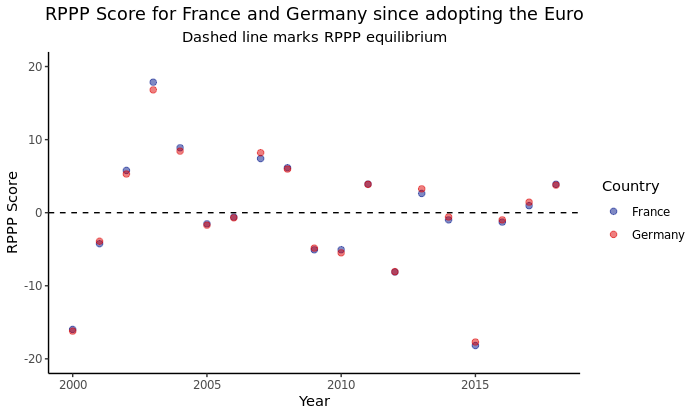


Figure 1

The above figure raises two interesting points. Firstly the RPPP scores of France and Germany mirror each other very closely suggesting our initial concerns around domestic factors creating divergence in RPPP do not appear to hold, at least not in this particular case.

The second point is around the scattering of RPPP scores and the fact that in only a handful of years the value comes close to the equilibrium score of 0. However, this dispersion should not be immediately taken as a failure of RPPP as to some degree it is the result of the scaling of our axis.

In order to determine if a statistically significant difference exists between our computed values of *ΔS* and (*πh - πf*) I ran a two tailed t-test where our hypotheses are:

H0 : µ *ΔS* = µ(*πh - πf*)

H1 : µ *ΔS* ≠ µ(*πh - πf*)

This results in p-values of 0.9242 when *πf* is France and 0.9329 when *πf* is Germany.

This tells us that we cannot declare a statistically significant difference between the exchange rate and inflation rate differentials.

Whilst this does not directly imply equivalence between the two sets of values it does offer some reinforcement to the theory that RPPP is operating at a macroeconomic level.

Investigation 2: RPPP for the USD against a pegged foreign currency

According to the IMF there are 63 countries that engage in pegging (IMF,2013), namely deliberately acting to maintain specific exchange rates with a target foreign currency. This presents an interesting challenge to RPPP.

If we presume that the attempts at pegging prove successful then *ΔS* is held very low, theoretically zero, therefore if RPPP is to be held then the inflation rates differential must also be approximately zero.

Counter to this argument is the fact that the exchange rate pegging methods such as quantitative easing and OTHER stuff often lead to increased inflation in the currency being supressed.

Does this inflation volatility prevent RPPP from occurring or does it serve as a mechanism through which the inflation rates are manipulated to account for the supressed *ΔS*?

To investigate this Figure 2 plots RPPP scores when *ΔS* = USD/CHY and *πf* is China.



Figure 2

This presents some interesting contrasts to Figure 1, the range of values is smaller with many results having an RPPP score of 0±5 and some notable outliers that align with the 2008 financial crisis and the high inflation of the mid 1990’s.

Repeating our t-test when *πf* is China results in a p-value of 0.0679, once again outside of the generally accepted 95% confidence interval and illustrating that we cannot declare *ΔS* and *πf* to be statistically different.

Once again this present no challenge to the validity of RPPP.

Investigation 3 : RPPP for the USD against freely floating currency

Finally I will investigate the validity of RPPP for the USD against the freely floating British Pound Sterling. This data set covers the entirety of the post Bretton-Woods era and the trade arrangements present between the two countries present no notable barriers to RPPP.

Figure 3 plots RPPP scores when *ΔS* = USD/GBP and *πf* is the United Kingdom.

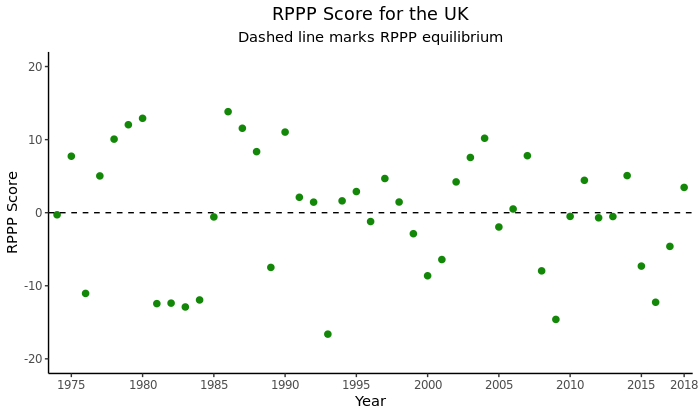


Figure 3

Interestingly the dispersion and range of the results is similar to the Euro countries from Figure 1, the Euro itself is a freely floating currency.

REPEAT THE STATS TEST

Range has gotten fatter.

RPPP validity still appears quite week.

References

(FRED,2020)

(Hazell, 2020) - A repository for the code written to undertake the analysis can be found at:  
<https://github.com/CptnCrumble/rpp>

(IMF,2013) - *Annual Report on Exchange Arrangements and Exchange Restrictions 2013.*

https://www.imf.org/external/pubs/nft/2013/areaers/ar2013.pdf