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THE PURCHASING-POWER-PARITY EXCHANGE RATE FOR A PHD STUDENT

Introduction

I recently left my very interesting and comfortable job at the Bank of England as an Economist for Professor Stephen Nickell to embark on a PhD at the University of Maryland, College Park in the United States.

While working in the City of London, I had heard many visiting American bankers state that a good rule-of-thumb for working out relative cost of living between the US and the UK was to assume that the Sterling (GBP) price for a good in the UK was the same as US dollar (USD) price for the same good in the United States. For example, the price of a pint of beer might be £3.50 in London, but only \$3.50 in the US.

The real exchange rate between two countries measures the relative cost of buying the same basket of goods in the two countries. I define the real exchange rate in the following way:

$$(\text{Nominal price of goods in the US})/(\text{Nominal price of goods in the UK}) = \text{real exchange rate}^1$$

If the rule-of-thumb were true (that the Sterling price of a good was the same as the US dollar price), this statement would imply that the real exchange rate between the UK and the US should be equal to approximately one.

The USD/GBP exchange rate has averaged 1.78 over the past three months. Assuming the rule-of-thumb any money I had saved up at from my work at the BoE which I planned to spend in the US, would buy me 1.78 times the amount of goods that I could buy in the UK, not bad at all.

Also although my stipend is only \$13,450 if this rule-of-thumb were true, the real value in terms of consumption goods in the US would be equivalent to £13,450 spent in the UK, and not £7556, the currency value of my stipend in GBP.

However, the reality has been somewhat different. Initially, the transition from one country, especially with imperial weights and measures in the US, makes price comparisons difficult to calculate. I didn't really know whether prices in shops really represented a bargain or not compared to the prices I faced in the UK. I merrily thought I was getting a great deal.

¹ I make the UK the numeraire country to avoid confusion because the USD/GBP exchange rate is quoted this way round. However, this *will* provide confusion for economists.

My suspicion that this rule-of-thumb was not a good measure of real exchange rate was first awakened when I thought about buying a car. This is the United States after all, and you are nobody without your automobile (well it is nigh on impossible to do much here without one as I am finding out).

I recently sold my nine year old Peugeot 405 estate for £775, it had a full service history, road tax already paid for the next 11 months and around 110,000 miles on the clock. This was pretty much the Glass guide² price for the car. I looked around Washington DC for a similar car, nine years old, full service history and 110,000 miles on the clock, and was surprised to find that it was almost impossible to find a car of that description for \$1380 (£775 multiplied by the current exchange rate) let alone for \$775, which the rule-of-thumb would predict. In fact it turns out that it would cost at least \$3000 to find a car with a similar specification in the US³.

Since Peugeot does not sell cars in the US, you may be thinking that I am not considering the same commodity. Fortunately for this exercise for a number of years, Ford did produce essentially the same car in the US as it did in the UK. In the US it is badged as the Contour and in the UK the same car is called the Mondeo. A 1999 model Contour with 100,000 miles sells for around \$4000 in the US while a 1999 model Mondeo with the same mileage sells for around £1200⁴.

This implies a real exchange rate of 3.33 USD's per GBP. By this calculation, the current USD/GBP exchange rate of 1.78 undervalues GBP relative to the USD by almost a factor of 2. Using this estimate of the real exchange rate, I find that the real value of my stipend in the UK is only £4035. This is a striking example and completely overturns the usual inference made from the Economist's "Big Mac" index where in PPP terms the current USD/GBP exchange rate makes GBP slightly overvalued relative to the USD.

However, a car is just one component of a basket of goods (though it can be a relatively large fraction of overall spending). For example petrol (gas) is significantly cheaper in the US; therefore, it is possible that these other components in a typical basket of goods of a student could overturn this result. Before, I directly calculate the real exchange rate for a typical basket I consider another source often used for real exchange rate comparisons.

Estimate of the real exchange rate in 2004 using data from the Penn World Tables

The Penn World Tables (PWT) provide a PPP measure of the GDP basket between countries. Unfortunately, the GDP basket differs from the consumption basket, hence I consider this to only be a rough approximation to my student basket of consumption.

² This is the motor trade manual for used car prices in the UK.

³ It is interesting to conjecture why relatively old used cars are so expensive in the US relative to the UK. My current preferred hypothesis is along the following lines. Since it is very difficult to live without a car in the US, the demand from relatively poor people for cars is a lot greater. Thus a car here is a necessity rather than a luxury in the UK. I will however, leave that for another paper.

⁴ Source: www.Cars.com and www.autotrader.co.uk. Prices were taken on 10/09/05.

For the UK, the PWT define PPP as the nominal currency value of GDP divided by the nominal currency value of GDP in the US. Currently the last observation from the Penn World Table is from 2000. I therefore, update this ratio accounting for differing consumption deflator inflation rates in the UK relative to the US between 2000 and 2004. This calculation implies an estimate of the real exchange rate to be 1.45.

Thus the PWT estimate of the real value of my stipend in the UK is £9271, a far more rosy picture than painted by the real exchange rate based on used car prices, though less optimistic than the rule-of-thumb. However, the basket of goods captured by the PWT is significantly different from the consumption basket of a student. In the next section I carefully construct identical baskets of goods in the UK and the US to find my true real exchange rate and hence the real value of my stipend in terms of UK goods.

Constructing a student basket of goods

The proliferation of internet shopping has significantly reduced the cost of conducting international price comparisons of goods. All the prices I use are from the internet. I have tried to carefully control for quality, picking like-for-like goods in both countries.

I have assumed that the student lives in a relatively unsafe neighbourhood somewhere in the suburbs (College Park in the US and West Ham in the UK) and shares a three bedroom house with two other students. The student's diet is based around the staples of pasta, potatoes and beef burgers supplemented with a small portion of salad. I assume the food is purchased from Tesco in the UK and Giant in the US⁵. I have carefully matched weights and volumes across goods. Lunch consists of homemade sandwiches taken to college daily and an apple. The student consumes two "Big Mac's" a week and has a haircut once a month. The student must also purchase course textbooks once a semester. The student purchases a car (I use the Ford Contour/Mondeo example from above) but in order to prevent this dominating the exercise I assume the expenditure is spread over three years. I assume the student drives around 40 miles per month, roughly the distance of trips to college and the supermarket. I assume fuel consumption of 21 miles per US gallon. (See appendix for data and sources). Finally in the UK I assume that the student consumes eight big bottles of beer a month, since beer is so hard to buy in Maryland, I do not include it in the basket!

You will notice that this is a fairly frugal existence, but it I believe it is a good representation of the expenditure pattern of a student trying to make ends meet. The main item missing from my study are utility prices. Finding comparable measures is quite tricky, however, given the hotter summers (ie use of air-conditioning) and colder winters in Maryland, it can probably be assumed that utility bills in the US are not lower than that in the UK. Thus by excluding utility bills I am probably underestimating the cost of the US basket relative to the UK basket.

⁵ In the UK Tesco has the largest market share, as does Giant in the DC/Maryland region.

Table 1: Total and Monthly expenditure (local currency terms)

	Cost of goods in the UK (£) (time over which consumption is spread)	Cost of goods in the US (\$) (time over which consumption is spread)	Monthly expenditure in the UK (£)	Monthly expenditure in the US (\$)
Basket of food	£29.92 (per ½ month)	\$55.76 (per ½ month)	£59.33	\$111.52
2 “Big Mac’s”	£3.98 (per week)	\$6.16 (per week)	£15.92	\$24.48
Rent	£309.33 (per month)	\$500 (per month)	£309.33	\$500.00
Textbooks	£174.96 (per ½ year)	\$408.34 (per ½ year)	£29.16	\$68.06
Haircut	£6.00 (per month)	\$15.00(per month)	£6.00	\$15.00
Car	£1200 (over 3 years)	\$4000 (over 3 years)	£33.33	\$111.11
Petrol (gas)	£6.40 (per month)	\$6.18 (per month)	£6.40	\$6.18
Total			£459.98	\$836.35

There are some striking results which appear from table 1. First, it is clear to see that the rule-of-thumb is in general a very poor approximation. It only appears to hold for petrol, for all the other components of the basket, the GBP amounts are significantly less than the USD amounts. Second, haircuts which are effectively a pure non-tradable good has a real exchange rate of 2.5 suggesting that prices of services might be cheaper in the UK than in the US at current prevailing exchange rates. Finally, the recent house price boom in the Washington DC area has almost equalized the real exchange rate of rents, one area where the price of goods in the US has traditionally been significantly cheaper than in the UK.

Overall, table 1 shows that an exchange rate of 1.81 USD per GBP is required to achieve purchasing power parity for my student basket of goods in the US vs. buying the same basket in the UK. This number is surprisingly close to the average USD/GBP exchange rate over the past year.

Therefore, my calculations suggest that the real value of my \$13,450 stipend in the UK is around £7430, almost the same as that given by the actual exchange rate. Therefore, for a student I argue that the real exchange rate between the US and the UK is equal to 1. This amount is significantly less than 1.45 which I estimated from the Penn World Tables GDP PPP figures, which translates into a real value of my stipend equal to £9274.

Conclusion

I have shown that the actual PPP exchange rate for my student basket of goods is very close to the actual USD/GBP exchange rate. This makes the real value of my \$13,450 stipend worth £7430 in UK goods. This figure is approximately £2000 less than an estimate based on GDP PPP figures from the Penn World Tables.

The current stipend for the UK's Economic and Social Research Council PhD studentship in the UK is around £14,000 in London and £12,000 elsewhere. At my calculated real exchange rate, this appears to be a fairly attractive package, even compared to best offers I received from US universities which offered stipends around \$18,000.

This conclusion also tentatively suggests that any analysis which makes US citizens better off in real terms by more than the currency exchange rate may be inaccurate for those on low incomes.

Appendix

Data

- Used car prices: Taken from www.cars.com in the US and www.autotrader.co.uk in the UK
- Book prices were taken from www.amazon.com in the US and www.amazon.co.uk on the 10th September 2005. The books in the basket were: Microeconomic Theory by Mas-Colell, Whinston and Green, Recursive Macroeconomics by Ljungqvist and Sargent, Econometric Analysis by Greene and Introduction to Mathematical Statistics by Hogg, McKean and Craig.
- The baskets of food were taken from www.giantfood.com and www.tesco.com on 18th and 17th September 2005 respectively. The baskets were composed of 4 UK pints of milk, 7 Granny Smith apples, 1 loaf of wholemeal bread, 1 jar of jam, 250g of butter, 150g of honey roast ham, 24oz of mild cheddar cheese, 1 iceberg lettuce, 4 tomatoes, 4 tins of 185g of tuna, 1 tin of 325g sweetcorn, 1kg of spaghetti, 2.5kg of baking potatoes, 3 tins of 400g tomatoes, 300g of cookies, 1 400g tin of minestrone soup, 500ml of mayonnaise, 4 rolls of toilet paper, 1 bottle of washing-up detergent, 6 eggs, 1 bar of soap, 1.5kg of onions, 4 ¼lb frozen beef burgers and 1 200g tube of Pringles original potato chips.
- “Big Mac” prices are from the 9th June economist Big Mac index.
- Haircut prices were taken from my Maryland classmates for the US and Mr Toppers in the UK.

Penn World Table data: **Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.**

Consumption deflator inflation data were taken from www.bea.doc.gov and www.statistics.gov.uk