Is the Chinese currency, the Renminbi, correctly valued?

Master thesis in finance

Author: Shi Wei Wang

Thesis supervisor: Stig Tenold

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This thesis was written as a part of the masterprogram at NHH. Neither the institution, the advisor, nor the sensors are - through the approval of this thesis - responsible for neither the theories and methods used, nor results and conclusions drawn in this work.

Contents

Preface

For my master thesis in finance I wanted to write about something of my interest and that had not been written in this context before. As I am of Chinese origin, the Chinese economy has always been of my interest. Especially in the recent years, the Chinese economy has experienced an enormous growth and transition from a socialistic planned economy to a socialistic market economy. Various topics had been written about China's economy as a thesis before, but I could not find any about the valuation of the Renminbi (RMB), the Chinese currency.

The idea of writing about china's currency was conceived during my exchange studies at Fudan University in Shanghai in the spring of 2007. Standing at the foreign exchange counter of the Bank of China filial at the Bund in Shanghai triggered the idea. As China's importance as a trade nation and a financial center increases for the Asia region and the world, the Renminbi's importance also increases. This notion has motivated me to pursue this topic.

Prior to writing this thesis, my knowledge about exchange rate forecasting was limited. But in a course, FIE 435 - Applied Finance, held by Professor Richard Harris in the spring of 2008 at the Norwegian School of Economics and Business Administration introduced me to Behavioral Equilibrium Exchange Rate (BEER) modeling. Therefore, the analytical foundation of this thesis will be based around two BEER models, one bilateral and one multilateral.

Much of the discussion about the valuation of the RMB is based on journals, papers and articles from well known academic and media sources. Here, I would like to thank my thesis supervisor for introducing me to new perspectives and much help that have contributed much to this thesis.

The discussions in the latter parts of the thesis could have been improved by using more sources to present more interesting perspectives. For the analytical parts of the thesis many challenges were encountered. The biggest challenge here was data availability. With more time and resources the improvements could have been done in a better and more sophisticated fashion. More focused comment on the statistics would also improve the quality of this thesis, if more time was available.

Hopefully the end result will give the reader a good overview of the topic and further inspire to more interest and research.

Summary

China has since the beginning of this decade been accused of artificially keeping its currency the RMB low in order to increase its exports. This have triggered protectionist acts from the US and demands of a RMB revaluation. This thesis will test this accusation by answering the following question.

"Is the Chinese currency, the Renminbi, correctly valued?"

International trade motivated by the concept of comparative advantage have many benefits and drawbacks. One drawback is the deterioration of domestic industries competing with international export industries. In order to prevent this protectionist acts are used. One way of pressuring another country to reduce its exports is through currency appreciation.

In order to answer the asked question a thorough presentation of the international foreign exchange market will be presented. In the same section, the determination of exchange rates in the long and short run will be examined. Closing this section a Behavioural equilibrium exchange rate (BEER) model, that is used by academics and practitioners of currency forecasting, will be presented.

China has been highly advanced throughout its rich and vast history. By recognising this we can understand more of why economic growth is so important for China today. In the history section of this thesis Chinas history will be presented with the focus on the economic development and various growth factors. This will lead to the addressing to the topic at hand, namely the alleged undervalued RMB that has provoked protectionist acts. In this section an interesting notion on the Plaza Accord will also be presented in detail. This will show that China is not the only country that has been pressured by the US to alter its currency in order to improve a deteriorating US economic.

The analysis of this thesis will be largely based on the theory presented in the first section. The methods of currency determination will be presented in order of sophistication. Starting with the basic Big Mac Index and ending with a multilateral BEER model. In closing this section a analysis will be preformed to see who will gain and lose in a due to protectionism between China and the US.

Theory

International trade and protectionism

Free international trade can provide benefits, it can also provide drawbacks. These drawbacks may be or can pose as the origin of protectionism. So, in order to understand what protectionism is and why it occurs, we need to understand the basics of one of the founding pillars of economics, namely trade.

The concept of absolute advantage and the principle of comparative advantage can help us understand why we trade. Set forth by Adam Smith at the end of the 17th century, absolute advantage states that one country that can produce a good at a lower cost than another country has an absolute advantage over the other country. At first glance this concept seems very sound and logical, but it has a severe flaw. Consider a bilateral trade example of two countries and two trading products. If one country has absolute advantage in producing both the two trading products (X and Y), the concept of absolute advantage would imply that the country with the absolute advantage would have nothing to gain from trade with the other country.

The concept of comparative advantage was presented by David Ricardo in 1817 where he explained that each country will benefit from trade if it specializes on the production and export of those goods that it can produce relatively lower cost. Continuing on the bilateral trade example with two countries and two trading products (X and Y) where the one country has absolute advantage in producing both products and assuming that one country has a comparative advantage in producing product X and another has a comparative advantage in producing product Y we will see that both countries will benefit if they produce and trade the product that they can produce at a relatively lower cost. Through this example we see that the concept of comparative advantage can present gains for both parties even though one country have a absolute advantage in producing all the trading goods. Another term for these net gains is the Gains from trade. If countries disregard the Gains from trade that may arise from comparative advantage and hide behind protectionism will pay through living standards and economic growth.

Protectionism

As mentioned in the beginning of this section, free trade provides benefits for a countries export industries in the sense that export industries can export to new markets. The previous bilateral trade examples shows that trade is rarely unilateral. Once markets are opened, trade

will go both ways. So, if a country exports, it will also have to import to optimally allocate resources (International trade course notes for reference). But, although international trade has its benefits for export industries, it can also harm of even destroy import competing industries. In such a case, a country would protect its own import competing industries against foreign export industries. This is called trade protectionism and is usually acted out in the form of a tariff or quotas. A tariff is basically a tax on imports, while a quota is a quantified limitation on imports.

There are two main ways protectionism is expressed[1]:

1. Direct attack on a foreign county's trading practices.
2. Direct attack on a foreign country's exchange rate policy.

The first way is more the traditional was of attack and the second way is the more recent way. Both are a response the a deficit in the balance of trade with a foreign trading partner, but the first way of protectionism may be directed against a deficit in the balance of trade of a particular industry.

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[1] Schwartz A.J. (2005)
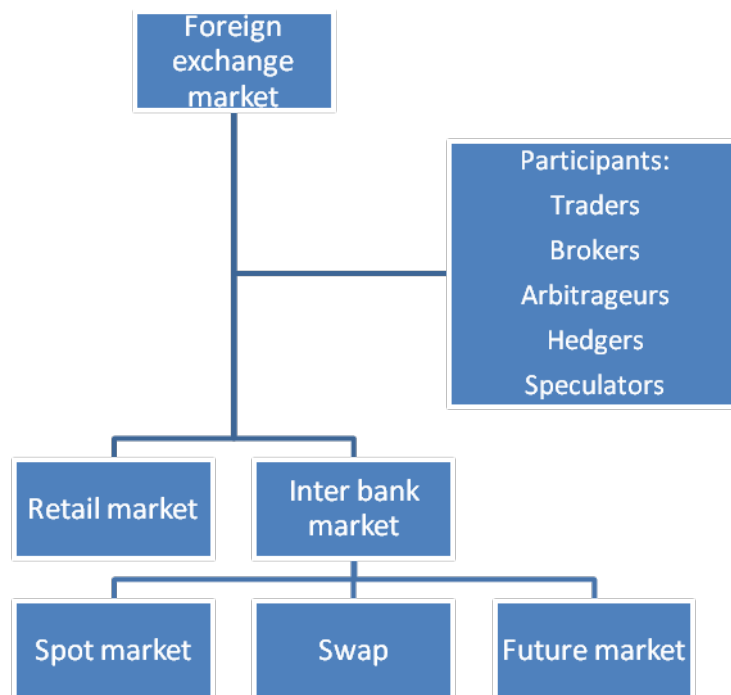
The foreign exchange market

In the following section foreign exchange market, currency policies and determinants of the currencies in long and short run will be presented. Much of the theoretical fundament of these topics is based on books by: Mishkin, Pugel and Lindert, and Shaprio. The discussion in latter part of this paper will revolve much around China and the US. Much of the illustration examples in the following section will hint to what is to come.

Different nations have different currencies. In international trade, countries trade goods and services with one and another. These goods and services must at some time be paid for in one currency or another, depending on the partner's preference. Foreign exchange is the act of trading different nation's monies in the foreign exchange market, whose primary function is to facilitate international trade and investment. An exchange rate converts one country's money in units to another country's money. Depending on the timing of the actual exchange of the monies we have two types of exchange rate.

- The spot exchange rate is the price for immediate exchange. (e_t) 35 % of the market.
- The forward exchange rate is the price for an exchange that will take place at a specific time in the future, such as 30, 90 or 180 days from now. (f_t^k) 12% of the market.
- Swap transaction involve a package of a spot and a forward contract. 53 % of the market.

Banks and traders working at banks are at the center for the foreign exchange market, conducting foreign exchange trades with their customers and each other. The trading done with customers is called the retail part of the market. Here we find small customers or individuals buying currencies for their vacation to large customers such as nonfinancial companies, financial institutions and other organizations that undertake large trades. The trading done between the banks is called the interbank part of the market. This is a global market that is open 24 hours a day and about half of all foreign exchange involve banks in London and New York. Most of the foreign exchange trading involves the exchange of U.S. dollars for another currency. Even trades between currencies other than the U.S. dollar use the dollar as an extra step in order to accomplish the trade. Due to this the dollar is also known as a vehicle currency. The figure bellow illustrates how the foreign exchange market is built up.

Figure 1: The foreign exchange market

In the retail part of the spot foreign exchange market, individuals, businesses and other organizations can acquire foreign money to make payments or sell foreign money that they have received in payments. Thus the foreign exchange market permits payments to flow between individuals, businesses and organizations that prefer to use different monies. These payments are for all items (payments of exports and imports of goods and services and payments for purchases or sales for foreign financial assets) included in the balance-of-payments account.

The interbank foreign exchange consists of about 95 percent of the foreign exchange market and can be divided by the sport market, forward market and swap market. Ranking them according to their size we will find the swap market on top with 53% of the market, the spot in the middle with 35% of the market followed by the future market with 12%[2].

This trading between banks serves several functions. First, it provides a bank with continuous stream of information on conditions in the foreign exchange market through communications with other banks and through observing the exchange rates being quoted. Second, it allows a bank to readjust its position at a low cost and quickly when the bank separately conducts a large trade with a customer. Third, it also allows a bank to speculate on exchange rates in the

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[2] Shapiro (2006) p247

near future by permitting the bank to take on a position in a foreign currency quickly. Such speculative positions are held only for a short time, typically less than one day.

There are two main types of interbank trading. One type of trading is conducted directly between traders at different banks. In this case traders know who they are trading with. The other type of interbank trading is the use of foreign exchange brokers. The use of brokers can provide anonymity and can reduce the cost of searching for the best available exchange rates, but they demand a commission for their services. The amounts traded in the interbank market are quite big, $1 million or more. Due to the big amounts and frequent transactions fine margins of profit and loss can loom large. In order to stay ahead in foreign exchange trading you need to react quickly and calm to given news.

Other participants in the foreign exchange market can also be categorized as arbitrageurs, hedgers and speculators. Arbitrageurs try to earn risk-free profits from interest differences between countries. They use forward contracts to eliminate the exchange risk involved in transferring their funds from one nation to another. Hedgers use forward contracts to hedge the home currency value of various foreign currency-denominated assets and liabilities on their balance sheets that are not to be realized over the life of the contract. In contrast to the previous presented participants, speculators actively expose themselves to currency risk. They buy or sell forward in order to profit from exchange rate fluctuations. Their participation is based on their expectations for the future spot exchange rate.

Currency regimes

An intuitive way to understand what makes a country's currency appreciate or depreciate is to analyze the foreign exchange market as any competitive market. Find the equilibrium through the interaction of demand and supply and then look at which forces lie behind the demand and supply curves. Trading on foreign exchange markets are motivated by various reasons, such as international trade of goods and services, which was mentioned in the introduction, or international flows of financial assets (international investment, loans and so on). Traditionally, trading on foreign exchange markets was motivated primarily by the international trade of goods and services. However, nowadays the trading of international financial assets, such as currencies and stocks etc, is motivating for foreign exchange trading more and more.

A nation's export of goods and service typically creates a supply of foreign currency and a demand for that nation's currency. Assuming the foreign buyers have their own currency to offer and the Chinese exporter prefers to end up holding Chinese RMB and not some other currency, for instance the U.S. dollar. For instance the importer in a foreign country desires to pay using his currency, while the Chinese exporter desires to be paid in RMB. In such a trade process foreign money must be exchanged for RMB. Importing goods and services correspondingly tends to create a demand for foreign currency and a supply of that nation's currency. Similar reasoning can be applied to transactions in financial assets. Capital outflows/inflows will create demand/supply for foreign currency and determine the market exchange rate, within constraints imposed by the nature of the foreign exchange system or regime under with the country operates.

Government policies toward the foreign exchange market

There are two main types of government policies towards the foreign exchange market. First, policies that are directly applied on the exchange rate itself, for instance exchange rate regulations. Second, policies that directly state who may use the foreign exchange market and for what purpose, for instance limiting peoples able to trade on the market.

Government policies toward the exchange rate itself are usually categorized according to the flexibility of the exchange rate (the amount of movement in the exchange rate that the policy permits). On one end of the scale the government can choose a floating rate allowing the market to decide and on the other end of the scale a fixed exchange rate can be chosen. In between lies also many choices referred to as "mixed exchange rates".

Government policies toward restriction on use can be no restriction, where everyone is free to use the foreign exchange market, or exchange control, where the government places some restriction on use of the foreign market. In the latter policy there are different levels of control. In the most extreme case all foreign exchange proceeds must be turned over to the country's monetary authority. In other forms of less extreme restrictions on use, capital controls can be imposed or the use of foreign exchange markets can be limited to certain types of products or services.
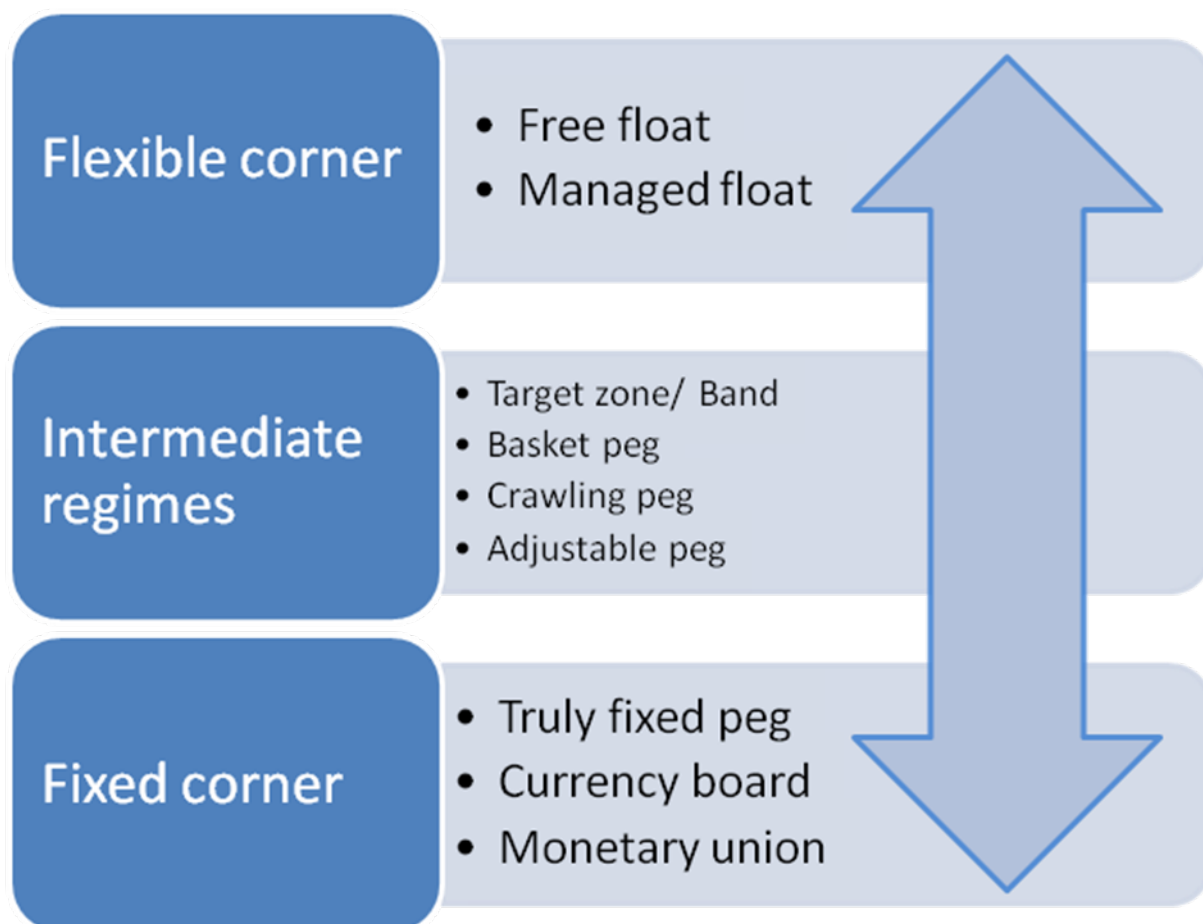
Figure 2: Nine major exchange regimes ranged from flexible to fixed[3]

The flexible corner

The free floating exchange rate is the polar case of complete flexibility, without intervention by governments or central banks. This implies that the spot price of foreign currency is market driven, determined by the interaction of demand and supply for that currency. This policy choice is also known as a pure or clean float. Under a floating exchange rate system a fall in the exchange rate value of a currency relative of another is called a depreciation of the currency and a rise is called an appreciation.

Even though a country is governed by floating exchange rate policy there are times when the government want to have direct impact on the exchange rate through official intervention. The intervention can come in many forms, but the most normal is regulating the amount of money or changing the interest rate. According to Shapiro free float have increased economic volatility instead of reduced it[4]. This in turn reduces economic efficiency and act as a tax on

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[3] Frankel J.A. (1999) – The international Financial Architecture
[4] Shapiro 2006 p. 91

foreign trade and investment. So, in order to reduce the economic volatility governments intervene to smooth out exchange rate fluctuations. This regime is also known as managed float or dirty float. Many countries also govern the foreign exchange market by aiming at an inflation target. Such an exchange rate system is closely tied with a managed float regime.

Intermediate regimes

In this group there are four major regimes and these will be presented from most flexible to least flexible. Target zone, sometime also called a band, allows a margin of fluctuation around one central rate. The governments must intervene when if the exchange rate hits the top or the bottom of the band. The basket peg regime fixes the currency to not one single currency, but a weighted average of a basket of currencies. How the average is weighted and which countries to include in the basket depends on the countries preferences. One example is to incorporate a country's major trading partners and another is to use the "special drawing right" (SDR) which is a readymade average by the International Monetary Fund (IMF). A government might insist that it will not change the exchange rate. If the commitment is not truly binding, then there is a possibility to alter the policy. In this case the term pegged exchange rate is used, in recognition that the government can move the peg. At the center of our scale of flexible and fixed we find the crawling peg which is a preannounced policy of devaluing a bit each week according to a set of indicators or to the judgment of the government monetary authority. The slightly more fixed version is called an adjustable peg. This regime fixes the exchange rate, but without any open-ended commitment to resist devaluation or revaluation in the presence of a large balance of payment deficit or surplus. If chosen par value is not in equilibrium in the country's international position, then the government may still change the par value. When officials reduce the otherwise fixed par value of a currency we call it devaluation and when they raise the par value of a currency we call it revaluation. These actions are the main ways of changing exchange rates in a nearly fixed-rate system.

The fixed corner

In the fixed rate system governments or central banks strive to keep the exchange rate fixed, at the par value towards a commodity or another currency, even if they chosen rate differs from the equilibrium rate suggested by the demand and supply curve. They are committed to buy or sell however much foreign currency it necessary at a given exchange rate, with a firm and lasting intention of maintaining the regime.

Currency board has three defining characteristics. Firs, fixing is not only obliged by policy, but also by law. Second, backing increases in the monetary base one-for-one with foreign exchange reserves. And third, balance of payment is allowed to tighten monetary policy thereby adjusting spending automatically.

The last of our nine major exchange regimes is the monetary union and it involves the adaptation of a foreign currency as a legal tender. The most know monetary union today is without doubt the European Monetary Union (EMU). However, this also includes the special case of official dollarization.

Currency determination

Why is the rise and fall of exchange rates important?

Exchange rates are important because they affect the relative price of domestic and foreign goods and services. The dollar price of Chinese goods and services to an American is determined by the interaction of two factors, the price of Chinese goods and services in china and the RMB/USD exchange rate. In general, when a country's currency appreciates the country's exports abroad become more expensive and less competitive. This in turn may lead to deficit in the trade balance. But on the flip side an appreciated currency also leads to cheaper imports. An appreciation of the currency is often used as a mean to curb inflation on imported goods such as raw material and so on. This assumes that the prices levels are constant in the two trading countries. Conversely, when a country's currency depreciates, its exports abroad become cheaper which means better competitiveness. But, again the country's imports becomes more expensive and raises the inflation on imported goods.

This information is important for companies and private individuals. Assuming they are risk averse, a stable currency would be preferred as it reduces currency risk and makes international decision making easier. Otherwise Companies would have to hedge against currency risk or reduce its international activities for less currency exposure.

Various currencies vs USD 1981-2008
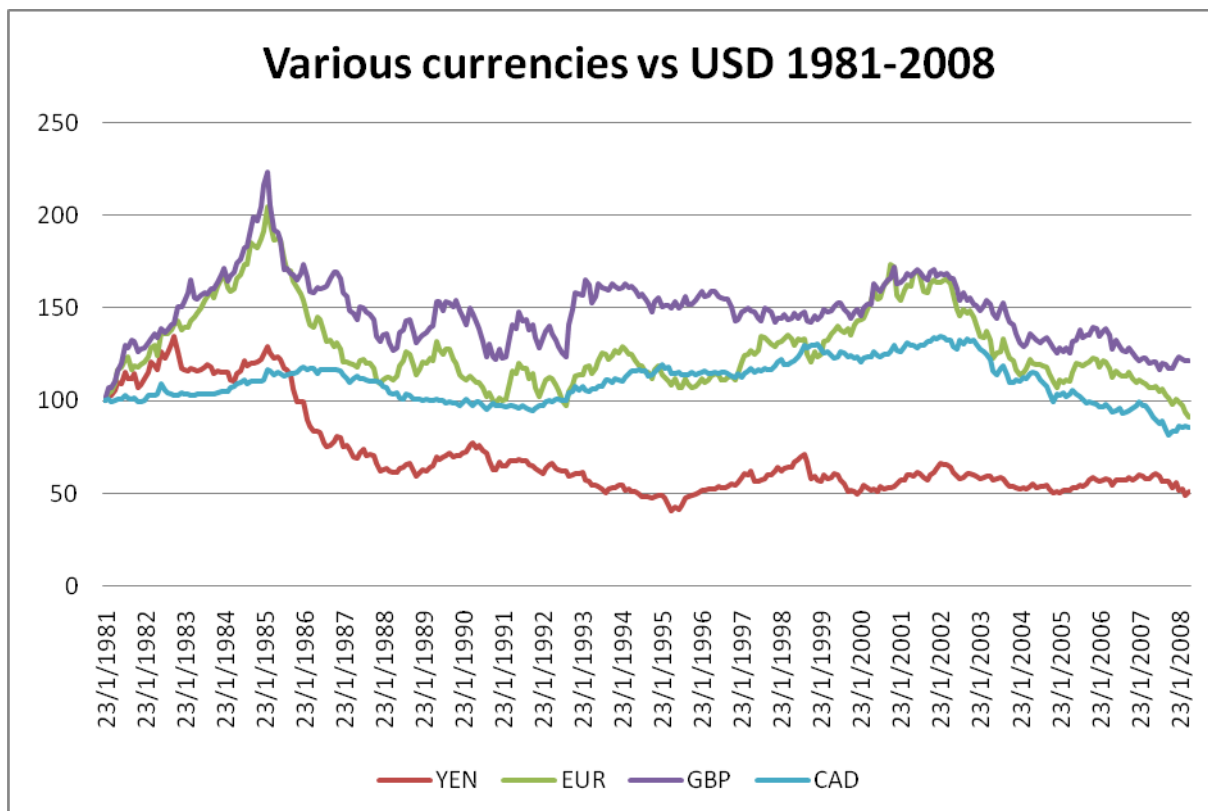
Figure 3: Various currencies vs. USD 1981-2008

Figure 3 shows the monthly local currency price for one dollar (X/USD) with units adjusted so that they are rebased at 100 January 1981. An increase in the plot means that the local currency has depreciated relative to the base currency, the USD (strengthening of the USD). A decline in the plot means that local currency has appreciated against the USD (weakening of the USD).

From the figure we can see that there are some short trends, medium trends and long trend. In the short run we can see quite clearly that the exchange rate is volatile from month to month. The medium trends span over a period of several years. From 81 to 85 for instance, the USD depreciated against all the currencies in this sample. The reason is the Plaza Accord and the Louvre agreement, which will be addressed later in the thesis. Also, at the end of the 80s and the beginning of the 90s we can see a medium period of high volatility. These medium trends sometimes counter the long trends. The long trend is quite clear for all the currencies. They all seem to move steadily forward. The GPB and the synthetic EUR tend to be correlated with each other. After 93 the CAD also seem to correlate with the GBP.

International pricing relations

There are several important pricing relations in international finance which are crucial to understand because they are related to fundamental efficiency concepts in finance. Practically these relations are vital in terms of determining the "correct" exchange rate for example during periods of market turmoil of economic shock. Before we take a closer look at the pricing relation, an important underlying concept in international finance is going to be presented, namely arbitrage.

One definition of arbitrage: The simultaneous purchase and sale of the same assets or commodities on different markets to profit from price discrepancies. (Shapiro 2006)

This concept is so important because many relationships between domestic and international financial markets, exchange rates, interest rates and inflation rates depend on arbitrage for their existence. From the arbitrage activities there are five theoretical economic relationships:
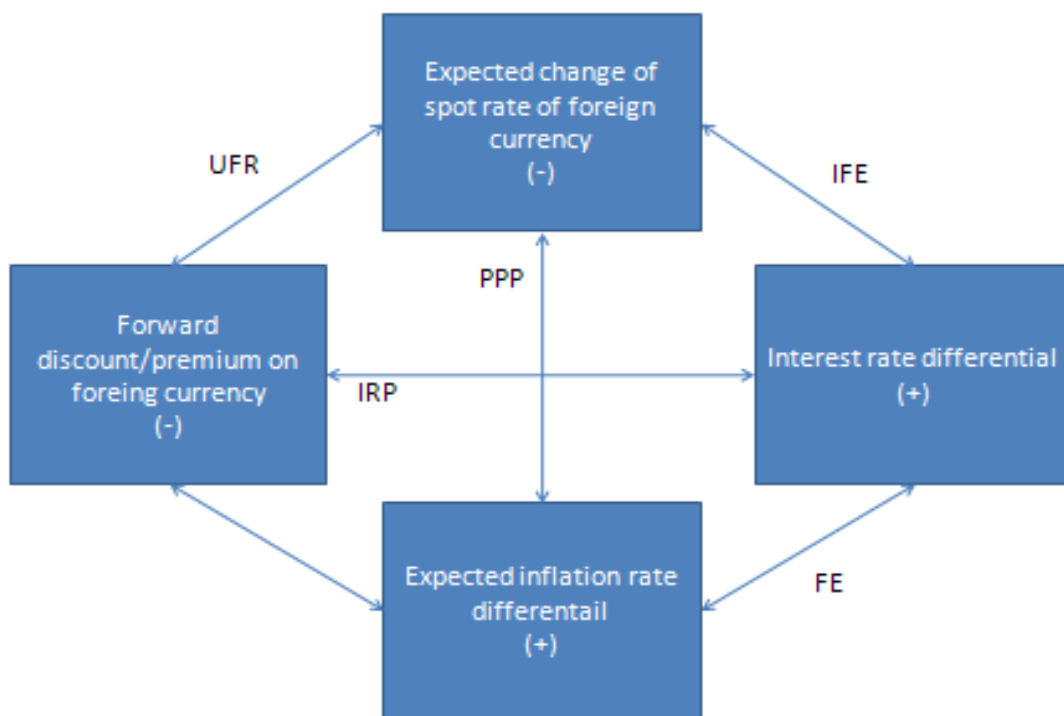

Figure 4: Five theoretical international economic pricing relationships

- Purchasing power parity (PPP)
- Fisher effect (FE)
- International Fisher effect (IFE)
- Interest rate parity (IRP)
- Unbiased forward rate (UFR)

What determines exchange rates in the long run?

In this section the focus will lie in the purchasing power parity for determining exchange rates in the long run. The following section the other four relationships will be used to explain how exchange rates are determined in the short run.

Based on the proposition that there is a predicable relationship between product price levels and exchange rates the theory of PPP is one of the most prominent to explain how exchange rates are determined. This relationship relies on the fact that there is an international market for goods and services. In the short run the market is subjected to minor or major shocks making it difficult for PPP to hold, but in the long run PPP should hold. Thus, the PPP hypothesis believes that international trade irons out differences in the price of traded goods. There are two versions of PPP, absolute PPP and relative PPP.

Absolute PPP

The law of one price stems from arbitrage and states that the exchange adjusted price of identical tradable goods and financial assets should be the same worldwide in perfectly competitive markets[5]. Taking this to national price levels rather than individual prices we are comparing PPP in its absolute version, absolute PPP. Absolute PPP states in other words; measured in the same currency, price levels should be the same worldwide. This version of the PPP assumed no arbitrage and ignores restrictions on free trade and product differentiation.

Absolute PPP presented formally:

$$P = e_s \times P_f \quad \text{or} \quad e_s = \frac{P}{P_f}$$

e_s = spot exchange rate of a foreign currency in the home currency

P = product price levels in the home country

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[5] Note: excluding transaction costs, taxes or tariffs and other restrictions.

P_f = product price levels in the foreign country

Different levels of absolute PPP.

1. Level of one heavily traded commodity: PPP predicts well

   At this level the absolute PPP is the same as the law of one price. This can to some degree be illustrated by the Big Mac index which is calculated by comparing the prices of Big Macs worldwide. The Big Mac PPP can then be compared with actual exchange rates we can then see whether a currency is over or undervalued by its standard. But when interpreting the results presented by the Big Mac index we need to be critical. This is due to that the Big Mac is a product comprised of traded and non traded inputs.

2. Level of all traded goods: PPP predicts moderately well

$$e_s = \frac{P_T}{P_{Tf}}$$

   Technical difficulties appear with comparing different index numbers for different groups of goods[6]. By comparing different products with different transport cost and subjected to different trade tariffs also makes things complicated. International product differentiation is common by companies in order to capture consumer surplus in different international markets. The difficulties become even greater when it comes to comparing financial assets with similar risks.

3. Level of all products (goods and services) in the economy: PPP predicts least well

   This is the broadest kind of price level and the one that relates most to the overall inflation in a country. This broad price concept includes many prices that fail to equalize between countries. The ones failing are mostly those for non traded products such as housing, haircuts and other local services. The price difference is significant between lower-income and higher-income countries[7].

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[6] Pugel and Lindert (2000)
[7] Pugel and Lindert (2000)

Relative PPP

The relative version of PPP is more commonly used nowadays. The relative version states that the exchange rate will adjust to reflect the price levels of the home and the foreign country. Below this is shown formally:

$$\frac{e_t}{e_0} = \frac{(1+i_h)^t}{\left([\![1+i_f)]\!]^t}$$

Where i is the rate of inflation with subscripts h for home and f for foreign. e_0 is the current spot rate and e_t is the spot exchange rate in period t. Thus, we can rewrite the formula to predict the future spot based on the current spot exchange and inflation rates:

$$e_t = e_0 \frac{(1+i_h)^t}{\left([\![1+i_f)]\!]^t}$$

For one period:

$$e_1 = e_0 \frac{(1+i_h)^{\square}}{\left([\![1+i_f)]\!]^{\square}}$$

The following approximation is often used for the one period relative PPP:

$$\frac{e_1 - e_0}{e_0} = i_h - i_f$$

From the approximation we can see that the relative PPP see that the exchange rate change in one period should equal the inflation differential for the same time period. This also implies that currencies with high rates of inflation should depreciate relative to currencies with lower rates of inflation.

An important lesson from the theory of PPP is that exchange rates might just reflect variations in prices across countries. It is therefore important to distinguish between the nominal exchange rate and the real exchange rate in order to gain more insight.

Nominal exchange rate: e_t

Real exchange rate: e_t'

$$e_t' = e_t \frac{P_h}{P_f}$$

Here the home and foreign price levels are indexed to 100 at time 0. This is done to reflect the change in relative purchasing power of these currencies since time 0. Alternatively, the real exchange rate can be calculated by directly reflect the change in relative purchasing powers of these currencies by adjusting the nominal exchange rate for the inflation in both currencies since time 0:

$$e_t' = e_t \frac{(1 + i_h)^t}{\left([1 + i_f]\right)^t}$$

If the real exchange rate remains unchanged, then the changes in the nominal exchange rate are fully offset by changes in the relative price levels the two countries. If PPP holds, then the real exchange rate remains constant at the exchange rate at time 0[8].

The PPP theory, under various definitions, has existed throughout the modern history of international economics. Whenever exchange rates become more variable as a result of exogenous shocks such as wars or other events the theory resurfaces. Mainly the PPP is used to reestablish some desired exchange rate by changing a nation's price level or to guess what the equilibrium exchange rate will be given domestic and foreign price levels.

PPP predicts better over the long run than in the short run. Although this theory has its drawbacks, it also has uses. It implies that low inflation countries have currencies that tend to appreciate in the foreign exchange market. For countries with high inflation, the opposite is implied by PPP, the currencies tend to depreciate.

Monetary approach to exchange rates

We have presented the theory of PPP and explained the relationship between exchange rates and price levels (domestic and foreign). Moving on we need to ask ourselves what determines the price levels or the rate at which it changes, the inflation rate? Economists believe that money supply or its growth rate determines the price level/inflation in the long run. This suggests that money supply and its link to price levels and inflation rates are closely linked to exchange rates in the long run, which is quite logical. An exchange rate is the price of one currency in terms of another.

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[8] Relative PPP formula substituted in to the real exchange formula.

Relative money supplies affect exchange rates. The more of a currency there is to circulate the less valuable it is, both internationally and domestically[9]. Cases of hyperinflation dramatize this point. The relationship between money and the national price level can be explained by the supply and demand of money.

The quantity theory equation

This equation says that in any country the money supply is equated with the demand for money, which is directly proportional to the value of gross domestic product:

$$M^s = k \times P \times Y \quad \text{and} \quad M_f^s = k_f \times P_f \times Y_f$$

M^s = home money supply measured in home currency

M_f^s = foreign money supply measured in foreign currency

P = home price level, f denotes foreign

Y = home real domestic product, f denotes foreign

k = indicate the proportional relationship between money holdings and the value of GDP

By taking the ratio of these two equations and rearranging the terms, we can use the quantity theory equations to determine the ratio of prices between countries:

$$\frac{P}{P_f} = \frac{M^s}{M_f^s} \times \frac{k_f}{k} \times \frac{Y_f}{Y}$$

We can now combine PPP with the quantity theory equation for the home country and the rest of the world. With this equation we can predict exchange rates based on money supplies and national products:

$$r_s = \frac{P}{P_f} = \frac{M^s}{M_f^s} \times \frac{k_f}{k} \times \frac{Y_f}{Y}$$

r_s = exchange rate between one foreign currency (say RMB) and home currency (say USD). It's also known as value of the currency of a foreign country.

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[9] Pugel and Lindert (2000); International Economics 11th ed.

The equation predicts that a foreign nation (China) will have an appreciating currency, r_s increases, if it has some combination of slower money supply growth ($\dfrac{M^s}{M_f^s}$ decreases), faster growth in real output ($\dfrac{Y_f}{Y}$ increases), or a rise in the ratio $\dfrac{k_f}{k}$.

By further exploring the possibilities of this equation we can quantify the effects on changes in money supplies of domestic products on the exchange rate. The equation implies that some key elasticity's are equal to 1. That is, If the ratio $\dfrac{k_f}{k}$ stays the same.

> r_s will rise by 1 percent for each 1 percent rise in the nominators (M^s or Y_f) or 1 percent increase by the denominators.

This equation also suggests that the exchange rates will not be affected by balanced growth.

What determines exchange rates in the short-run?

In order to answer this question the four remaining theoretical economical relationships will be presented. Thereafter these relationships will be used to aid the explanation of the asset market approach which can be used to determine exchange rates in the short run.

The Fisher effect

The Fisher effect (FE) states that the nominal interest rate r is made up of two components, a real required rate of return a and an inflation premium equal to the expected inflation i. See the formula below:

$$1 + r = (1 + a)(1 + i)$$

$$r = a + i + ai$$

Approximation: $r = a + i$

The generalized version of the FE states that the real returns are equal for all countries through arbitrage.

$$a_h = a_f$$

The subscript h and f stands for home and foreign, respectively.

If the expected real returns were to differ, then capital would flow from the low real rate currency to the high real rate currency. This process of arbitrage would continue, without government intervention, until expected real returns were equalized. Then, in equilibrium it should follow that the nominal interest rate differential will approximately equal the anticipated inflation differential between the two currencies:

$$r_h - r_f = i_h - i_f$$

The exact form:

$$\frac{1 + r_h}{1 + r_f} = \frac{1 + i_h}{1 + i_h}$$

From this equation the generalized version of the FE is saying that currencies with high rates of inflation should bear higher interest rates than currencies with lower rate of inflation.

The international Fisher effect

When combining the conditions of PPP and FE, the result is IFE. PPP implies that the exchange rates will move to offset changes in inflation rate differentials and FE implies that…

$$\frac{(1 + r_h)^t}{(1 + r_f)^t} = \frac{E(e_t)}{e_0}$$

Where $E(e_t)$ is the expected exchange rate in period t. The single-period analogue is presented below:

$$\frac{1 + r_h}{1 + r_f} = \frac{E(e_t)}{e_0}$$

Approximation for relatively small r_f:

$$r_h - r_f = \frac{E(e_t) - e_0}{e_0}$$

IFE states that currencies with low interest rates are expected to appreciate relative to currencies with high interest rates.

Interest rate parity theory

Interest rate parity holds when, assuming an efficient market with no transaction costs, the interest rate differential is approximately equal to the forward differential. This theory ensures

that the difference between the domestic interest rate and the hedged foreign rate, also known as covered interest differential is zero. Below we can the interest rate parity stated formally:

$$\frac{1 + r_h}{1 + r_f} = \frac{f_1}{e_0}$$

Where f_1 is end-of-period forward rate. An approximation is often expressed by:

$$r_h - r_f = \frac{f_1 - e_0}{e_0}$$

From the equations above we can say that high interest rates on a currency are offset by forward discounts and that low interest rates are offset by forward premiums.

If the covered interest differential is not zero, then there is an arbitrage incentive to move money from one market to the other, also known as covered interest arbitrage.

$$1 + r_h < \frac{(1 + r_f)f_1}{e_0}$$

In this case funds will flow from the home market to the foreign market

$$1 + r_h > \frac{(1 + r_f)f_1}{e_0}$$

In this case, the opposite will happen.

Uncovered interest parity is similar to covered interest parity. From the parity equation for uncovered interest parity we can see the difference:

$$\frac{1 + r_h}{1 + r_f} = \frac{E[(e]_t)}{e_0}$$

For the covered interest parity we are covered/hedged by the forward, but here we are not covered since this parity condition is based on expectations of the future spot rate at period t. Hence, the name uncovered interest parity.

Unbiased forward rate

Unbiased forward rate states that the forward rate is an unbiased predictor of the future spot rate.

$$f_{t+1} = E[(e]_t)$$

If the UFR holds, then uncovered interest parity equals the covered interest parity.

Economists believe that exchange rates can be best understood in terms of demands and supplies of assets denominates in different currencies. This is called the asset market approach to exchange rates. The monetary approach, which emphasizes the subset of assets that are considered to be money, is one variant of the asset market approach. We know that the monetary approach is useful in understanding long term movements in exchange rates, but in short term it has not proven capable[10]. In order to gain more understanding of the short run movements, we need to use a broader asset market approach that incorporates all financial assets. Major conclusions are that the exchange rate value of a foreign currency (e_0) is increased in the short run by these changes.

A rise in the foreign interest rate relative to our interest rate ($r_f - r_h$).

A rise in the expected future spot exchange rate ($E[(e]_t)$)

This broad asset market approach also helps us to understand the tendency for exchange rates to "overshoot" – to change more than seems necessary in reaction to changes in government policies or to other important economic or political news. It is here important to stress that although the asset market approach gives us some insights, there is also a lot of questions that are left unanswered.

Asset Markets and International Financial Investments

Most of foreign exchange trading is related to positioning or repositioning of the currency composition of the portfolios of international financial investors. As demand and supply of financial assets denominated in different currencies shift around, so will the supply and demand of the currencies shift around. Thus, it is important to focus on the perceptions and actions of international financial investors in order understand exchange rates in the short run.

From uncovered interest parity we know the relationship between the domestic interest rate, the foreign interest rate, the current spot rate and the expected future spot exchange rate. In these relationships the two exchange rates imply the expected appreciation or depreciation. Change in any of these four variables implies that adjustments will occur in one or more of the other three.

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[10] Pugel and Lindert (2000): International Economics 11th ed. p. 407.

Change in Variable	Direction of International Financial Repositioning	Implication for the Current Spot Exchange Rate
Domestic interest rate (rh)		
Increases	Toward domestic currency assets	e decreases (domestic currency appreciates)
decreases	Toward foreign currency assets	e increases (domestic currency depreciates)
Foreign interest rate (rf)		
Increases	Toward foreign currency assets	e increases (domestic currency depreciates)
Decreases	Toward domestic currency assets	e decreases (domestic currency appreciates)
Expected future spot exchange rate E(es)		
Increases	Toward foreign currency assets	e increases (domestic currency depreciates)
Decreases	Toward domestic currency assets	e decreases (domestic currency appreciates)

The analysis for each change in one of the variable assumes that the other two variables remain unchanged

Table 1: Determinants of exchange rates in the short run[11]

The role of interest rates

From the international Fisher effect there seem to be a close relationship between foreign exchange markets and movements in interest rates. Changes of exchange rates often follow changes in interest rates. By looking at news coverage of exchange rate changes we often see a close correlation with interest rate changes. From the "Determinants of exchange rates in the short run" table above we see that news on interest rates affects the exchange rate.

The role of the expected future spot exchange rate

We have mentioned that currencies are traded in spot and in futures. Futures-trading is based on expectations of future exchange rates, recall unbiased forward rate (UFR). These expectations can also have a powerful impact on international positioning, which in turn affects the current exchange rate. Taking a closer look on what determines expectations of future exchange rates we can gain more insight on how the short run exchange rates are determined.

Bandwagon: Expectations based on the current trend and that the trend will continue. E.g. currencies that have been appreciating are expected to do so in the close future. This effect is often the start of speculative bubbles that are inconsistent with economic fundamentals e.g. PPP-value. However, expectations based on that the trend will turn can also be developed. For e.g. if the current exchange rate is above its estimated PPP value, then investors might expect that the currency will depreciate back toward its PPP value leading to stabilized speculation.

News can also change expectations in future exchange rates. This can be compared with the stock market where news affects the stock price based on the expectations of future cash

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[11] Pugel and Lindert (2000): International Economics 11th ed. p 409.

flows. However, for news to affect the exchange rates, they should often be of a bigger magnitude affecting on a macro scale. One example is a change in interest rates. If the interest rate is raised, a capital inflow would occur. This would lead to an appreciation of the currency. Conversely an interest reduction would lead to a capital outflow and in turn a depreciation of the currency.

Exchange rate overshooting

The idea of exchange rates being determined in the short run by investors' portfolio decisions seems quite remote from the long run view of PPP and the monetary approach. Still, we have covered the basis for how the short run is related to the long run, through expectations that exchange rates eventually moves towards their PPP values. International investors can react rationally to news by driving exchange rates past what they know to be its ultimate long run equilibrium rate and then slowly move back to that rate later on. This is called overshooting by the investors. In other words, in the short run the exchange rate overshoots it long run value and then reverts back toward it. Overshooting can also be done be other actors in the markets for instance governments, central banks and so on.

How well can we predict exchange rates in the short run?

It seems very hard to predict exchange rates in the short run. Like stocks, exchange rates react to new information. Due to the unexpected nature of news, it is very hard to incorporate it in to any predictions. Immediate reactions to news appear to overshoot and then adjusting to the PPP or monetary approach in the long run. Studies have shown that different news affect the exchange differently, sometimes exchange rates are even not affected at all. This makes it even more difficult to incorporate unexpected news in to any predictions. And also exchange rate expectations can be formed without much reference to economic fundamentals. Through the work of well known economists[12] the conclusion seems clear, that it is very difficult to predict the exchange rate in the short run.

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[12] Frankel and Rose (1995), Wren-Lewis (2002)

Behavioral equilibrium exchange rate

A Behavioral equilibrium exchange rate (BEER) model of exchange rate estimation will be used to evaluate if the RMB is correctly valued. In this analysis the Hodrick/Prescott (HP) filter will be used. I will therefore present the HP-filter first and then the BEER model.

HP-filter[13]

The HP-filter is a popular method to decompose time series. The filter assumes that a time series consist of a trend component and a cyclical component.

$$y_t = \tau_t + c_t$$

y_t is the series, τ_t is the trend component and c_t is the cyclical component.

The main function off the HP-filter is to even out the cyclical component. This is done by minimizing the following expression:

$$\min \square \left\{ \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \right\} \; for \; t = 1 \dots T$$

The first section of the expression is the squared difference between the series and the trend and constitutes the cyclical component. The second section measures the change in the trend and is weighted with the parameter λ .

By setting λ equal to 0, only the first section is minimized, which states that the trend follows the series ($\tau = y$). This is an unrealistic assumption which implies that cyclical variations don't exist. By setting λ equal to ∞ , the first section loses its meaning relative to the second section. We can now conclude that λ can be sett to any number in this intercval, $(0, \infty)$. However, in order to make the choice easier we can use the following values:

$\lambda = 14400$ for monthly observations

$\lambda = 1600$ for quarterly observations

$\lambda = 100$ for annual observations

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[13] Lecture notes FIE 403 – "Konjunktur analyse" spring 2008, NSEBA.

Introduction of BEER

This model of currency valuation was developed by Macdonald (1997) and Clark and Macdonald (1998). In short they use fitted values of an estimated economic model of exchange rate to establish the long run equilibrium exchange rate. This model has been used by both academics and practitioners in order to establish the equilibrium value of currencies and to forecast future movements for both mature economies and emerging economies[14].

The behavioral equilibrium exchange rate (BEER) framework used en economic relationship between the real exchange rate and macroeconomic variables that are assumed to define internal balance in an economy and external balance with the global economy.

General form of BEER:

$$q_t = \beta Z_t + \varepsilon_t$$

q_t is the real exchange index, Z_t is an (n x 1) vector of macroeconomic variables, β is and (n x 1) vector of parameters to be estimated and ε_t is a stationary, zero-mean, random error that is orthogonal to Z_t.

The parameter vector β defines the equilibrium relationship between the real exchange rate, q_t, and the macro economic variables, Z_t. The term, ε_t, represents the transitory disturbance to this equilibrium relationship.

Given the current values of macroeconomic variables we can estimate the real exchange rate.

$$\bar{q}_t = \hat{\beta} Z_t$$

Since the macroeconomic variables Z_t, contain transitory components they fluctuate with business cycle, which contribute to any measured disequilibrium in the exchange rate. There for it is common to specify the equilibrium exchange rate using an estimate of the permanent component of Z_t.

$$\bar{\bar{q}}_t = \hat{\beta} \tilde{Z}_t$$

$\tilde{Z}_t$ is the permanent component, and $\bar{\bar{q}}_t$ is the Permanente equilibrium exchange rate (PEER).

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[14] MacDonald Ronald (2007): Exchange rate economics – Theories and evidence, Ch9, p.234. Routledge, NY

The systematic part of the BEER model defines the long run equilibrium relationship between the exchange rate and the fundamental variables. However, in the short run deviations from the equilibrium occur from shocks to wither the exchange rates of the fundamentals. These deviations from the equilibrium are captured by the error term, ε_t. In this setting, the future trajectory of the exchange rate required to restore equilibrium provides a forecast of the short run movements in the actual exchange rate[15]. The difference between actual and the estimated equilibrium exchange rate gives an indication of any mispricing or over/under valuation.

The Exchange rates and the fundamental variables are usually found to be non-stationary, so empirical implementation of these models usually makes use of the co integration and error correction framework. This equilibrium model implies that the exchange rates and the fundamental variables are co integrated. Estimating this co integrating vector provides an estimate of the long run relationship and the error correction model provides short run exchange rate forecasts.

Since the macroeconomic variables, Z_t, are chosen arbitrary, the BEER model is an ad hoc model. In the literature many BEER models have been employed, using many different macroeconomic variables. These models have generally been found to offer superior performance in terms of both long rum valuation and short run dynamics.

Faruqee (1995) and Alberola el al. (1999) derived the BEER formally based on stock-flow equilibrium, yield specifications that include measures of relative productivity between tradable and non tradable sectors and net foreign assets. These variables usually form the starting point of empirical work using this methodology. Moving on, empirical studies usually include measures of government expenditure, terms of trade, financial deepening, measures of openness and real interest rate differentials. Studies by Cheung et al. (2007) also try to capture institutional and demographic differences between countries.

In general BEER estimates the misalignment of the CNY range from about 2 to 10 percent. This is supported by the works and comments of these economists: Chou and Shih (1998), Funke and Rahn (2004), Wang (2004), Cheung, Chinn and Fujii (2005)).

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[15] Much like the principle of a PPP exchange rate or a Real exchange rate.

History

China is one of the world's oldest continuous civilizations, with a recorded history of nearly 3500 years[16]. Throughout its history China has been highly advanced in economics, technology, science and arts compared with contemporary civilizations. That is until the early modern period of industrialized western countries. The Chinese take great pride in their history and their former eminent position in the world. This is greatly reflected in current political opinions and attitudes to international relations. The government's policies and reforms being carried out are aimed at getting China back into its place as a world leading country.

The industrialization of western countries was the beginning of the gradual fall of China under foreign countries. Western countries with superior economy, technology and military powers were able to obtain more and more economic and political privileges from China through unequal treaties and the opium war in the beginning of the 19th century. This period of national recession had later been seen upon as a period of "national humiliation"[17]. The last Chinese dynasty, the Qing dynasty, collapsed in 1911 and was succeeded by the Republic of China inspired by Sun Yat-sen. Sun Yat-sen later established the Kuomintang or Chinese Nationalist People's Party in the early 1920s.

After the founding of the Communist Party of China (CPC) in 1921 a power struggle between the Kuomintang and the CPC broke out. The Kuomintang under the leadership of Chiang Kai-shek was forced to flee to Taiwan after the invasion of Japan during World War 2. The CPC proclaimed the founding of the People's Republic of China (PRC) under the leadership of Mao Zedong October 1 1949.

In the years to come Mao introduced massive economic and social reformations, modeled after the Soviets. Hereunder the First Five Year Plan (1952-1957) was acted out with the emphasis of industrializing the PRC rapidly from an agricultural dependent country. As the CPC's political power gradually grew, political opponents were harshly repressed. In 1958 the economic development program "The Great Leap Forward" was announced as part of the Second Five Year Plan, but this time Mao broke with the Soviet model. The goal was to continue to increase industrial and agricultural output. The outcome of "The Great Leap Forward" failed causing a spectacular drop in agricultural production and ineffective

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[16] www.state.gov
[17] Chinese translation

industrial production structure with low yield. The result was one of the worst man made famines the world had ever seen. (Source: Encyclopedia Britannica). The Sino/Soviet break in 1958 also worsened the bilateral relationship between these countries in the years to come.

In the early 1960s General Secretary of the CPC, Deng Xiaoping, became dominant in the government adopting pragmatic economic policies for the social reconstruction. These new "capitalist" policies gained much political support within the Chinese government and Deng became increasingly popular. Afraid of losing political grounds to Deng, Mao initiated in 1966 the Great Proletarian Cultural Revolution. The Cultural Revolution lasted till 1969, but caused political and social anarchy and lasted for the better part of a decade after which the political situation gradually stabilized. Deng was re-instated in 1975 to pursue the course of economic reform. Mao died in September 1976.

The Student protests at Tiananmen Square in the summer of 1989 were one of the first incidents that got China media coverage worldwide. It was not the kind of media coverage the Chinese government wanted at the time. The Student protests was caused by the intensified dissatisfaction towards the government because of high inflation due to previous reforms, discontent with previous rapid reform policies and government corruption. The students' unwillingness to retreat led to the government's use of military force on June 4. Fire was opened towards unarmed students and civilians. There are no official numbers on how many casualties there were. The Chinese Red Cross initially reported 2,600, and then quickly retracted that figure under intense pressure from the government. The official Chinese government figure is 241 dead, including soldiers, and 7,000 wounded[18]. This incident caused economic reforms to slow until 1992.

1992 marked the end of the Deng era as a number of younger and pro-reform leaders with various backgrounds from engineering and natural science rather than revolutionary struggles came in to power. Together with Deng's call for faster en bolder economic reforms, China shifted gears and accelerated. Among these new leaders Presidents Jiang Zemin was the key figure. However, lacking the revolutionary background, he never gained profound authority within the CPC like Deng or Mao. Thus, a more collective leadership style was introduced with decisions based on debates and compromises.

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[18] Frontline (2008): The memory of Tiananmen 1989, URL:
http://www.pbs.org/wgbh/pages/frontline/tankman/cron/

The Five Year Plan of March 2001, the 10th in line, emphasized on continuing economic growth and China entering the World Trade Organization (WTO) as a main goal. At the time the difficult relationship between China and the USA remained a possible obstacle for China entering WTO. This relation was improved after the September 11 incident the same year, when China joined the US-led coalition against terrorism. In December 11 2001 China entered the WTO.

As Jiang Zemin retired from the position of General Secretary of the CPC in November 2002 and President in March 2003, he keeps his important position as the Chairman of the Central Military Committee (CMC). Although Jiang is cutting back on his political activities he still plays an important role. In November 2002 his own political philosophy, the Theory of the Three Represents, was written in to the party Constitution, next to Marxism-Leninism, Mao Zedong Thought and Den Xiaoping Theory. Jiang's political philosophy is adopted as a party ideology and it legitimizes the party's turn toward capitalism. Hu Jin Tao entered as both the new General Secretary of the CPC and the President along with great staff changes in the government bureaucracy.

Through the latter half of the 20th century Chinese politicians have firmly committed to reform and opening to the international community. The current government has also indentified the reform of state industries and the establishment of a social security system as government priorities. In order to reach these goals, the government has initiated privatization schemes of unprofitable state-owned enterprises and the development of a pension system as well as reducing the government bureaucracy. The next generation of Chinese political leaders was presented in the CPC's 17th Party Congress held in October 2007. Key names are Xi Jinping - the current Vice president of the government, Li Keqiang – the current Vice Premier and Wang Yang.

Economy

In 1978 the PRC initiated a process of "reform and opening" led by Deng Xiaopeng. The goal was to encourage the modernization of the Chinese economy while maintaining a socialist structure. Reforms were gradually implemented and with the phasing out of collectivized agriculture, and expanded to include the gradual liberalization of prices, fiscal decentralization, increased autonomy for state enterprises, the foundation of a diversified

banking system, the development of stock markets, the rapid growth of the non-state sector, and the opening to foreign trade and investment.

During the 1980s the reforms led to growth rates of 10 percent in agricultural and industrial output. Reforms were initiated rapidly in the financial, fiscal, price-setting, and labor systems which led to an overheated economy and the increasing inflation rates in the late 1980s. In 1988 the government initiated a austerity program in order to save the economy, but the discontent with the government had already triggered incident of Tiananmin in 1989. As of this the Chinese economy entered a period of slightly lower growth.

In 1992 Deng Xiaoping made a series of pronouncements designed to reinvigorate the process of political reforms. A 10 year development plan was developed and stated that China's key task was to create a "socialistic market economy" and stressed the continuity in the political system with bolder reform of the economic system.

As more and more reforms were introduced to open up to foreign trade and investment and change the domestic structural economic, China gradually moved from a planned economy system towards a open market economy where market forces were allowed to operate. However, reform measures were adopted in a selective, partial and pragmatic way, making the Chinese transition process a unique case. Selective, because only a few coastal provinces were affected and these would become the growth engines of the reform process. Partial, because they were introduced into the excising socialistic economy, which lead to the emergence of a mixed economy with a number of socialistic characteristics. Pragmatic, because many of the reforms were often introduced when required by economic developments.
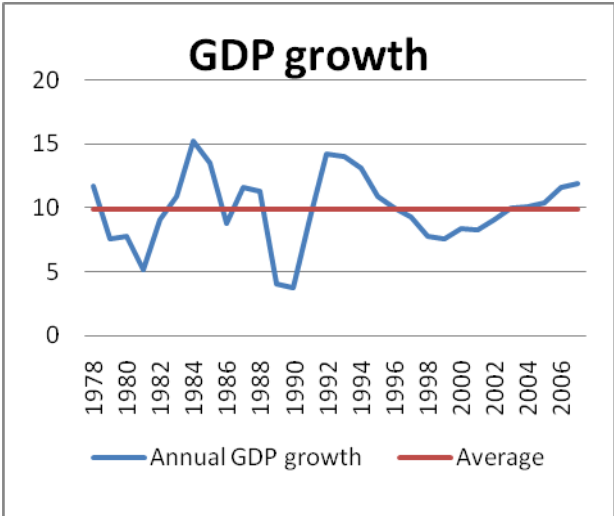

Figure 5: China's GDP growth in percent; 1978 to 2008

Over the period of 30 years China have recorded remarkably high level of efficiency gains and sustained level of economic growth, only comparable with the first and second generation tigers in modern times[19]. The average Gross Domestic Product (GDP) growth over this period is measured to be in the order of 9.8 percent per annum[20]. As a result, China was in 2007 the second largest economy in the world after the US measured in PPP, although in per capita terms China is still categorized as a lower middle-income country. Measured in GDP china is the world's 4th largest economy[21]. Chinas ongoing economic transformation has had tremendous impact not only for China, but also the world. Over the three decades of reforms, China has had the largest reduction in poverty and the fastest increase in income ever seen. The size and impact of China's economic growth have led China to become an important part of the global economy. The result after 30 years is an economy resembling those of a market economy and a growing integration in to the world economy. As we currently are in the 11th Five-Year Plan it will be exciting to see how China will continue to grow and integrate with the world economy in the years to come.

Economic structure

Before 1978, China's economy was comprised of agriculture and light and heavy industry. The agricultural foundation was however weak and the ratio between light and heavy industries were unbalanced. After 1978 and the introduction of "opening and reform" China adopted a series of policies and measures to improve the domestic economic structure. By prioritizing on the development of light industry, expanding the export of top quality consumer goods, strengthening the construction of basis industry and facilities and devoting major efforts to develop tertiary industry, China's economic structure have become more coordinated, optimized and balanced. The results of this can be seen in the spectacular industry growth rate of staggering 30.4 percent in 2003. At that time the industrial sector reached around 50 percent of GDP[22].

Today the industrial structure of China is quite different from that of post "opening and reform". The proportion of primary industry has declined, whereas secondary and tertiary industries have grown. Where, once the nation's growth was primarily driven by the primary and secondary industries, growth is now being driven by the secondary and the tertiary

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[19] See Bjorvatn and Tenold (2006) where this comparison is done with GDP growth.
[20] Own calculations based on data from World Development Indicators (WDI)
[21] CIA and U.S Department of State
[22] International Business (2005): Exploring market opportunities in China, page 21.

industries. The secondary industry is actually the main engine of rapid development of China's economy.

Establishment of the diversified-ownership economy

Today the Chinese government encourages the development of diversified economic elements while insisting on the primacy of public ownership. Before the reforms however, China had a unitary public ownership economy, which lacked vitality. The structure of China's secondary industry changed fundamentally during the 1980s. Until 1978 output was dominated by large state-owned enterprises (SOEs). Since then much of the output shifted over to the township and village enterprises (TVEs), private entrepreneurs or foreign investors, either in wholly owned enterprises or in joint ventures. By 2002 the share of SOEs and sate-holding enterprises in gross industrial output value had shrunk to 41 percent. The isolated SOEs output value was recorded at only 16 percent.

The internal reforms aimed at resurrecting the economy did not quite increase the efficiency of the public sector. SOEs absorb more than half of all fixed-capital and employ about 60 percent of the urban working population, yet their share in industrial output is shrinking. By opening up to foreign investment and linearization of foreign trade the structural impact on the economy increased in effectiveness and speed through the introduction of both competition and foreign technology. Through this we can observe that process of opening up China has allowed china to exploit its comparative export advantages and acquire foreign technology through foreign direct investment (FDI).
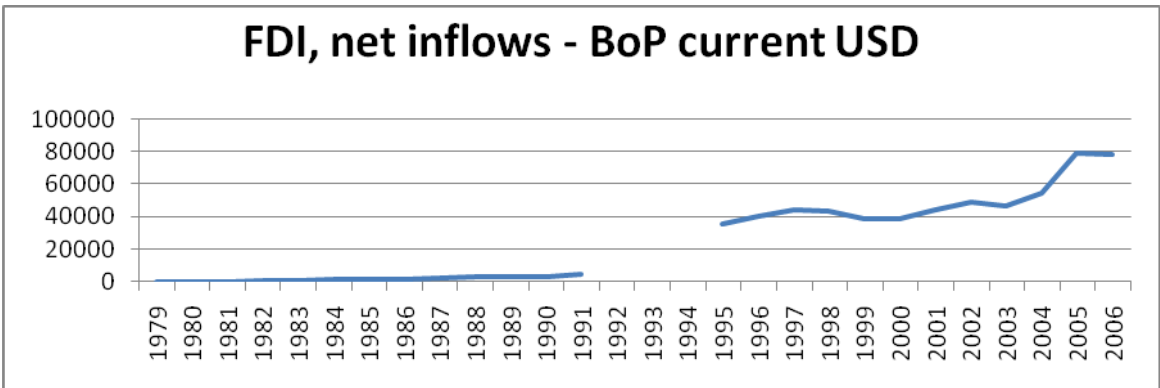
FDI

Figure 6: Net FDI inflows to China in millions

Through foreign direct investment (FDI) the Chinese economy has obtained large amounts of capital formation, employment creation, labor training, export promotion, technological transfer, productivity improvement and competition. Since 1978 China has become one of the largest recipients of FDI among developing countries. During the 1980s FDI grew quickly, but was restricted to export-oriented operations and required foreign investors to form joint-venture partnerships with Chinese firms. The incident of Tiananmen slowed down this development. In order to increase FDIs again the government introduced legislation and regulations designed to encourage foreigners to invest in high-priority sectors and regions.

In the early 1990s foreign investors were allowed to manufacture and sell goods in the Chinese domestic market and the authorization of establishing wholly-owned enterprises became quickly the preferred from of FDI. The legislation and regulation of the FDI have however led to great gaps among regions, saturation in some industries and an underdeveloped service sector. At the same time the largest fraction of the FDI into China, about 60 percent, actually came from overseas Chinese investors from Hong Kong, Taiwan Macau and other countries. With this notion on the FDI into China one could imply that the slowdown of FDI inflows into China since 1997 could be explained by the impact of the Asian Financial Crisis of that year. Another explanation is the change in FDI recording measures. Annual inflows of FDI in 2007 were recorded to 75 billion USD, making China the largest recipient of FDIs and by the end of 2007 more than 5,000 domestic Chinese enterprises had established direct investments in 172 countries and regions around the world[23]. Opening the economy still remains central to China's development. About half of China's exports are produced by foreign-invested companies and China is still attracting large investment inflows. The Chinese foreign exchange and gold reserves and gold reserved were recorded to 1.493 trillion at the end of 2007, making China's foreign exchange reserved the largest in the world[24].

Although large FDI inflows into China have been documented through uses of fiscal and other incentive policies, the Chinese FDI policy is still quite restrictive on entry forms, foreign ownership shares, and industry scope. In some high technology industries wholly foreign-owned enterprises are not allowed establishment and in other industries the Chinese partners must have majority share holdings or a dominant position. These restrictions are likely to reduce the attractiveness of high tech FDI into China. Thus, the Chinese FDI policy

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[23] CIA and U.S. Department of State
[24] U.S. Department of State

regime needs to be further liberalized on competition policies, industrial policies and intellectual property rights' protection and enforcement. When China entered the WTO in 2001, measures were taken to eliminate certain trade-related investment and to open up specific sectors that previously were closed for FDI as a first step. These commitments are ensured by new laws, regulations and administrative measures being issued. Remaining major barriers to FDI include opaque and inconsistently enforced laws and regulations and the lack of a rules-based legal infrastructure.
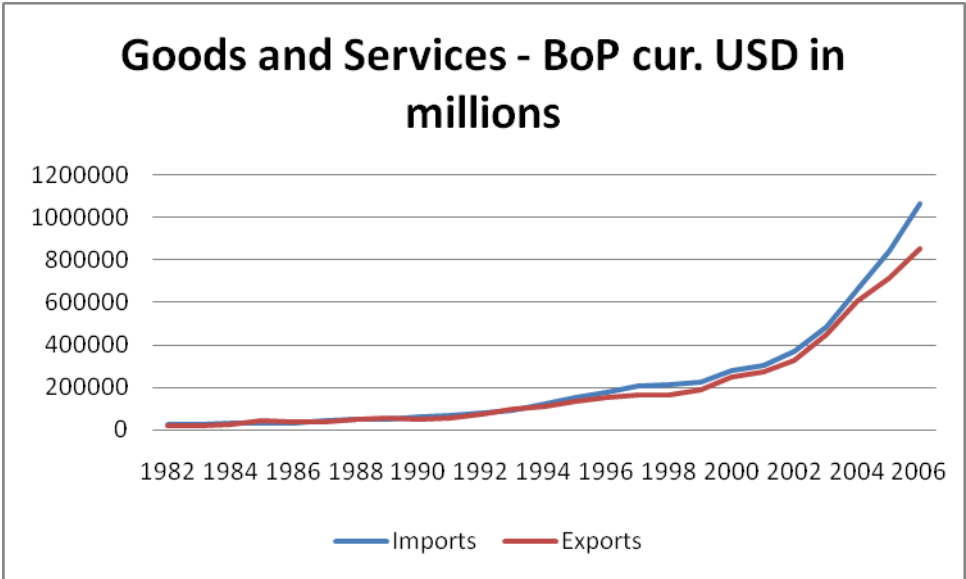
Import and export

Figure 7: Chinese imports and exports

As a big player in the international trade arena, China has maintained favorable trade relations with other countries since the 1990's. China joined the Asia-Pacific Economic Cooperation (APEC) group, which promotes free trade and cooperation in the economic, trade, investment, and technology spheres in 1991. At this time international trade was controlled by government middlemen and trade barriers was widely used to protect domestic industries and SOEs. By joining APEC was a first step to liberalize China's trade policies. These trade barriers, such as quotas and tariffs, were further lightened and other WTO commitments were implemented as China joined the WTO in December of 2001. Although China have made significant progress implementing its WTO commitments, some serious concerns such as intellectual property rights protection still remains.

To nurture the export growth, bread and butter of rapid economic growth, China have pursued policies that attract FDI to export industries, liberalized trading rights and implemented many

of WTO's commitments for China. In the current Five Year Plan, number 11, adopted in 2005, the focus is on developing a consumer demand-driven economy to sustain economic growth and address global imbalances.

In 2006 the total export amounted to 969 billion USD, and imports amounted to 791 billion USD. The three biggest trading partners the same year were USA, Japan and Europe[25]. However, China ran a trade deficit against South Korea, Japan, Taiwan, and Hong Kong among others (2004). This fraction of the imports account for machinery, transport equipment, and chemical products needed to fuel the world's production factory that China has become. According to The Economist – Pocket World Figures, one-fifth of global trade expansion between 2000 and 2003. This expansionary effect was evident in both exports and imports. Cheap Chinese exports started hitting western markets, at the same time as Chinas appetite for raw materials contributed to economic expansions in developing countries in the Asian region and in South America.

Previously China has focused on the manufacturing of labor intensive commodities like textiles and clothing. This is now changing as Chinese exports are consisting more and more of value-added products in order to optimize the structure of exports as well as the economy.

China and foreign exchange

The Renminbi means literally the people's currency and is the official currency of the People's Republic of China. It is also often referred to as the Chinese Yuan, its principal unit which can be subdivided into 10 Jiao and 100 Fen. Issued by the People's Bank of China, the monetary authority of the PRC, it has the CNY as its ISO 4217 abbreviation, although another abbreviation RMB is also widely used. The Latinized symbol is[26].

The Renminbi was first issued in December of 1948, about a year before the Communist Party established the People's Republic of China. A revaluation of the new RMB occurred in 1955 in order to end the hyperinflation that plagued the Republic of China at the end of the Kuomintang era at the rate of 1 new Yuan = 10000 old Yuans[27].

Until 1978 the RMB was set to unrealistic exchange values with strict rules. With the initiation of opening and reform policies a dual track currency system was introduced. This

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[25] China Statistical Yearbook 2007: ch. 18-8.
[26] Chinadaily (2008): Bizchina and wikipedia
[27] Chinadaily (2008): Bizchina

system allowed the RMB to be used domestically only and forced foreigners to use foreign exchange certificates. However, the unrealistic rates which the RMB was pegged to led to high level of black market currency trading. Acknowledging this problem, the Chinese government introduced swap centers for the foreign exchange in the late 1980s and early 1990s to make the RMB more convertible. This led to more realistic exchange rates and the abolishment of the dual track system.

The RMB is convertible on current accounts, but not capital accounts. For some time in the 1990s the goal was to make the RMB fully convertible, but in the retrospect of the Asian financial crisis the PRC has been concerned that the Chinese financial system would not be able to handle a sudden free float of the RMB. Today, China is still reluctant to float the RMB, although small gradual steps toward such a policy are being made.

As one of the results of the overall economic reform the Chinese foreign exchange regime underwent a major reform in 1994. An adaptation of a market based and managed float exchange rate system was made and would set the goal for the currency to become convertible for current account transactions. One single exchange rate at 8.7 RMB/USD was set from merging the official exchange rate and the foreign exchange coordination rate in the beginning of 1994. In April the same year the China's foreign exchange center in Shanghai began operation and marked the beginning of the Chinese inter-bank foreign exchange market. The value of the RMB appreciated slightly to 8.3 RMB/USD by mid 1995 and stayed at 8.28 RMB/USD since September 1998 till mid 2005, when the RMB/USD exchange rate appreciated 2.1 percent and new changes was made to the foreign exchange regime. The RMB was now devalued to 8.11 RMB/USD and the peg towards the USD was removed under much pressure from the US.

The new policy constituted of a basket, band and crawl, resulting in the BBC exchange policy name[28]. The People's Bank of China announced that the RMB would be pegged to a basket of foreign currencies and would trade within a narrow 0.3 percent band against this basket of currencies. This allowed the RMB to become more flexible and float against a number of currencies. The currency basket was not disclosed at the time, but some sources online say that: "The PRC stated that the basket was of The US dollar, the euro, the Japanese yen and the South Korean won. The basket also contains the UK pound, the Thai baht and the Russian

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[28] Term used by economist such as Williamson (2001) and Frankel (2007)

rouble"[29]. The RMB have since 1995 steadily appreciated and the cumulative appreciation is calculated to about 15% till January 2008[30].

The RMB remained pegged to the USD during the Asian financial crisis of 1997. At the time the RMB was under severe pressure to devalue amidst the sharp depreciations of several Asian currencies. The stance of remaining unchanged proved to a pillar for stability in the international monetary system and won much appreciation by China's neighbors, international financial institutions and even the policy makers in the US.

By the beginning of the 21th century he economic reforms, vast amounts of FDIs and low cost labor made China to become one of the major exporters of labor-intensive precuts in the world. This led to the significant increase of China's foreign exchange reserves and in 2003 it reached $350 billion. Another notion is that other labor-intensive exporters were finding it hard to compete with the Chinese. These developments have triggered intense acquisitions and debates about the valuation of the RMB since 2002. According to Purchasing Power Parity (PPP) the RMB may be as much as 40 percent undervalued[31]. It is argued that the undervalued RMB may lead to deflation in neighboring countries, worsening of the bilateral trade deficit between the US and China and millions of job loss in the US's manufacturing industry.

Although Chinas foreign exchange policy was changed towards a more flexible exchange rate in 2005 have led to a slight appreciation of the RMB, critics are still not content. The Chinese government favors economic stability and in this content they want to keep the RMB stable. With many challenges still to solve in the Chinese economy, a floating exchange rate system would be unwise for the time being.

According to Anna J. Schwarts (2005), the ground for the charge that China is manipulating its exchange rate was this:

"Over the past two years China's real exchange rate has depreciated while a surplus in its balance of payments has strengthened. Its current account surplus in 2003 with the US was more than $120 billion, much larger than its overall surplus with the world of $46 billion. Over the past decade capital inflows have produced a surplus in the capital account of about

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[29] Lonymphics (2008): Renminbi
[30] Thomson DataStream
[31] Cheung et al. (2005), Frankel (2005), Wang (2004), The Economist – The Big Mac Index (various issues)

4 % relative to GDP, and a large inflow in 2003 in anticipation of expected appreciation of the RMB. The Current Account surplus relative to GDP is about 3 % of GDP. In addition, China used the surplus to purchase dollar assets. Its foreign exchange reserves, now more than $600 billion, have been accumulating over the past decade and at a particular rapid pace since 2003, suggesting that it is trying to hold down the real exchange rate. "

The pressure from the US was in the form of trade argument. They claimed that the manipulated RMB exchange rate was favouring Chinese export, causing massive a massive bilateral trade deficit and loss of millions of American jobs. The G7 countries and the European Union are also in favour of a RMB revaluation, although they are not as persuasive as the US. It is this policy in the view of the critiques that contributes to the US growing current account deficit. The critiques argue that if the exchange value of the RMB were to appreciate relative to the USD, then Chinese goods would become more expensive in the US and China's trade surplus with the US would be reduced.

Some members of the US Congress claim that the RMB is undervalued by at least 30% to 40%[32]. However, there seem to some disagreement in the US on whether protectionism against china is the best way to reduce the US current account deficit. The ex US Federal Reserve chairman Alan Greenspan and many other economists argue that exchange rate changes alone would not lead to a tangible shrinkage in the trade gap between the US and China, because America would still demand low-cost products from developing countries. Furthermore, more than half of exports from China are actually made by foreign founded factories. Masaki (2005) estimates that the overall US imports from China, more than 25% are products made locally by US subsidiaries or affiliates. Here we have a classic example on that goals economics and politics conflict.

This notion has made China the prime target of the US protectionism. Complaints about China's trading practices according to Schwartz (2005) range from counterfeiting patented and copyrighted products, granting illegal subsidies on exports of agricultural products, and erecting nontariff barriers against soybean imports. Through the Multi-Fiber Agreement, which governed textile quotas for developing countries from 1974, China has faced restrictions on its textile exports. When the agreement expired at the end of 2004, there was prospected of a larger textile export by China in 2005. This concern lead foreign textile

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[32] Masaki, Hisane (2005)

manufacturers to demand "special safeguard"[33] provisions that the importing countries obtained as one of the conditions for admitting China to the WTO.

The allegations that China is manipulating its exchange rate have been the basis for the introduction of bills in the Congress to impose a surcharge on Chinese exports to the US is China fails to end the practice. High profiled politicians in the Bush administration, such as U.S Treasury Secretary John Snow have also tried to pressure China to end alleged currency manipulation. In October 2004 during the G-7 countries dinner meeting, Chinese officials told their US counterparts that they intended to float or revalue the RMB without committing themselves to a date when the change would begin. Secretary Snow found the Chinese position unsatisfactory, but acknowledge that progress was being made.

This sentiment was not shared by an alliance of American manufacturing companies and labor unions. They petitioned the Bush administration to sue China at the WTO for the currency manipulation. Although resolving currency disputes was the IMF's responsibility, the petitioners had to turn to WTO, because the IMF denied the petition. However, IMF later commented that the Chinese RMB as well as the currencies of the rest of Asia should be more flexible.

The Plaza agreement and Louvre accord

At the beginning of the 1980s the US economy was suffering from low growth and inflation. When Reagan became president of the United States in 1981, his goals was to save the US economy. Reagan managed to facilitate growth through expansionary fiscal policy, but at the cost of increasing the current account deficit. He also cooled down the inflation with a tight money policy, but the higher interest rate caused by the policy appreciated the USD. The appreciation of the USD accelerated an increase in the current account deficit and decreased the competitiveness of US exports motivating the congress to restrict imports. In September 1985 this protectionist threat to the international trading system stimulated finance ministers and the heads of central banks from the world's five biggest economies, the G-5 countries[34] to reach an agreement to devalue the USD through intervention in the currency markets by all the participating countries. The agreement was reached at the Plaza Hotel in New York, hence the name, The Plaza agreement and was intended to last for two years. Each country also made specific promises on economic policy: the United States pledged to cut the federal

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[33] Masaki (2005)
[34] France, West Germany, Japan, the United States and the United Kingdom

deficit, Japan promised a looser monetary policy and a range of financial-sector reforms, and Germany proposed tax cuts. Not all the promises were held, but even so the plan turned out to be successful and the dollar depreciated against the other countries.

The reason for the devaluation of the USD was motivated by two causes. The first cause was to reduce the current account deficit. By devaluing the USD, US exports would become cheaper to its trading partners. This would increase exports and hopefully reduce the current account deficit. The second cause was to help the US economy to emerge from the recession in the 1980s. These causes are both interdependent since a trade motivated reduction of the current account deficit, meant an increase in productivity.

After the signing of the agreement the USD did indeed decline until the beginning of 1987, on average by 35 % relative to foreign currencies. The exchange rate of the USD versus the YEN declined over 51% over the agreement period and most of this depreciation was due to spending by the participating central banks. Since the depreciation of the USD was orderly pre announced it did not lead to financial panic in the international market. The figure beneath shows the development of the G5 countries' currencies plus Canada's versus the USD. The exchange rates are all shown in local currency per dollar. This means that a decline in the lines implies that the local currency have appreciated against the USD (or that the dollar have depreciated against the foreign currency).
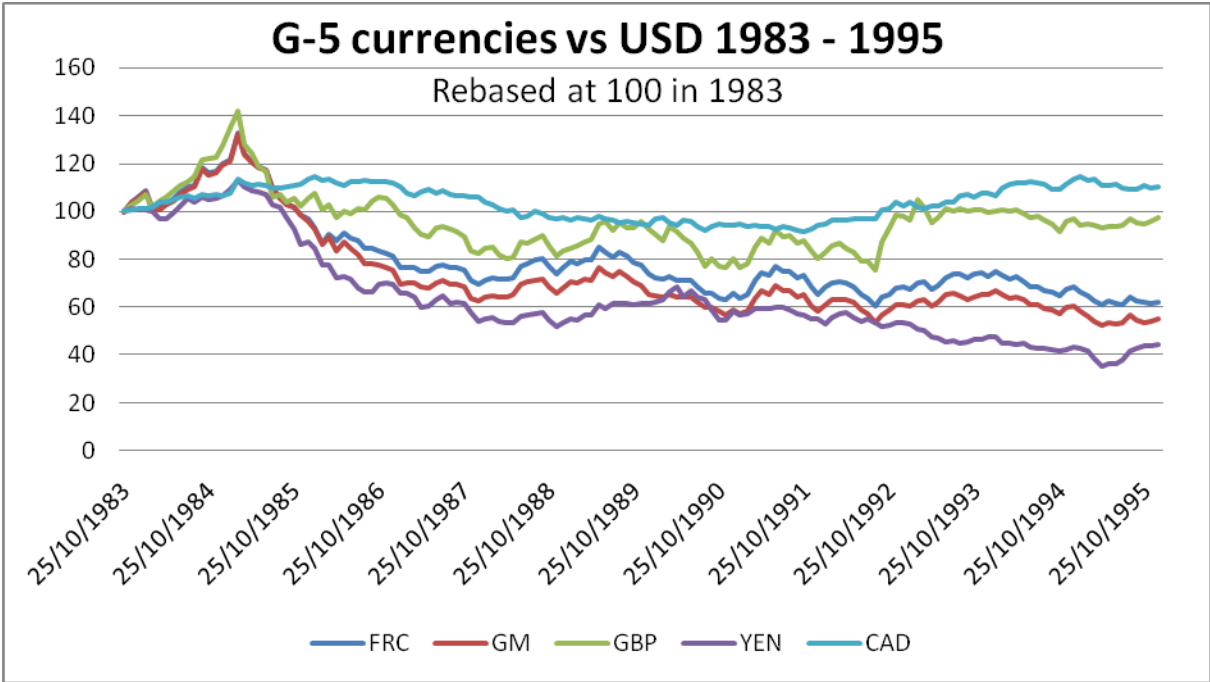

Figure 8: G-5 currencies per USD from 1983 to 1995

Form the Figure we can clearly see that the Plaza Accord did indeed serve its purpose in devaluing the USD. The dollar depreciated against the French Franc, German Mark, Great Britain Pound and the YEN indicating that the intervention in the currency markets was very effective.

The Plaza Accord did reduce trade deficit with Western European countries, but failed to fulfill its primary objective of eliminating the trade deficit with Japan. The deficit between the US and Japan was due to trade structural conditions rather than monetary. The US exports did become more competitive after the devaluation, but this did not happen in Japan due to Japan's structural restrictions on imports.

By the end of 1987, the dollar had fallen by 54% against both the D-mark and the yen from its peak in February 1985[35]. Already in the beginning of 1987 there was a growing concern over the decline in the dollar, caused by currency speculation. This paved way for the Louvre accord in February 1987 where the G-5 countries plus Canada agreed that exchange rates should be stabilized around the current levels. Again specific policy promises were made: The United States to tighten fiscal policy, Japan to loosen monetary policy. Again the participants promised currency intervention if major currencies moved outside an agreed, but unpublished, set of ranges. The dollar promptly rose against all the G5 members except for Canada. The USD did continue to fluctuate relative to foreign currencies after the Louvre accord, but in the longer trend seemed to be stable.

If the Louvre Accord had managed to keep the YEN stable, it would have led the Japanese economy on a growth path. But the YEN continued to appreciate against the USD. The strengthened YEN caused devastating effects for the export-dependent Japan and created an incentive for the expansionary policies that led to the Japanese asset price bubble in the late 1980s. In other words the rising YEN limited the monetary policy options and the Bank of Japan kept the interest rate too low, too long. This in combination with excessive business investment, lax lending by Japanese financial institutions and inadequate macroeconomic policies resulted in a bubble economy whose effects led the Japanese economy in to a decade long depression due to the following deflation.

Black Monday (19 October 1987) implied a free fall in the USD and stock prices worldwide and by then end of the year the YEN was approaching 120 to the USD. The Bank of Japan (BOJ) was afraid that a further fall in the USD would lead to a global depression, so they

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[35] Economist.com: Economics A-Z – Plaza Accord

continued with an easy monetary policy. This was done by keeping the discount rate at 2.5 % for two years and three months[36], leading to money supply growth. Between 1987 and 1999 money supply grew with more than 10 % annually, generating excess liquidity, increasing stock and land prices. In December 1989, the Nikkei index hit the record high 38,062 yen[37].

By the beginning of 1989 inflation pressure mounted in Japan, due to shortage of labor and increase in prices of imports. The BOJ started with a radical tightening of the monetary policy increasing the discount rate to 3.25 % in May 1989 and by August 1990 there was a further increase of the discount rate to 6%. This monetary policy shift caused the stock and property prices to plunge and reversed the borrowing cycle. Private investment declined in the beginning of the 1990s'. That resulted in GDP stagnation shown in the figure below[38].
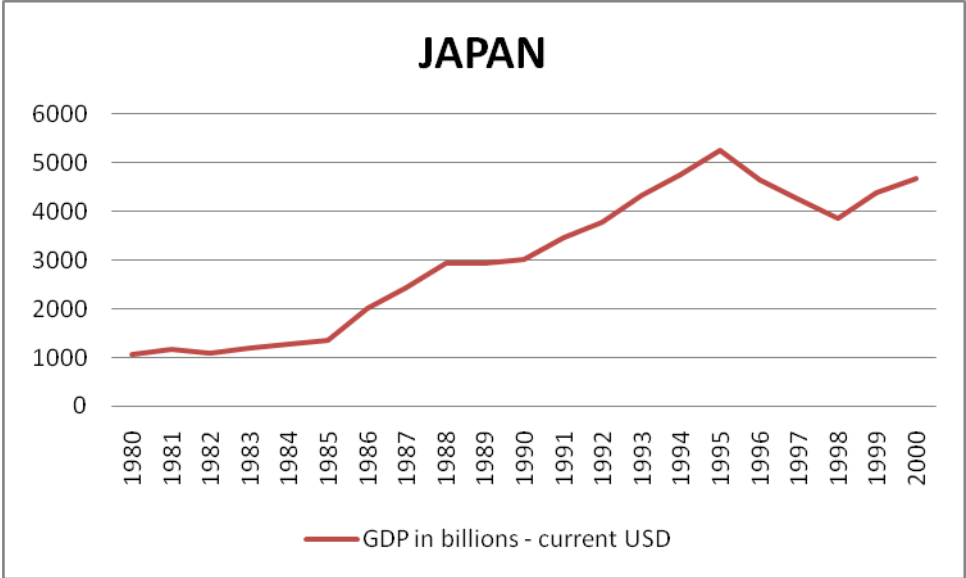

Figure 9: GDP of Japan 1980 to 2000

Japan has an imbalanced current account, which is in a structural surplus. Much of this is due to a large excess of savings over investment, reflecting in a surplus of exports over imports. This payment imbalance is not solved by the market intervention for the YEN appreciation. What is really needed to correct such an imbalance of savings and investment is a negative real interest rate. Other ways the currency appreciation will harm the economy even more.

The Plaza accord did not balance out the trade deficit between Japan and US. However, the US still continued putting pressure on Japan to restraint its exports. This continued through

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[36] Kawanishi (1999)
[37] Kawanishi (1999)
[38] World Development Indicators

the Reagan, Bush senior and the Clinton administration, before Japan began to say no to what they saw a unjust US demands that contravened international trade rules. In the mid 1990s such a trade policy stance marked a significant departure from the post war Japanese trade policy

China in the footsteps of Japan

The pressure for China to move from a pegging the RMB to the US to a floating currency policy became a hot topic in the beginning of the 2000s, when Chinese exports started to soar to the sky. Whereas during the Asia crisis of 1997, there rather complements than critique when china held the same exchange rate[39]. In the prologue to the election year of 2004 the topic of a RMB revaluation emerged once again by the help of the Bush administrations political campaign. On the 5 September 2003 president Bush himself went on CNBC in order to promote his policy with this comment[40]; "…we expect our trading partners to treat our people fairly – our producers and workers and farmers and manufacturers – and we don't think we're being treated fairly when a currency is controlled by the government." China also faced sanction bill in the US Congress, motivated by their protectionism.

China has drawn the historical lesson of what the 1985 Plaza Accord did to the growth of the Japanese economy. Therefore, China is hesitant in submitting to the same sort of agreement now. When joining the World Trade Organization (WTO) China agreed to more exchange rate flexibility, but due to unfavorable conditions in the world economy since 2001 have delayed the process. Before China de-pegged the RMB from the USD in July 2005 there were several concerns. A revaluation of the RMB could lead China towards a depression similar to that of Japan in the late 1980s. Widespread job losses could emerge for Chinese workers, who are much poorer than their American peers. Floating the RMB could also subject the currency speculation further increasing the appreciation pressure.

China daily conclusion in 2003; "A more undesirable consequence might be the impression that international browbeating can effectively mandate China's forex policy. Then, the next time some international dignitary says something about the RMB, market players will follow his or her comments and put pressure on the currency." …" Should China now give in the pressure to face dire consequences later? 'No way.'"

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[39] Mork Knut .A. (2006)
[40] Burdmand, M (2003)

Comparing this historical international policy coordination with the situation today we can see several similarities. The US is much the same then as now. The US has a trade deficit of 57.2 billion USD in October 2008[41]. They are still motivating the use of currency intervention in order to stimulate more effective trade policies. Today, China has overtaken the role of Japan. However in the section to come we are going to take a closer look at the similarities and differences between the situation in the late 1980s and today.

The congress is not only concerned about the trade deficit between the US and China, but Chinas recent aggressive investments in the US also raises concern. These concerns have manifested among the American people in the perception of China as a main economic adversary and even a new threat.

As one of the first generation tigers, Japan was predicted to replace the US as the biggest economy in the world sometime in the 21st century[42]. In 1985 when the Plaza Accord was signed Japan was the world's largest creditor nation with a trade surplus of more than 50 billion USD with the US. Today China is often in the focus in terms of high growth countries. (In 2005) China was the seventh largest economy in the world in terms of gross domestic product (GDP), and also the third largest trading nation after Germany and the US. With these merits and as the world's most populous nation China is projected by many to become the number one economy in the world by about 2050, at the latest.

According to Masaki many experts say that in terms of economic development China is now where Japan was in the 1960s. That was a decade where Japan's economy was defined as high flying and the national income more than doubled. The summer Olympics in Tokyo in 1964 provided a good opportunity to showcase Japan's miraculous recovery from world war two and rapid growth. Maybe it is a mere coincidence that Beijing hosted the summer Olympics in 2008.

Japan joined the General Agreement on Tariffs and Trade (GATT), later to be succeeded by the World Trade Organization, in 1955. Although Japan was backed by the US, some countries, including Britain and France invoked Article 35 of the GATT rules and retained discriminatory trade measures against Japan. Getting those discriminatory trade measures

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[41] U.S Census Bureau (2008)
[42] Masaki (2005)

lifted became Japan's biggest foreign-policy tasks throughout the 1960s.At the end of 2001 when China joined the WTO, it was also subjected to tougher terms than other new entrants. Other WTO members had for instance the right to single out China and impose "special safeguard" emergency import restrictions. Ordinary "safeguard" import restrictions is applied to all WTO members, but the "special safeguard" restrictions can only be applied to China and will remain in place until the end of 2013. These special safeguards are discussed more thoroughly by Lardy (2002)[43].

In the 1960s the textile trade was the main source of trade friction between the US and Japan. Today the textile trade is yet again a source of trade friction. US have consequently accused China of failing to comply with its commitments made when joining the WTO, including the touchy topic of intellectual property rights. In the future more trade disputes are bound to break out, as it was between the US and Japan. This will in turn further fuel the topic of an undervalued RMB.

In the 1980s Japan was targeted with sanctions bills by the US Congress, which called for a 20% surcharge on Japanese imports. In 2005 bills targeting China was submitted calling for a 27.5% surcharge on all imported Chinese goods unless China revalues the RMB drastically[44].

Backed up by the strong Yen at the end of the 1980s, Japanese companies invested heavily in the US. They made high-profile acquisitions, such as the purchase of the Rockefeller Center by Mitsubishi Estase Co just to mention one. The buying of American assets by Japan stirred negative reactions from many Americans. In recent times China has been trying to invest in the US as well, but is facing heavy opposition from the Congress. For instance in 2005 the state run China National Offshore Oil Co Ltd tried to acquire Uncoal with a bid of $18.5 billion, but was disapproved by the Congress who cited security concerns. When the Chinese Lenovo Group Ltd purchased IBM Corp's PC operation late 2004, some Congress members also voiced security concerns.

As we can see, there are several striking similarities between China today and Japan in the mid 1980s. However alike they are, there are bound to be differences.

One of the biggest differences between Japan and China is political regimes. Japan and the US have often shared the common values on the bilateral security treaty since the end of

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[43] Lardy N.R. (2002): Ch. 3 p. 81. And more on US policy in ch. 5
[44] Masaki (2005)

World War II. In the 1980s the US president Reagan forged close ties with then Prime minister of Japan Yasushiro Nakasone called the "Ron-Yasu relationship". In this decade the Japan's security operation was significantly developed with the US. Whereas China is governed by one communist party with quite different views on human rights, democracy, Taiwan, Tibet as well was over trade. Another notion is that Chinese leaders often express a need to promote the multi-polarization of the world, rather than having the world dominated by a single superpower.

The political tension is often complemented with military tension. In the case of the US and China, this is no exception. The US is worried about the increased military spending of China and the ongoing modernization of the military fearing it could pose as a threat to Asian neighbors and American military forces deployed in the region in the long term. While, China in alarmed by the global transformation of the US military and also by the realignment of American forces stationed in Japan. This Bush administration insists that the transformation of the US military is aimed at ensuring stability in the "arc of instability" stretching from the Middle East to North Asia via South and Southeast Asia. China, however, suspects that the real motive for the transformation might be a "soft containment" of China. Also, the stronger security alliance between the US and Japan has also alarmed China since they agreed to make peaceful resolution to tensions on the Taiwan Strait as one of their common strategic goals to be pursued under the new bilateral security agreement. China still regards Taiwan as a renegade province that must be reunified with China, by force if necessary.

In 2005 China joint a statement with Russia and four other Central Asian countries calling for an early withdrawal of US forces from Central Asia. The same year China also conducted its first high profile joint military exercise with Russia. The statement and the military exercise were widely seen as countering the US domination of world affairs. The US is also frustrated over that China is building ties with anti-US, oil-rich countries like Iran and Venezuela. China has also strengthened ties with Myanmar in recent years, in defiance of US and European sanctions against the military-ruled Southeast Asian country.

Moving on from the political to the economical issues we notice that there are economical differences between Japan and China. The trade data of the two countries show differences in the trade structures. Although both countries have huge trade surpluses with the US, Japan's overall trade surplus with the world is well over $100 billion, compared with China's of $20-$30 billion.

Masaki explains he reason for the low world trade surplus as this. Although China's exports of labor intense products, machinery and electric appliances have gained huge trade surplus with the US and Europe, but at the same time China has run a big trade deficit with Asian neighbors. China have so far been an assembly base for multilateral companies, especially from Asian neighbors, for products to be exported to the US and Europe. According to Masaki more than half of Chinese exports are made locally at foreign-founded factories. Another point is that China often imports high-tech parts and components from Japan and South Korea and so on for assembly of Chinese products. This adds little value to products in local production.

As mentioned, the trade friction at the present time between the US and China is still over low-tech products, but as China continues to catch up with the US through technological progress, more and more high-tech will be the focus of trade disputes. Back in the 1980s mighty Japanese banks swept through the global capital markets, including those in the US, but today Chinese banks are almost invisible abroad. The explanation for this might be that the Chinese economy is still a socialistic market economy vs a market economy of Japan which was established post World War II, Masaki implies.

Although there are disputes between China and the US on many political issues, there are also issues that the two nations agree on. The Clinton administration referred to China as a "strategic partner", whereas the following Bush administration referred to China as a "strategic competitor" in early 2001. The Bush administration did soften on its rhetoric after the September 11 terrorist attacks in hope of cooperation from China in for its global fight against terrorism and also in resolving the standoff over nuclear programs of North Korea, for which China is one of the few remaining allies. But the US-China relationship of constructive cooperation began to show its seams after the US launched the war against Iraq in early 2003. The Iraq war also caused disputes between the US and some of its cold war allies, like France and Germany, as well was Russia.

China is becoming more and more important trading partner for Japan, but Japan is gradually becoming less important trading partner for China. This asymmetrical phenomenon is reflected in the booming Chinese economy and the slumping Japanese economy. Trade disputes will not only occur between China and US but also China and Japan in the future, as China moves in to more high-tech sectors. In this development and the ongoing asymmetrical

phenomenon, it looks like China will be put at an advantage in future trade negotiations with Japan.

Analysis

The Big Mac Index

The Big Mac index was created by the Economist's economics editor in 1986 and has since then become a widely used guide to how far currencies are from their fair value. The Economist has printed this index annually since its birth. The index is based on the theory of purchasing-power parity (PPP), which we have already presented and states that in the long run, exchange rates should move towards levels that would equalize the prices of an identical basket of goods and services in any two countries. The Big Mac Index is a simple version of the absolute PPP consisting of only one good, the Big Mac hamburger that is available in 120 countries at the present time[45].

The implied Big Mac PPP is calculated by taking the local price of a Big Mac divided by the dollar price of the Big Mac.

$$Big\ Mac\ PPP = \frac{P_{local}}{P_{\$}}$$

This implied exchange rate would leave burgers costing the same in America as elsewhere. Comparing the implied Big Mac PPP with the market rate of the local currency and the dollar we can imply whether the currency is under- or overvalued:

				Valuation	£ and €
implied Big Mac PPP	<	Market exchange rate	=	Under	Over
implied Big Mac PPP	>	Market exchange rate	=	Over	Under

Note that when comparing the British Pound and the Euro, the implied PPP and the exchange rates are noted in dollar per Pound or Euro. The comparison gives therefore opposite interpretations.

In March 2007 the Big Mac cost 11 RMB in China and 3, 41 USD[46] in the US. This gives us an Implied Big Mac PPP at 3.23 RMB/USD. The market exchange rate in March was 7.69

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[45] The Economist (1992-2007), various issues
[46] Calculated average based on four major cities in the US. Source; The Economist

RMB/USD and from this we can clearly see that the Chinese RMB is undervalued. Undervaluation in percentage:

$$\frac{PPP - e}{e} = \frac{3{,}23 - 7{,}69}{7{,}69} = -58\%$$

This percentage of undervaluation makes the RMB the most undervalued currency against the USD in 2007. As we shall see later, the Chinese RMB has been in the 50th percentile region since the RMB was pegged to the USD in 1994.

Below I have plotted the development of the implied Big Mac index (red line) and the exchange rate (blue line) from 1992 to 2007 for the Britain, Canada, Euro area and Japan. The plotted periods are based on data availability. The Euro didn't exist before 1999, hence the shorter period. Whenever the blue line is above the red line, then the local currency is undervalued relative to the dollar. Exceptions are the Pound and the Euro, who has the invert interpretations.
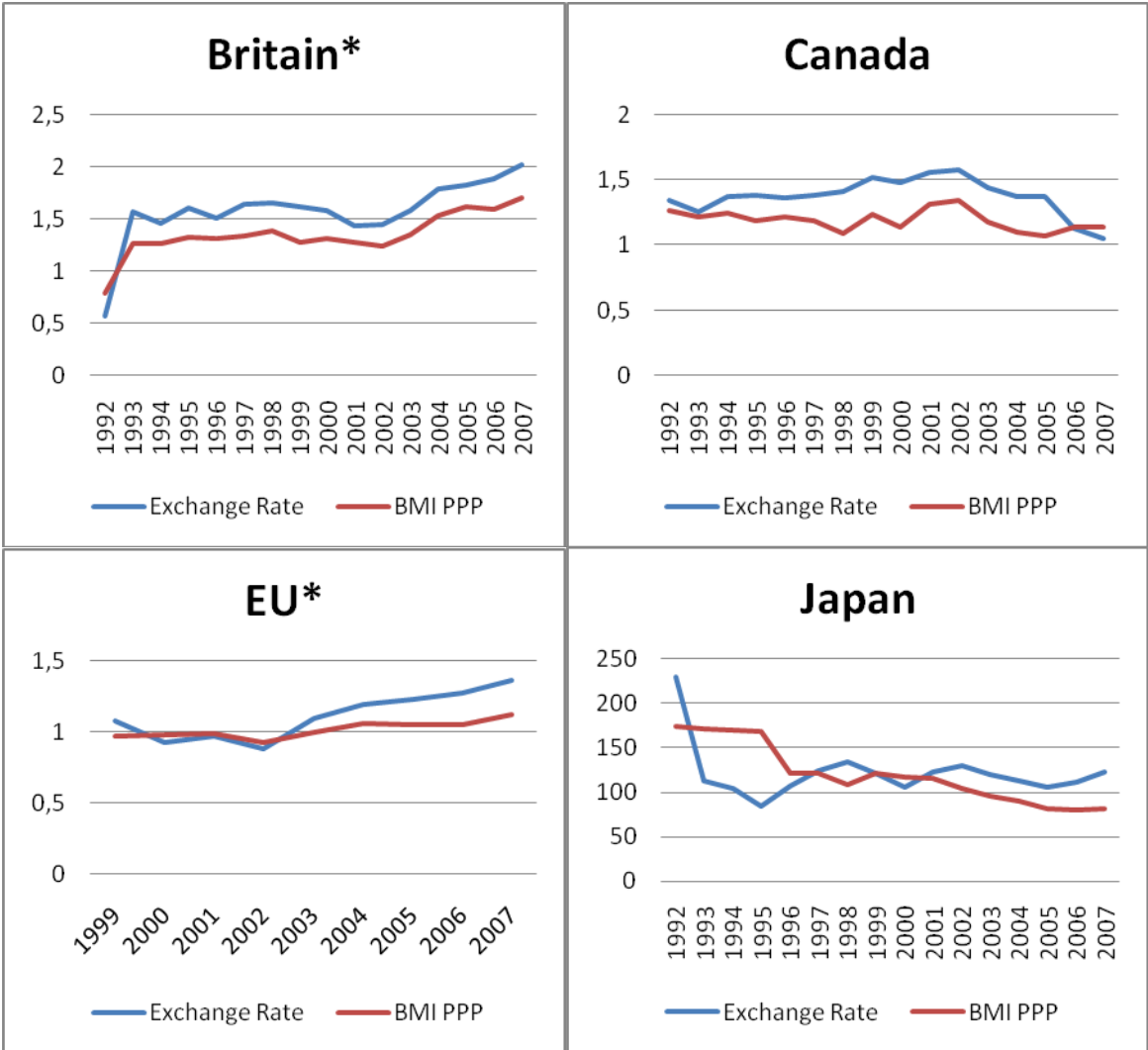
This index was created in order to make foreign exchange easier to understand for the average Joe and can therefore not be used as a precise predictor of currencies movements. It is simply a light hearted guide to whether currencies are at their "correct" long-run level. From the figures the implied Big Mac index and the exchange rates seem to move together in the long run. However, in the short run we see periods of both over and under valuation. It's here worth mentioning that burgers cannot sensibly be traded across borders and prices are distorted by differences in taxes and the cost of non-tradable inputs, such as rents.

However, putting the drawbacks aside, the Big Mac index has an impressive record in predicting exchange rates. Take the Euro for instance; when it was launched at the start of 1999, most forecasters predicted that it would appreciate. But at the start of 1999, euro burgers were more expensive than American ones measured in USD. Hence the Big Mac Index signals that the euro is going to depreciate and history proved it right. This can be seen as the drop in the blue line for the Euro between 1999 and 2000. Also, back in 2003 the Big Mac Index predicted that China would come under increasing pressure for revaluing the RMB. In 2005 this predicament was fulfilled by a revaluation of the RMB to a small degree, as we shall see in the figure below.

In 2003 academic economists started taking the Big Mac index more seriously. Almost a dozen studies on the index came out that year and there was even written a book about the index* by Li Lian Ong, of the International Monetary Fund. She concludes that the Big Mac Index has been surprisingly accurate in tracking exchange rates in the long term. However, there are some persistent deviations from PPP, especially in emerging-markets where the currencies are consistently undervalued[47].

One of the reasons for this undervaluation is the difference in productivity. Rich countries have higher productivity than poor countries. In the case of tradable goods this is quite true, but when it comes to non-tradable goods productivity between rich and poor countries become more even. Non-tradable goods are cheaper in poorer countries because wages are the same in both sectors. When this is said, it is safe to say that a basket that includes non-tradable goods, like the Big Mac, the currencies of poor countries will always look undervalued. Ms Ong finds that currency deviations from PPP are indeed related to productivity differences relative to America. She finds that the Big Mac index performs better in tracking exchange rates after adjusting for the productivity difference.

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[47] The Economist (2003): McCurrencies

China

Exchange Rate — BMI PPP
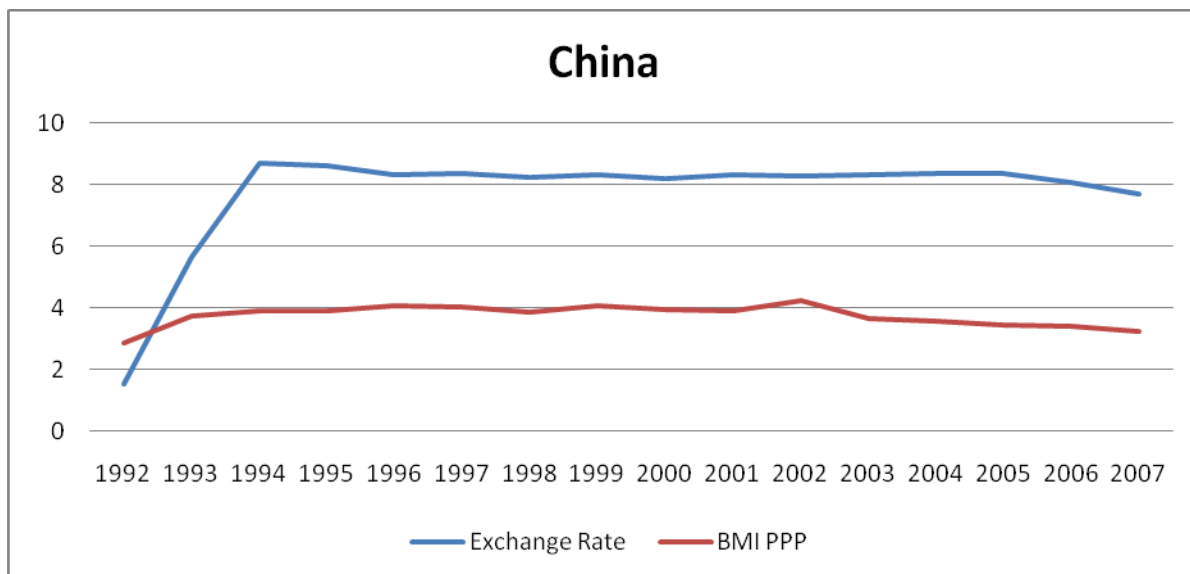
In the discussion of whether the Chinese RMB is undervalued, some American politicians are fond of citing the Big Mac index rather too freely when it suits their cause; demands for a big appreciation of the Chinese currency in order to reduce America's huge trade deficit. Judging from the figure above, they seem to be right. The Big Mac Index does indeed undervalue the RMB and has done it consecutively since 1994. But the cheapness of a Big Mac in China does not really prove that the RMB is being held far below its fair-market value. As mentioned, PPP is a long-run concept. It signals where exchange rates are eventually heading, but it says little about today's market-equilibrium exchange rate that would make the prices of tradable goods equal.

Further, a hamburger is a product of both traded and non-traded inputs. More important, the Chinese price of a Big Mac charged in China helps to pay for the retail space in which it is served, and for the labor that serves it. Neither of these two crucial ingredients can be easily traded across borders. David Parsley, of Vanderbilt University, and Shang-Jin Wei, of the International Monetary Fund, estimate that non-traded inputs, such as labor, rent and electricity, account for between 55% and 64% of the price of a Big Mac[48]. They find that the traded parts of the burger that are converge towards purchasing-power parity quite quickly, while the non-traded bits converge much more slowly. Any disparity in onion prices will be halved in less than nine months, for example, but a wage gap between countries has a "half-life" of almost 29 months.

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[48] Parsley, David C. and Wei, Shang-Jin (2005)

As mentioned in the presentation of the PPP, the prices of traded goods will tend to be similar to those in developed economies. But the prices of non-tradable products, such as housing and labor-intensive services, are generally much lower in less developed countries. Hence, they show disported results for poorer countries, mostly in the direction of undervaluation.
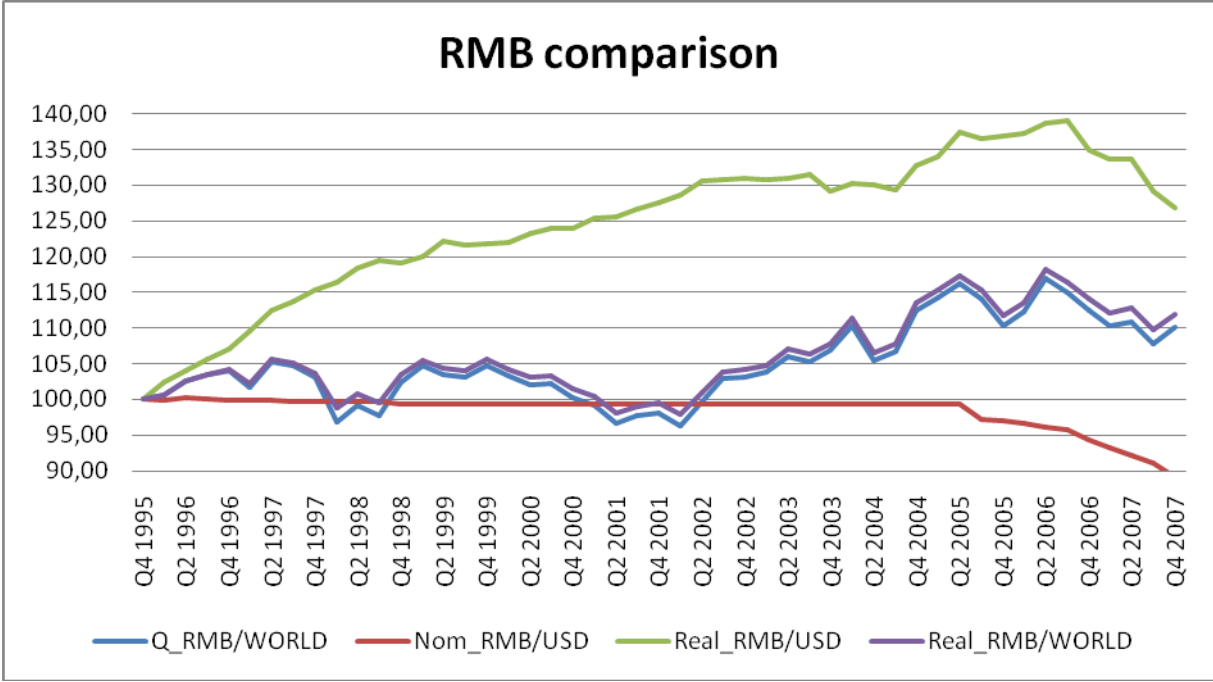
Real exchange rate comparison

Figure 10: RMB compared with its PPP implied and RER values

By comparing the nominal RMB/USD exchange rate with the real RMB/USD exchange rate we comparing the actual exchange rate with the PPP implied one. The results are shown in figure 10 above.

Real exchange rate: e_t^r

$$e_t^r = e_t \frac{CPI_{Ch}}{CPI_{US}}$$

The quarterly data I have used were gathered from Thompson DataStream. The first observation was recorded in quarter four 1995 and the last in quarter four 2007, giving a total of 49 observations. This comparison compares only a bilateral relationship. For an easy comparison of the exchange rates I rebased the exchange rates to 100 in the fourth quarter of 2007. I then plotted the nominal RMB/USD exchange rate shown as the red line in the RMB comparison figure above. The real RMB/USD exchange rate is shown as the green line and it has steadily increased, telling us that the real USD has appreciated relative to the real RMB.

This trend turned around Q3 2006, and then the real USD depreciated relative to the real RMB. This comparison shows a big misalignment between the nominal and real RMB/USD exchange rate that have been increasing over the analysis period. In Q4 2007 the misalignment was measured at -29.72 percent.

For a trade argument on currency manipulation to promote exports it is argued that such a comparison will tend to give a biased view. The reason is that a country trades not only with one nation, but with multiple nations and therefore a multilateral comparison would give a more correct picture. I have therefore also calculated a trade weighted real RMB/WORLD exchange rate, which is represented by the purple line.

Construction of trade weighted real RMB/WORLD exchange rate

This exchange rate is often called a real equilibrium exchange rate (REER) and is constructed as a geometric, trade-weighted average of the individual bilateral rates with China's 14 largest trading partners[49]. The same method will be used later in the other analysis.

REER

$$Q_t = \prod_{i=1}^{n} Q_{i,t}^{w_i}$$

$Q_{i,t}$ is the real bilateral exchange rate with country i at date t, rebased to 100 in Q4 1995 and w_i is the weight of country i in China's total international trade (which for simplicity constitutes of 14 countries).

The real bilateral exchange rate

$$Q_{i,t} = S_{i,t} * \frac{CPI_{i,t}}{CPI_{China}}$$

$S_{i,t}$ is the nominal exchange rate with country i at date t, expressed as the number of RMB per national currency. $CPI_{i,t}$ is the seasonally adjusted consumer price index for country i at date t.

Trade weights

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[49] China statistical yearbook 2007: US, Japan, Hong Kong, Euro land, UK, South Korea, Taiwan, Singapore, Australia, Malaysia, Canada, Indonesia, Russia and Thailand

$$w_i = x \frac{X_i}{\sum X_i} + m \frac{M_i}{\sum M_i}$$

X_i is the volume of Chinese exports to country i, M_i is the volume of Chinese imports from country i, x is the percentage shade of exports in China's total trade and m is percentage share of imports in China's total trade. A single set of weights is used to construct the REER over the whole sample. This is consistent with the way in which the IMP calculates REER.

The blue line is calculated in the same way, but inputs' natural logarithm was used instead of their normal values. As we can see both multilateral exchange rates show that the real world currency have appreciated relative to the real RMB. The misalignment in Q4 2007 was measured at -20.41 percent. The natural logarithm exchange rate showed a misalignment of -19.03 percent. The misalignment of the real exchange rates is shown in the figure below.
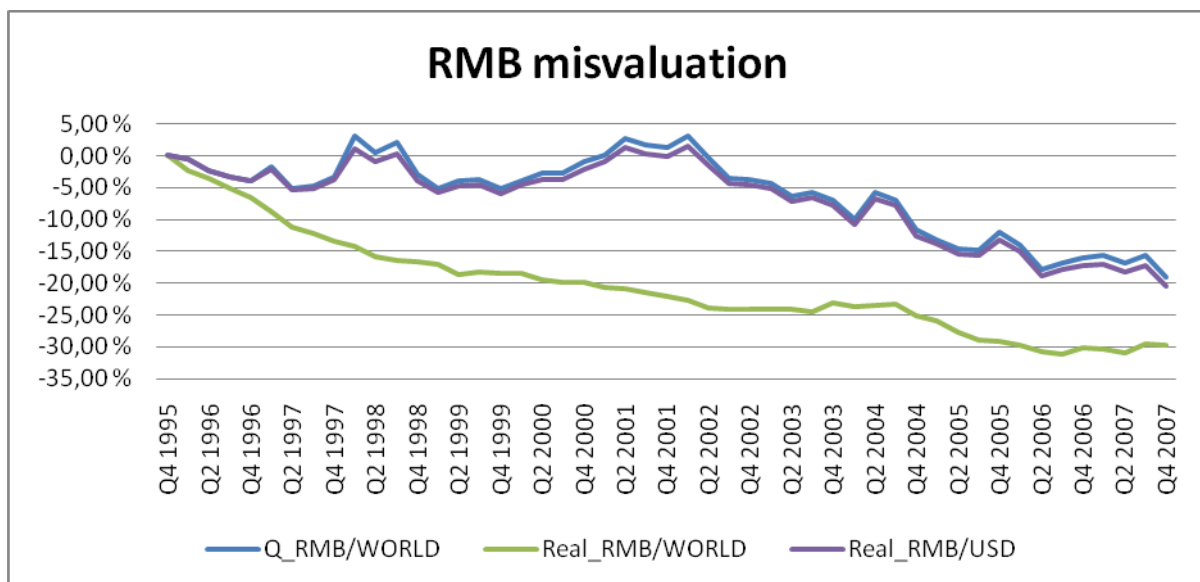
Figure 11: Misalignment of the RMB in percent with its PPP implied and RER values

Bilateral BEER model

The BEER model to be estimated is given by:

$$\ln Q_t = \beta_0 + \beta_1 \{RIR_t^{US} - RIR_t^{CH}\} + \beta_2 \ln \left\{ \frac{PROD_t^{US}}{PROD_t^{CH}} \right\} + \beta_3 \left\{ \frac{TOT_t^{US}}{TOT_t^{CH}} \right\} + \beta_4 \left\{ \frac{FIS_t^{US}}{FIS_t^{CH}} \right\} + \varepsilon_t$$

$Q'_t = S_t * \left\{ \frac{CPI_t^{US}}{CPI_t^{CH}} \right\}$ is the real exchange rate of the RMB/USD.

$RIR_t = \ln(1 + LR_t) - \pi_t$ is the real interest rate and $\pi_t = \ln CPI_t - \ln CPI_{t-4}$ is the yoy inflation.

$PROD_t = \dfrac{CPI_t}{PPI_t}$ is the relative productivity and PPI_t is the producer price index.

$TOT_t = \dfrac{EXPRC_t}{IMPRC_t}$ is the terms of trade or trade balance, $EXPRC_t$ is export and $IMPRC_t$ is the import

$FIS_t = \dfrac{GOV_t}{GDP_t}$ is the fiscal expenditure, GOV_t is the government consumption.

Using the current values of the right hand side variables in the BEER model yields the equilibrium real exchange rate given by:

$$\bar{q}_t = \hat{\beta}_0 + \hat{\beta}_1 FIS_t + \hat{\beta}_2 PROD_t + \hat{\beta}_3 NFA_t + \hat{\beta}_4 RIR_t$$

 In order eliminate the transitory components of the fundamental variables using the Hodrick-Prescott filter with a λ parameter of 1600, which is standard in applied macroeconomic work[50].

The fitted values of the BEER model are then calculated using the smoothed fundamental variables, again for each of the two estimation methods. The HP-filtered version of the BEER model:

$$\bar{q}_t = \hat{\beta}_0 + \hat{\beta}_1 \widehat{FIS}_t + \hat{\beta}_2 \widehat{PROD}_t + \hat{\beta}_3 \widehat{NFA}_t + \hat{\beta}_4 \widehat{RIR}_t$$

DATA

This model is estimated using quarterly data over the period Q4 1996 to Q4 2007. The data used is gathered from Thompson DataStream[51]. The actual period shown in the test result is only from Q4 1997 to Q4 2007, due to the calculation of the relative real interest rate.

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[50] Macroeconomic data are reported quarterly and the band width of 1600 is fitted for quarterly data.
[51] See appendix for the codes of the input variables used

Results bilateral

The summary output for the bilateral regression looks good in terms of R-squared, which is at 0.7. This implies that the variables explain 70 percent of the variations in the nominal exchange rate. The variables are not significant according to the P-values[52], making the model les sound.

Below I have plotted the four variables of the model in order to gain some insight in how they affect the BEER. The red lines represent the HP-filter filtered values and the blue lines are the unfiltered values. RIR has a growing trend.FIS is quite stable, slightly growing trend and a annual pattern is clearly seen. TOT is decreasing with some variations. PROD is stable over the analysis period and showing signs of a decrease.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.83713903
R Square	0.70080175
Adjusted R Sq	0.6675575
Standard Erro	0.02744886
Observations	41

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.06353124	0.01588281	21.0803897	5.0265E-09
Residual	36	0.02712384	0.00075344		
Total	40	0.09065508			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.92877329	0.06277265	30.7263343	1.9906E-27	1.80146446	2.05608211	1.80146446	2.05608211
X Variable 1	-0.1124832	0.11769945	-0.9556816	0.34560703	-0.35118874	0.12622235	-0.35118874	0.12622235
X Variable 2	1.27995111	0.16530329	7.74304664	3.5688E-09	0.94470049	1.61520172	0.94470049	1.61520172
X Variable 3	-0.07077686	0.05400051	-1.31067027	0.19826945	-0.18029497	0.03874124	-0.18029497	0.03874124
X Variable 4	-0.01069789	0.03123482	-0.34249879	0.73396729	-0.07404505	0.05264927	-0.07404505	0.05264927

Table 2:Summary output of the bilateral BEER regression

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[52] Keller and Warrack (2003)ch 11
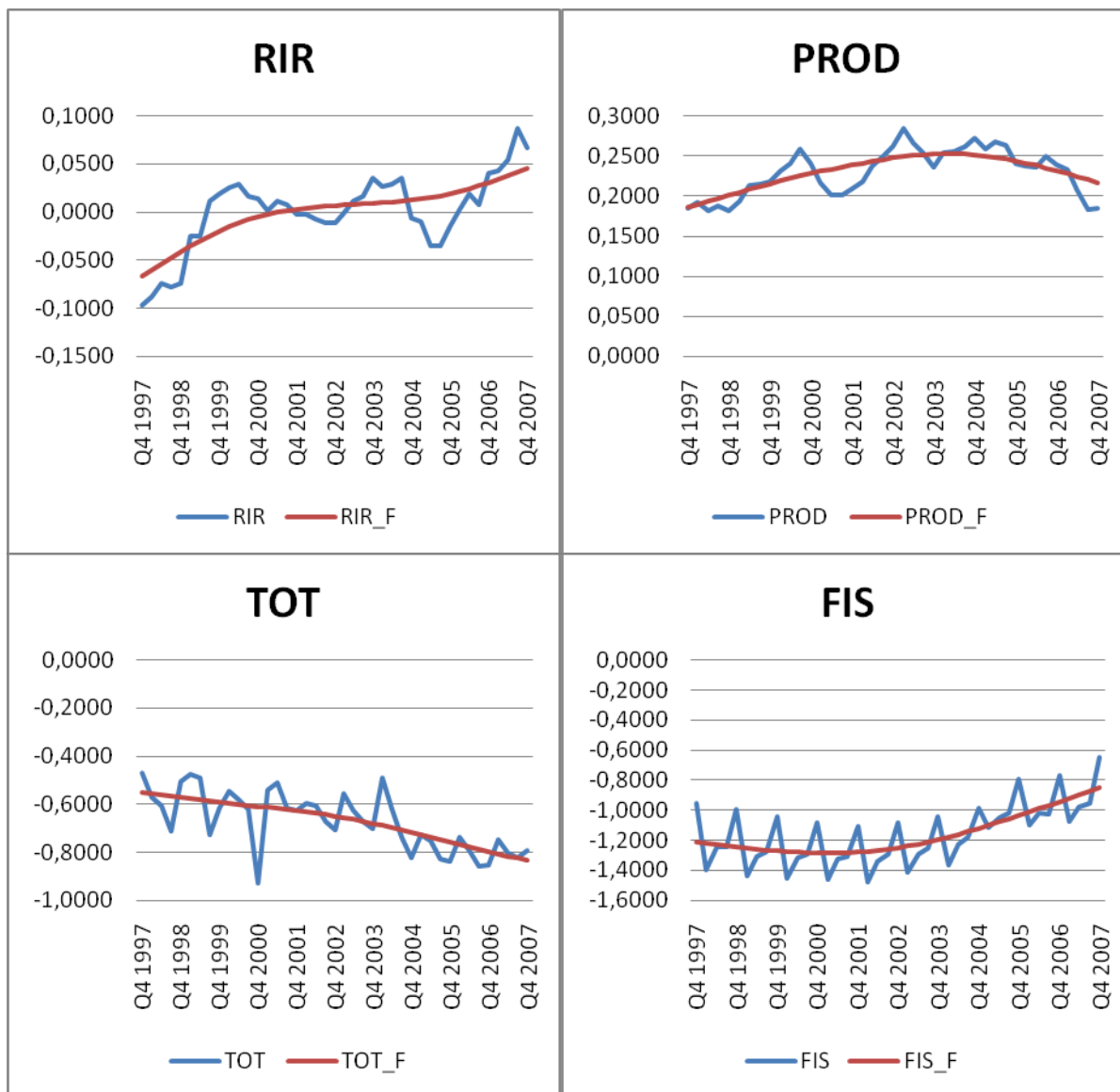
Figure 12: Summary of the bilateral BEER variables

The results of this model show that the nominal RMB/USD exchange rate is undervalued by -1.75 percent compared with the nominal fair value of the BEER model. By comparing the nominal exchange with the filtered nominal fair value the model actually overvalue the RMB by 2.87 percent.

In presenting the results, I have calculated the nominal exchange rates the BEER model estimated. In this way the unfiltered and filtered exchange rates are comparable with the actual nominal exchange rate of RMB/CNY.
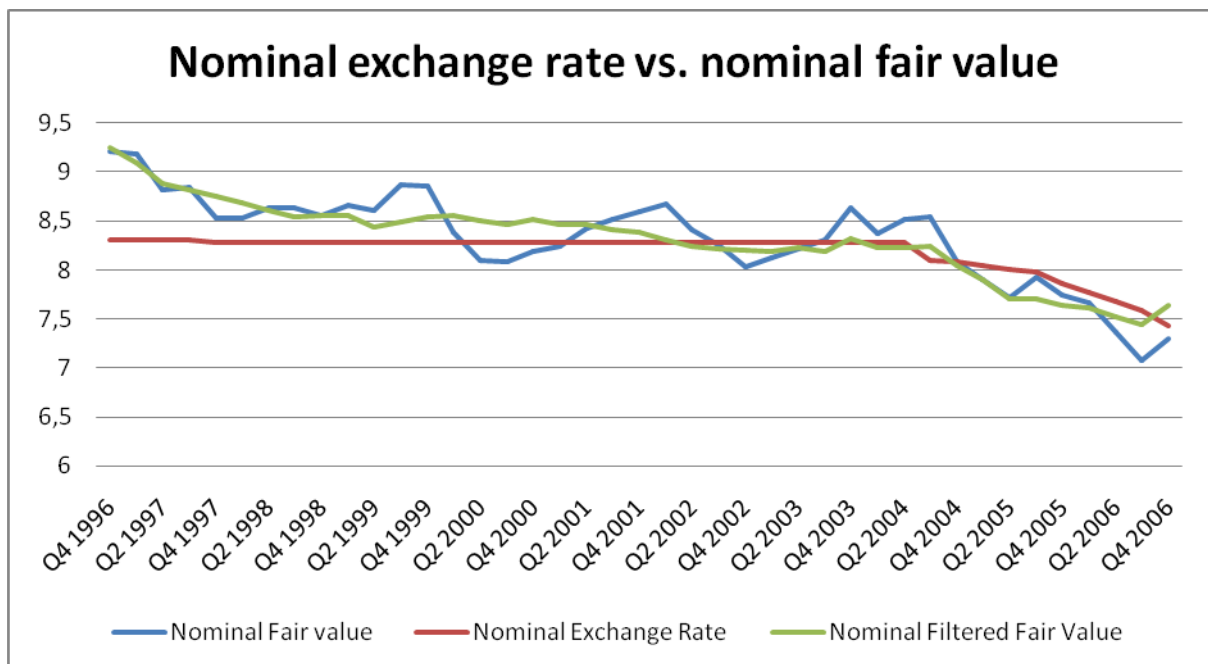
Figure 13: Results of the bilateral BEER

Figure 14: Misalignment of the Renminbi

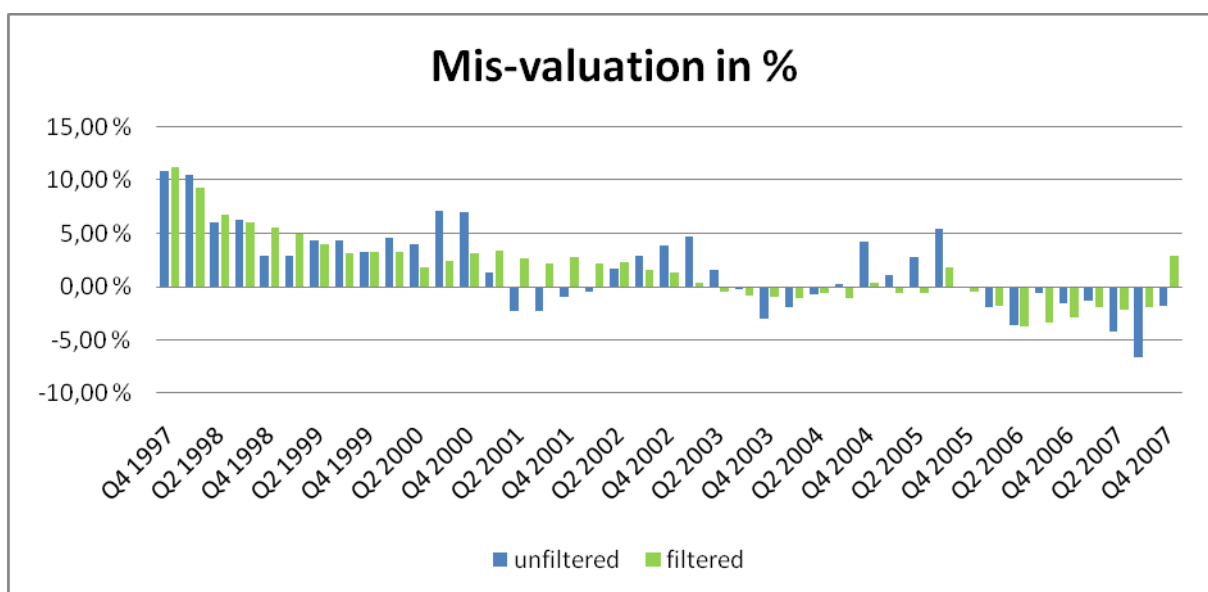Once again, this analysis was done in a bilateral fashion. This had its uses in explaining whether the RMB is to depreciate or appreciate against the USD. But there is little information on why there is an incorrect valuation if there is one. To gain more insight a multilateral BEER model with similar variables is constructed in the next section.

Multilateral BEER model

The estimated BEER model for the real RMB exchange rate I am going to use is given by:

$$q_t = \beta_0 + \beta_1 FIS_t + \beta_2 PROD_t + \beta_3 NFA_t + \beta_4 RIR_t + \varepsilon_t$$

q_t is the log real effective exchange rate (REER), FIS_t is the relative government expenditure, $PROD_t$ is relative productivity differential between the tradable and non-tradable sectors, NFA_t is China's net foreign asset position and RIR_t, is the relative real interest rate.

DATA

This model is estimated using quarterly data over the period Q4 1995 to Q4 2007. The data used is gathered from Thompson DataStream[53]. The actual period shown in the test result is only from Q4 1996 to Q4 2007, due to the calculation of the relative real interest rate.

Construction of the RMB REER

The REER used is constructed as a geometric, trade-weighted average of the individual bilateral rates with China's 14 largest trading partners[54].

REER

$$Q_t = \prod_{i=1}^{n} Q_{i,t}^{w_i}$$

$Q_{i,t}$ is the real bilateral exchange rate with country i at date t, rebased to 100 in Q1 1997 and w_i is the weight of country I in China's total international trade (which for simplicity constitutes of 14 countries).

The real bilateral exchange rate

$$Q_{i,t} = S_{i,t} * \frac{CPI_{i,t}}{CPI_{China}}$$

$S_{i,t}$ is the nominal exchange rate with country i at date t, expressed as the number of RMB per national currency. $CPI_{i,t}$ is the seasonally adjusted consumer price index for country i at date t.

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[53] See appendix for the codes of the input variables used
[54] China statistical yearbook 2007: US, Japan, Hong Kong, Euro land, UK, South Korea, Taiwan, Singapore, Australia, Malaysia, Canada, Indonesia, Russia and Thailand

The real exchange rates are rebased so they are on the same scale, before they are logged.

Trade weights

$$w_i = x \frac{X_i}{\sum X_i} + m \frac{M_i}{\sum M_i}$$

X_i is the volume of Chinese exports to country i, M_i is the volume of Chinese imports from country i, x is the percentage shade of exports in China's total trade and m is percentage share of imports in China's total trade. A single set of weights is used to construct the REER over the whole sample. This is consistent with the way in which the IMP calculates REER. Together these countries account for 77.49% of China's total international trade.

Relative fiscal expenditure

An increase in government spending should yield a reduction in the level of the net foreign assets of a country. This in turn causes depreciation in that country's currency. The fiscal variable is defined as:

$$FIS_i = ln \left\{ \frac{GOV_{China,t}}{GDP_{China,t}} \right\} - \sum_{i=1}^{n} w_i \ ln \left\{ \frac{GOV_{i,t}}{GDP_{i,t}} \right\}$$

GOV is government consumption and GDP is gross domestic product.

Relative productivity

The Harrod, Balassa, Samuelson effect states that relatively larger increases in productivity in the traded goods sector are associated with a real appreciation of the currency of a country. Under certain assumptions, the productivity differential can be measured by the price differential between the two sectors (Cheung, Chinn and Fujii (2005)). The productivity variable is defined as:

$$PROD_i = ln \left\{ \frac{CPI_{China,t}}{PPI_{China,t}} \right\} - \sum_{i=1}^{n} w_i \ ln \left\{ \frac{CPI_{i,t}}{PPI_{i,t}} \right\}$$

CPI is the consumer price index and PPI is the producer price index.

Net foreign assets

In order to capture portfolio balance effects, net foreign assets are included. A current account deficit for a country leads to a corresponding increase in the stock of foreign asses own by the

country. This represents an investment by foreign investors, who will demand a higher interest rate in foreign currency terms. At a given level of domestic interest rates, this can only be achieved by depreciation in that country's currency.

Accurate measures of a country's net foreign assets are generally available only for developed countries. As a proxy, it is common to simply cumulate the current account balance, which ignores changes in the current market value of previously accumulated foreign assets. The measure of net foreign assets for China is therefore:

$$FIS_i = ln\left\{\frac{\sum_{i=1}^{t} CA_{China,i}}{GDP_{China,t}}\right\}$$

CA is the current account balance.

Relative real interest rate

Changes in government expenditure are likely to have an effect on the real interest rate of an economy. This in turn will affect the level of the real exchange rate through real interest parity condition. To take this affect in to account, the real interest differential is included in the BEER model. The real interest rate differential is defined as:

$$RIR_i = ln\left\{\frac{1 + LR_{China,t}}{1 + CPI_{China,t}}\right\} - \sum_{i=1}^{n} ln\left\{\frac{1 + LR_{i,t}}{1 + CPI_{i,t}}\right\}$$

LR is the long term interest rate for country i at date t, measured by the yield to maturity on a 10 year government bond[55].

Using the current values of the right hand side variables in the BEER model yields the equilibrium real exchange rate given by:

$$\bar{q}_t = \hat{\beta}_0 + \hat{\beta}_1 FIS_t + \hat{\beta}_2 PROD_t + \hat{\beta}_3 NFA_t + \hat{\beta}_4 RIR_t$$

In order to eliminate the transitory components of the fundamental variables, the Hodrick-Prescott filter with a λ parameter of 1600 will be used[56].

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[55] Due to data availability shorter rates are used for some countries. These are:
[56] Macroeconomic data are reported quarterly and the band width of 1600 is fitted for quarterly data.

The fitted values of the BEER model are then calculated using the smoothed fundamental variables, again for each of the two estimation methods. The HP-filtered version of the BEER model:

$$\bar{\hat{q}}_t = \hat{\beta}_0 + \hat{\beta}_1\widehat{FIS}_t + \hat{\beta}_2\widehat{PROD}_t + \hat{\beta}_3\widehat{NFA}_t + \hat{\beta}_4\widehat{RIR}_t$$

Results Multilateral

On the next page the summary output of the regression is shown and I have also plotted the four variables of the model in order to gain some insight in how they affect the BEER.

The model has an R-squared of 50 percent, which means that the variables are able to explain about half of the variations in the nominal exchange rate. The variables are all significant according the P-values, especially PROD and NFA[57].

As for the rest of the figures the red lines represent the HP-filter filtered values and the blue lines are the unfiltered values. FIS is quite stable and a annual pattern is clearly seen. NFA is increasing steadily with an annual pattern as well. This is natural as Chinas NFA actually have increased. For the first half of the analysis period PROD declined with no clear annual pattern and the second half it increased. RIR showed a drop in the first half of the analysis period and stabilized in the second half.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.70979483
R Square	0.5038087
Adjusted R Square	0.45418957
Standard Error	0.03929188
Observations	45

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.06270209	0.01567552	10.1535176	9.0651E-06
Residual	40	0.06175406	0.00154385		
Total	44	0.12445615			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.67455596	0.0852188	54.8535779	2.8789E-39	4.50232235	4.84678957	4.50232235	4.84678957
X Variable 1	-0.35976025	0.22565186	-1.5943155	0.11873756	-0.81581966	0.09629916	-0.81581966	0.09629916
X Variable 2	-0.15363197	0.03820899	-4.02083284	0.00024973	-0.23085522	-0.07640872	-0.23085522	-0.07640872
X Variable 3	0.03782569	0.0105203	3.59549419	0.00087928	0.01656337	0.05908802	0.01656337	0.05908802
X Variable 4	0.32667411	0.21385457	1.52755264	0.13449338	-0.10554209	0.75889031	-0.10554209	0.75889031

Table 3: Summary output of the multilateral BEER regression

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[57] Keller and Warrack (2003)ch 11
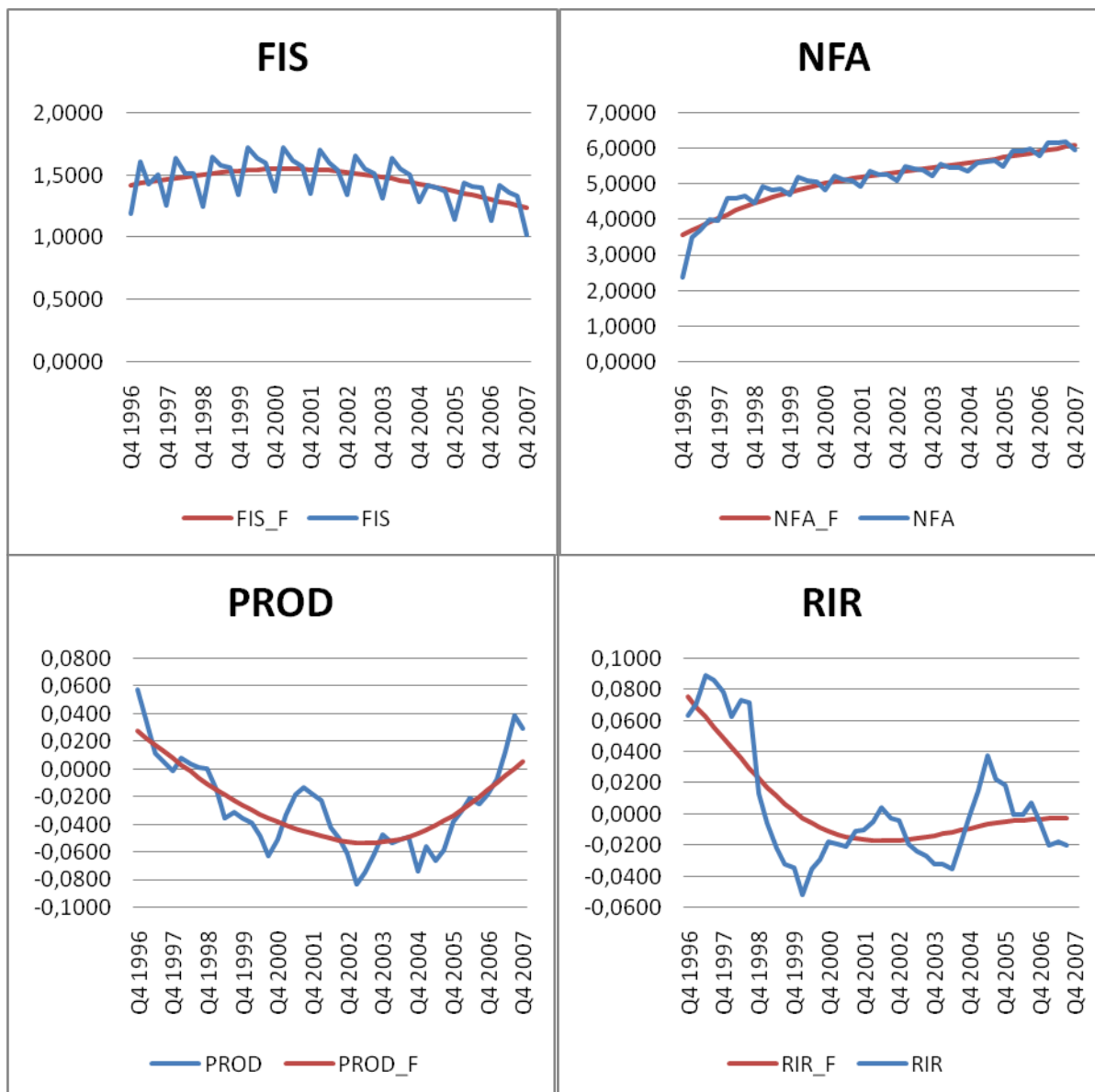
Figure 15: Summary of the multilateral BEER variables

On the next page the results of the multilateral BEER is plotted and the misalignment shown. My model shows that the RMB is undervalued by -2.43 percent against the unfiltered BEER and overvalued by 0.37 percent.

It is here interesting to note that my model shows that the fair value actually was overvalued to the BEER in the beginning of this decade when the discussion about the undervaluation was at its peak.
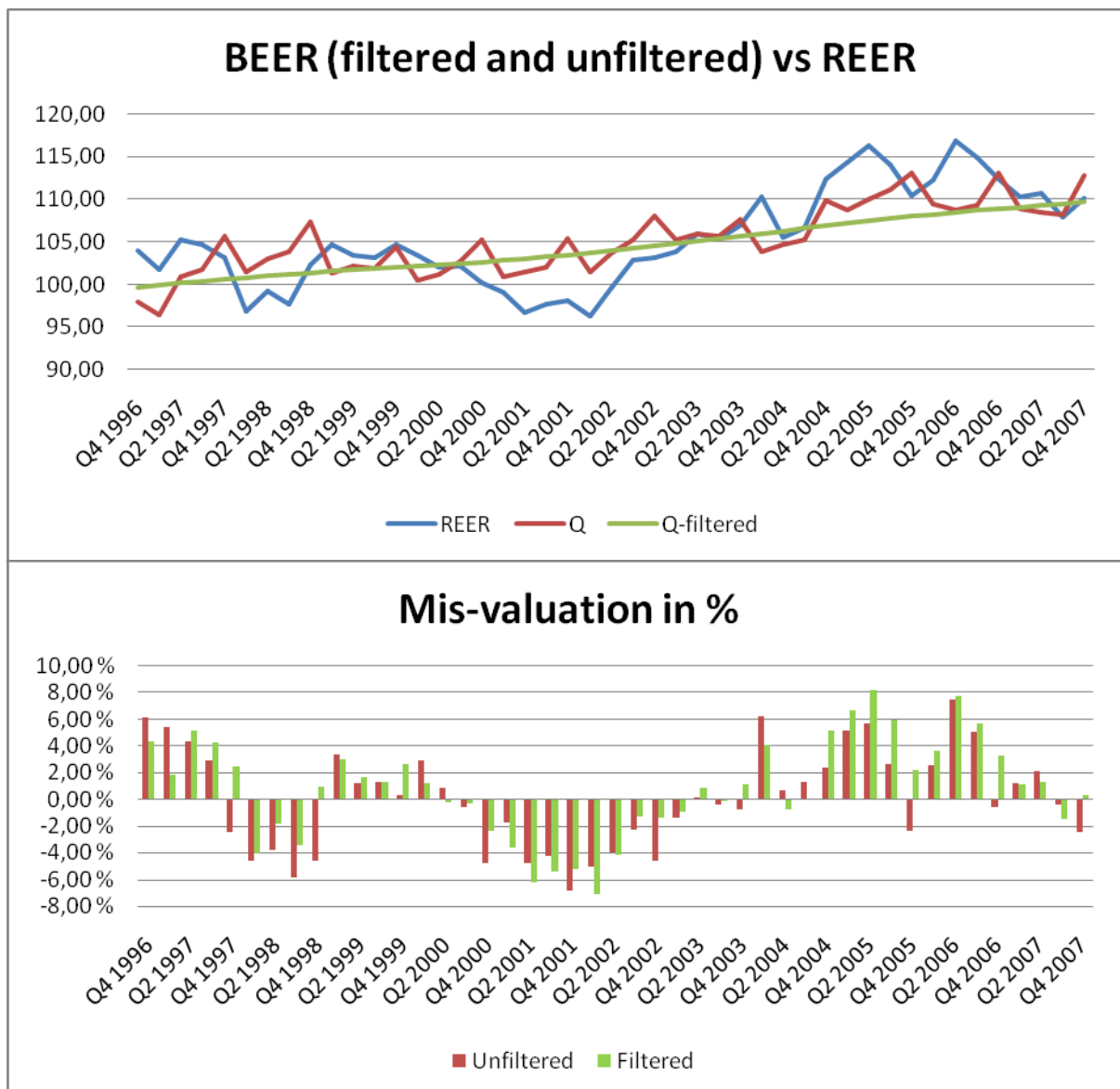
Figure 16: Results of the multilateral BEER

Weaknesses of the model

The model used is subjected to several weaknesses, most of whom are related to de data selected. First of all a big number of observations is preferred. With only 41 observations the models predictability might be reduced. There are also differences in the composition of the data chosen. For instance, the CPI in US and the CPI in China consists of different prices. This non-comparability of the variables also reduces the quality of not only this mode, but others as well. All the data used in the model are as mentioned quarterly, but for the Chinese government consumption (GOV) only yearly data was found. The quarterly data set for GOV China was created by using linear interpolation. This procedure also adds reduces the quality

of the model. As no long interest rate for Singapore was found, the long interest rate of Hong Kong was used on the notion that these are the most similar economies in this analysis. One last notion is that the Chinese government is known to be nontransparent. Although figures are published publicly on a regular basis, many question the quality of the figures.

The variables in the BEER model are likely to be non-stationary, so the model will only make economic sense if the variables are cointegrated. Estimation of the BEER model should therefore performed in a conintegration framework. A two step procedure to do this in shown by Engle and Granger (1987), which estimates the most significant cointegrating vector between the variables using OLS. The first step to estimate the equilibrium value of RMB REER is to use the fitted values of the BEER model based on the estimated cointergrating vector from the Engle-Granger approach. The second step is to eliminate the transitory components of the fundamental variables using the Hodrick-Prescott filter with a λ parameter of 1600, which is standard in applied macroeconomic work[58].

Such valuation models that uses economic fundamental are often best suited for mature economies. If used on transition economies such as China, then one should interpret the results with extra caution.

Analytical summary

Various methods for currency valuation have now been explored. From the simple, yet at times effective BMI to the more sophisticated BEER models I have found that the RMB is undervalued. The range of the valuations can be seen in the summary table below. There we can see that BMI undervalues the RMB the most, followed by the real exchange rate comparison and then by the BEER models.

For the RER comparison, a undervaluation of the RMB evened out when the multilateral exchange rate. This is logical based on the notion that a country seldom runs a trade surplus with all its trading partners. This was however not the case between the bilateral and multilateral BEER models. There the bilateral regression actually misaligned less. The two models were however not totally equal, due to data availability issues. It is also worth noting that according the P-values, the multilateral regression is more sound than the bilateral one, as the latter has almost none significant variables.

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[58] Macroeconomic data are reported quarterly and the band width of 1600 is fitted for quarterly data.

	BMI	RER	BEER
Bilateral	-58%	-29.72%	-1.75%
Bilateral filtered			2.87%
Multilateral		-20.41%	-2.43%
Multilateral log		-19.03%	
Multilateral filtered			0.37%

Figure 17: Summary table of the various analyses

As we can see there is a great deal of variation in the results of the different valuation methods used. Models of low misalignment of the RMB are seldom quoted by US Congressmen, while models of high misalignment are frequently quoted. The focus of politicians are usually set on a short term where trade gains which are minor compared with the gains of long term stable economic growth.

US and China economic relations

By the end of 2007 the cumulative US investment in China was estimated to 57 billion USD, making the US the sixth largest foreign investor in China. The preferred forms of FDI are various forms of joint ventures and wholly-owned enterprises. With more than 20000 establishments in China the US FDI covers sectors such as manufacturing, hotels, restaurants and petrochemicals. In addition there are projects by US-based multinationals in China.

China is currently the third largest trading partner with the US and the US is the second largest trading partner with China. The bilateral trade between China and the US grew from 33 billion USD in 1992 to over 386 billion in 2007. In recent years US exports to China have increased more than any other marked, with a growth of 21, 32 and 18 percent in the years 2005, 2006 and 2007. However, despite increased exports, the US have for some time suffered a bilateral trade deficit with China. As US imports increased with 12 percent in 2007, the US trade deficit with China brought to 256 billion USD.

Three factors that influence the US trade deficit with China include the following[59]. First, a shift of low-end assembly industries to China from the newly industrialized economies (NIEs) in Asia. China has increasingly become the last link in a long chain of value-added production. Because U.S. trade data attributes the full value of a product to the final assembler, Chinese value-added gets over-counted. Second, a strong demand for Chinese goods. Third, China's restrictive trade practices, which have included an array of barriers to foreign goods and services, often aimed at protecting state-owned enterprises. Under its WTO accession

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[59] U.S. Department of State

agreement, China is reducing tariffs and eliminating import licensing requirements, as well as addressing other trade barriers.

The US is fully aware of China's current and future position in the world economy and has therefore recognised the importance of building healthy bilateral economic relations with China. This is done by nurturing mutual interest in strengthening the global economy, addressing global imbalances, and promoting energy security and environmentally sustainable growth. According to the US government, the US approach to its economic relation with China has two main elements and the initiation of Strategic Economic Dialogue[60]:

First, the United States seeks to fully integrate China into the global, rules-based economic and trading system. China's participation in the global economy will nurture the process of economic reform, encourage China to take on responsibilities commensurate with its growing influence, and increase China's stake in the stability and prosperity of East Asia.

Second, the United States seeks to expand U.S. exporters' and investors' access to the Chinese market. As China grows and develops, its needs for imported goods and services will grow even more rapidly. The U.S. Government will continue to work with China's leadership to ensure full and timely conformity with China's WTO commitments--including effective protection of intellectual property rights--and to encourage China to move to a flexible, market-based exchange rate in order to further increase U.S. exports of goods, agricultural products, and services to the P.R.C.

In order to achieve these objectives, the United States has engaged with China in the Strategic Economic Dialogue (SED). The SED is a biannual event, focusing on three major themes:

- Maintaining sustainable growth without large trade imbalances;
- Continued opening of markets to trade, competition, and investment;
- Cooperation on energy security, energy efficiency, and the environmental and health impacts.

The first SED was held in 2006 and have since then been the US delegation have been led by Secretary of the Treasury Hank Paulson, while Vice Premier Wu Yi have led the Chinese delegation. The last SED, fifth in its line took place in December 2008.

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[60] U.S. Department of State

China's position

The Chinese government that was reluctant to move toward a flexible exchange, knowing the arguments in favor for exchange flexibility, had its reasons. Moving toward a more flexible exchange rate system would cause the RMB to appreciate and thereby solve the inflation problem. But an appreciation of the RMB would also worsen the undeveloped and to some degree zombie banking[61] industry and the problem of employing the rural population.

As we know China has the world's largest population. This fact has made the prospect of supplying the Chinese population with foreign exports irresistible to worldwide exporters leading to a steady inflow of capital. Before the Chinese forms could purchase foreign assets back in 2004, they were required to convert the dollar proceeds of their exports into yuan. If the People's Bank did not buy the dollar, the exchange value of the yuan would appreciate. In purchasing dollar, the central bank increases the monetary base, which has been growing at a fast annual rate.

GPD growth has been in the 10 % range since the economic reform and opening were initiated in1978, with investments up to 47% of GDP and savings at 44% in 2004. Local authorities have sponsored many of these investments, pressuring state owned banks to lend money to provide finance for projects that zoning and environmental regulators have not approved. This have in part have led to the concern of overheating the economy and increased credit growth. In this high growth situation, China has adopted countermeasures towards overheating. According to Schwartz (2005) the countermeasures were slowing credit growth, restraining investment in certain sectors such as steel, cement and real estate. In 2003 China began banning projects in overheated sector in order to slow down growth. The government managed to slow down growth in fixed-assets investment in 2004, but GDP growth exceeded the 2003 growth rate by 0.04 % and reached 9.5%. In order to curb inflation the central bank is trying to restrain demand and monetary growth through moral suasion to restrict commercial bank loans and selling interest bearing central bank bills[62].

As the Chinese exports increases the central bank uses the proceeds to accumulate foreign exchange reserves. This in turn enables banks to lend freely as their bank reserves are

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[61] Term used by Schwarz (2005)
[62] See Schwartz (2005) for more details

expanded, further increasing growth. This is becoming a concern as an undervalued RMB in the end is the source of the banking and loan excess. A currency appreciation would help as it would cut back the growth rate of the monetary base and bank loans. This conclusion has been challenged as credit expansion can be controlled without altering the exchange rate. Besides, there are still greater challenges China's banking system is facing such as reforms and large amounts of NPL's. The need to appreciate the RMB to tighten credit expansion cannot be justified at this moment.

The Chinese banking industry is dominated by four state owned banks. Their loan portfolios are filled with non performing loans (NPL) to state-owned enterprises (SOE). If a credit reduction was to occur, then it would mean the end for the SOEs, which employ half of all industrial workers. According to Schwarts the banks are already insolvent but permitted to continue in operation because the authorities do not know how to cope with the fallout. If higher interest rate actually took effect, it would be a further calamity for the banks and the authorities. Therefore If the RMB is to float, then China must retain control on the ability of its people to hold foreign assets. This is to counter a possible capital flight by increasing the interest rate on deposits.

The growing urbanization in China is creates the problem of finding employment in the traded goods industries in urban areas for workers shifting from farms in rural areas. According to Schwarts, Robert Mundell (2004) maintains that if the RMB appreciated, this problem would worsen as a consequence of decreased competitiveness in export industries. Mundell uses this stability argument to promote a fixed exchange rate system. Schwartz views this as tactic admission that the RMB is undervalued.

A view of contrast is presented by Morris Goldstein (2004) and he makes a strong case for the revaluation of the RMB. He focuses on the domestic demand as source of economic growth by improving financial intermediation and strengthening the domestic banking system. This would lessen the protectionist pressure against China. The high savings rate would provide domestic funds for high investment. Increased imports into china would promote domestic efficiency and lead to higher competition and higher productivity growth. The main message by Goldstein is that a revalued RMB would be in their interest of China's sustainable noninflationary economic growth.

The low wages and vast amounts of Chinese workers should be accredited for the low price of Chinese exports. From a economic and strategic point of view China is a goldmine, as its can

both serve a production facility and also in the future a vast market. The low wages of Chinese workers are also highly price sensitive. A revaluation of the RMB will not help the US trade deficit for certain, but it will for sure cause massive unemployment among Chinese workers. Comparing Chinese workers and US workers we will find a big gap in terms of living and working standards[63].

The US position

The critique of China's exchange rate accounts for two concerns. One is the size of the bilateral trade deficit. The US textile industry has taken the biggest losses against the Chinese competition. However, Chinese exports to the US compete with exports from other developing countries rather than with US industries. The decline in demand for US exports should be more attributed to the slow growth in other US trading partners, and it is the rapid US productivity growth that fundamentally have contracted manufacturing employment. Thus, revaluation of the RMB by itself would not suffice to achieve balanced trade with China.

The decline in profitability of US firms and the loss of employment by its workers as a result of increased competition with cheap Chinese exports have created a problem for the administration (particularly in an election year). Where firms facing bankruptcy and workers facing unemployment turns to political trade protectionism in hope of prolonging the life of the industry they operate in. Their arguments are that China uses unfair trading practices to keep cost low, like manipulating its currency and subsidizing industries. The immediate political problem for the US is how to respond to the plight of manufacturers in general. Protectionist measures and government subsidies will not prolong the life of an industry facing low-cost competitors.

The US is also concerned about the huge bilateral trade deficit with China, which contributes the to the current account deficit. There are dispersed views of whether the current account deficit is sustainable. However, if the US current account deficit is not sustainable, then it would lead to a catastrophic disruption of the American and then the world economy.

There are other ways to reduce the current account deficit than protectionism, since the US protectionism has not served its purpose according to Schwarts (2005). An alternative, although one that is less likely to happen, is to conduct an inflationary monetary policy. This

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[63] Jeanneney G, Sylvaine et al. (2005)

would lead to less attractive US investments for foreign investors. The current account deficit is likely to persist as foreign exporters accept their payments in dollar assets.

So far the US current account deficit has been covered by Asian central banks. It is unclear whether this will continue in the future. In the Asian central banks reduce the demand for US treasury Bills, a depreciation of the dollar would still have a positive effect on the US current account deficit.

The current situation

Since China de-pegged the RMB from the USD in July 2005, the People's Bank of China has published 14 monetary policy reports. In the latest report published November 17 2008 there was no comment on the exchange rate policy outlook, whereas previous reports all discussed the foreign exchange rate policy. This departure from past practice begs the question as to whether a shift in exchange rate policy will happen.

After three years of a BBC exchange rate policy the RMB have appreciated about 20 percent against the USD. Today the RMB seems to have returned to a nearly hard peg to the USD. Whether this is a new RMB regime or a short-term change to cope with the current global financial crisis, time will show. No matter what is the motivation, stability is a highly important element in such times of financial turmoil. Such a strategy proved successful for China during the Asian financial crisis of 1997 and might prove successful yet again.

As mentions large portions of China's growth comes from exports. As the world goes in to a recessions, demand is diminishing. According to Wang and Zhang (2008) China's export growth have decelerated significantly since the beginning of this year and is expected to decline sharply in the coming quarters amid a global recession. This has led to the question of how long the RMB can remain stable before it depreciates.

If the RMB exchange rate is to be determined freely by the market, such a possibility is low Wang and Zhang (2008) argues. In their view the renminbi exchange rate – as one of the most important macroeconomic variables – is still fundamentally undervalued and needs to appreciate toward its equilibrium level over the medium term. But the Chinese foreign exchange policy is a intermediate regime where the RMB is remains a policy instrument that is tightly managed by the authorities. From a political point of view the RMB could still be devalued.

The most obvious benefit of devaluation is that Chinese exports will become cheaper and more competitive. But right now, this effect will be minimal as external demand is deteriorating. Devaluation of the RMB will however limit the downside for exports.

In these times of highly unstable financial markets, when many emerging market economies are very fragile, there are three arguments against RMB devaluation. First, devaluation may lead to large capital outflows from China, running the risk of destabilizing the domestic financial markets. Second, China and the RMB have become important symbols of growth and stability in the South East Asian region. If the RMB is devalued, then it could have major negative effects on the currencies in the rest of the region. Chinese politicians that want to promote the RMB as a major international currency in the long run would not like to face such a consequence. Third, a further devaluation of the RMB would increase the already prolonged discussion of Chinese foreign exchange policies between China and the US. It is also worth noting that the new democratic office in the US is more likely to take a tougher stance on this issue.

Wang and Zhang (2008) believe that the benefits are outweighed by the costs. In their view the stability and the China and US relations argument are the most important. As for maintaining Chinese exports the government has implemented other strategies such as reducing export taxes[64], removing tariffs and allowing easier access to bank lending by small and mid-sized enterprises in the exporting industry.

In light of the current global financial crisis a stable RMB exchange rate is probably the best policy for China, the South East Asian region and for long term international relation between China and its trading partners. By keeping the RMB stable against the USD the trade discussion between China and the US will continue, but it will also have a important implication for financial market investments where the funding currency is the USD. Wang and Zhang (2008):

"a stable renminbi has been the main reason for the 'outperformance' of the Chinese stock market since August as compared to its EM peers."

"Looking ahead, we expect that a stable renminbi exchange rate against the US dollar will likely continue to be an important factor underpinning the performance of China's stock market."

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[64] China Briefing (13.11.2008) and China Briefing (21.11.2008)

The RMB had its biggest one day depreciation December 2nd 2008 since the de-pegging in 2005[65]. A drop of 165 basis points was recorded, which led to the ending of 6.8505 RMB/USD. Chinese officials say that the RMB will stay stable to the USD for the short term, and that it in the future will follow market trends and other currencies. This might be sing of a temporarily break of the from the BBC policy in order to cope with financial crisis. However, the depreciation will provide little help to exports as international demand is deteriorating.

Conclusion

Exchange rates can be seen as determined by market forces in equilibrium of the supply and demand. Like stocks, they are highly subjected to news and therefore hard to forecast for the short-term. For the long term the concept of PPP is often used. Other forecasting tools make use of economic fundamentals such as the BEER model.

In this thesis I have examined how exchange rates are determined in a PPP and BEER framework. My analyses show that different models of valuation will give different levels of misalignment. Based on this notion models that undervalue the RMB by a big margin will still be used in pressuring for a RMB appreciation. From the BMI, PPP and the RER analysis the RMB will appreciate in the long term, as they undervalue the Renminbi in the range of -58 percent to -20 percent. The speed and fashion of the appreciation is in the hand of both the international market outlook, Chinas overall economic performance and the Chinese government. According the BEER analyses the RMB should remain stable as the misalignment is only in the 0.3 to around 3 percentile overvalued. This indicates actually that the Renminbi should depreciate in the mid to long term.

To answer the question asked in the beginning of the thesis I will base on my analyses and caution. The simple, although effective PPP and RER analyses states a undervaluation. While the more sophisticated, although more subjected to weaknesses BEER models concludes a minor overvaluation. Taking in to account that China is a transition economy with many unstable fundamentals I have to conclude that the Renminbi is more likely to be undervalued than overvalued and it will in time appreciate against the dollar.

As to the future currency policy of China stabilization should be in focus for the short-term. In these times of financial crisis the US should set aside its pressure to RMB appreciation and focus on collaboration with China to stabiles the global economy. China remains a important

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[65] Sina English (12.02.2008)

part in stabilising the South East Asian region where many emerging market a highly vulnerable to the current financial crisis. For the mid to long term Chinas should focus on implementing reforms on the banking sector. Before this is done a free float of the RMB is not advised as the current banking includes many NPLs taken by SOEs that employ vast amounts of Chinese works.

Although parts of China may resemble the pinnacle of modern society, poverty still reins the rural areas. This is one of many signs that China is still an emerging economy and not a mature one as many would thing at a first glance. Currently China is facing many challenges that mature economies of today faced when they were emerging as global markets. With the pressure of mature economies, China is trying to integrate to a world economy while finding its own identity. In such a situation China has to balance the interest of all the parties it interacts with. With this in mind, it will be exciting to see how China will evolve and further integrate to the world economy.

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Appendix

The data gathered from Thomson Datastream and their codes

	PPI	Code
CNY		PPI
USD	US PPI - FINISHED GOODS NADJ	69998881
YEN	JP CORPORATE GOODS PRICE INDEX: DOMESTIC - ALL COMMODITIES NADJ	497933344
EUR	EJ PPI: INDUSTRY (EXCLUDING CONSTRUCTION) NADJ	841140699
HKD	HK PPI - ALL MANUFACTURING INDUSTRIES NADJ	489991111
KOR	KO PPI NADJ	549998873
TWD	TW WPI NADJ	525999333
SGD	SP DOMESTIC SUPPLY PRICE INDEX NADJ	520050952
MYR (IMF)	MY PPI NADJ	MYQ63...F
AUD (IMF)	AU PPI NADJ	AUQ63...F
GBP	UK PPI - OUTPUT OF MANUFACTURED PRODUCTS (HOME SALES) NADJ	19733352
CAD	CN INDUSTRIAL PRICE INDEX: ALL COMMODITIES NADJ	77005395

	GOVERNMENT CONSUMTIPN	Code
CNY	GOVERNMETN CONSUMPTION	GOV (USD)
USD	US GOVERNMENT CONSUMPTION & INVESTMENT (AR) CURA	USCNGOV.B
YEN	JP GOVERNMENT CONSUMPTION EXPENDITURE (AR) CURA	JPCNGOV.B
EUR	EJ CONSUMPTION EXPENDITURE - GENERAL GOVERNMENT CURA	EJCNGOV.B
HKD	HK GOVERNMENT CONSUMPTION EXPENDITURECURN	HKCNGOV.A
KOR	KO GOVERNMENT CONSUMPTION EXPENDITURECURA	KOCNGOV.B
TWD	TW GOVERNMENT CONSUMPTION CURN	TWCNGOV.A
SGD	SP GOVERNMENT CONSUMPTION EXPENDITURECONN	SPCNGOV.C
MYR (IMF)	MY GOVERNMENT CONSUMPTION CURN	MYI91F..A
AUD (IMF)	AU FINAL CONSUMPTION EXPENDITURE: GENERAL GOVT. CURA	AUCNGOV.B
GBP	UK GENERAL GOVERNMENT: FINAL CONSUMPTION EXPENDITURE CURA	UKCNGOV.B
CAD	CN GOVERNMENT NET CURRENT EXPENDITURE(SA,AR) CURA	CNCNGOV.B

	GROSS DOMESTIC PRODUCTION	Code
CNY		GDP
USD	US GDP - (AR) CURA	USGDP...B
YEN	JP GDP (AR) CURA	JPGDP...B
EUR	EJ GDP CURA	EJGDP...B
HKD	HK GDP - EXPENDITURE BASED CURN	HKGDP...A
KOR	KO GDP CURA	KOGDP...B
TWD	TW GDP CURN	TWGDP...A
SGD	SP GDP AT MARKET PRICES CONN	SPGDP...C
MYR (IMF)	MY GDP CURN	MYI99B..A
AUD (IMF)	AU GDP CURA	AUGDP...B
GBP	UK GDP AT MARKET PRICES CURA	UKGDP...B
CAD	CN GDP AT MARKET PRICES (SA,AR) CURA	CNGDP...B

	LONGTERM INTEREST RATE	Code
CNY		LR
USD	US GOVT BOND YIELD - LONGTERM	741110481
YEN	JP GOVT BOND YIELD - LONGTERM	741580362
EUR	EA E12 YIELD 10-YEAR GOVERNMENT BONDS NADJ	870008946
HKD	HONG KONG EXCHANGE FUND NOTE 10 YR - RED.YIELD	HKEFN10
KOR	KO GOVT BOND YIELD - LONGTERM	745420331
TWD	TW TAIWAN GOVERNMENT BOND YIELD 10 YEAR (EP)	100770202
SGD	HONG KONG EXCHANGE FUND NOTE 7 YEAR - RED. YIELD	HKEFN7Y
MYR (IMF)	MY GOVT BOND YIELD - LONGTERM	745480807
AUD (IMF)	AU GOVT BOND YIELD - LONGTERM	741930259
GBP	UK GOVT BOND YIELD - LONGTERM	741120290
CAD	CN GOVT BOND YIELD - LONGTERM	741560317

	EXCHANGE RATES	Code
RMB	CHINESE YUAN TO US $ NOON NY - EXCHANGE RATE	U$CHFR2(ER)
YEN	JAPANESE YEN TO US $ NOON NY - EXCHANGE RATE	U$Y.FR2(ER)
EUR	US $ TO EURO (WMR&DS) - EXCHANGE RATE	USEURSP(ER)
HKD	HONG KONG $ TO US $ (HK) - EXCHANGE RATE	HKUSDSP(ER)
KOR	SOUTH KOREAN WON TO US $ (KO) - EXCHANGE RATE	KOUSDSP(ER)
TWD	TAIWAN NEW $ TO US $ (TW) - EXCHANGE RATE	U$NTDSP(ER)
SGD	SINGAPORE $ TO US $ (SG) - EXCHANGE RATE	SGUSDSP(ER)
MYR	MALAYSIAN RINGGIT TO US $ NOON NY- EXCHANGE RATE	UMFR2(ER)
AUS	AUSTRALIAN $ TO US $ - EXCHANGE RATE	USDAUSP(ER)
GBP	US $ TO UK £ (WMR) - EXCHANGE RATE	USDOLLR(ER)
CAD	CN $ TO US $ NOON CN - EXCHANGE RATE	CNUSDSP(ER)

BILATERAL	EXPORT/IMPORT	Code
CNY	CH EXPORTS (IN US$) CURN	CHQ70..DA
CNY	CH IMPORTS CIF (IN US$) CURN	CHQ71..DA
CNY	CH BOP: CURRENT ACCOUNT BALANCE (US $) (AR) CURA	CHOCFCACB
USD	US EXPORTS (IN US$) CURN (~U$)	USQ70..DA~U$
USD	US IMPORTS CIF (IN US$) CURN (~U$)	USQ71..DA~U$
USD	US EXPORT UNIT VALUES (IN US$ TERMS) NADJ	USQ74..DF
USD	US IMPORT UNIT VALUES (IN US$ TERMS) NADJ	USQ75..DF

CNY	VARIABLES	Code
	CH PPI NADJ (~U$)	100778338~U$
	CH CPI (PREV. YEAR =100) NADJ (~U$)	517700993~U$
	CH FOREIGN ASSETS NET (MONETARYSURVEY) CURN (~U$)	749240256~U$
	CHINA SPECIAL TIME DEPOSIT RATE, 5Y - MIDDLE RATE	Y76076
	Name	Code
	CH GOVERNMENT CONSUMPTION (CURRENT) (~U$)	517700803~U$
	CH GDP (DS CALCULATED) CURN (~U$)	517910670~U$
	Name	Code
	CH GDP GOVERNMENT CONSUMPTION EXPENDITURE (ANNUAL) CURN	870012485
	CH REAL EFFECTIVE EXCHANGE RATE INDEX - CPI BASED SADJ	CHQ..RECE

	CPI	Code
USD	US CPI - ALL URBAN SAMPLE: ALL ITEMS NADJ	69998877
JPY	JP CPI: NATIONAL MEASURE NADJ (~U$)	499999887~U$
HKD	HK CPI COMPOSITE NADJ	480810006

TRADE WEIGHTS	
USD	20.48%
YEN	17.08%
EUR	15.98%
HKD	12.60%
KOR	11.26%
TWD	9.25%
SGD	3.30%
MYR	3.10%
AUS	2.73%
GBP	2.39%
CAD	1.84%
TOTAL	100.00%

The trade weights were calculated with data from China Statistica Yearbook (2007) ch. 18.