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Purchasing Power Parity — Relevant for the 1990s?

by
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Summary

- We view Purchasing Power Parity (PPP) as a valuable tool for assessing proper currency valuation and measuring relative competitiveness. Although we find that PPP is of limited value in predicting short-term movements in the value of the U.S. dollar, PPP appears to have both policy and forecasting applications for currencies within the European Monetary System (EMS) and countries saddled with hyperinflation.
- Using Salomon Brothers's consumer price-based measure of PPP, which we introduce in this publication, we estimate that the U.S. dollar is undervalued by almost 30% versus the Japanese yen and by 25% versus the Deutschemark.
- A return of the U.S. dollar toward its equilibrium value probably will not begin before other factors — such as interest rates, expectations about the value of the currency and confidence in the real economy — reverse the current slowdown in U.S. capital inflows. Nonetheless, the dollar likely will not set new lows.
- We believe that structural factors in the Japanese export sector since the second half of the 1980s may result in a persistent overvaluation of the yen, when measured by most purchasing power models. An alternative calculation of PPP that excludes nontradable goods shows that the U.S. dollar is only 7% below its year-end 1990 PPP value versus the yen.
- Our estimates of the PPP level for the British pound indicate that the central parity rate for the pound within the Exchange Rate Mechanism (ERM) of the EMS — DM2.95/£ — represents a competitive exchange rate based on relative records of inflation in Germany and the United Kingdom. Moreover, even modest inflation projections for the two countries imply that no breaching of the lower ERM limit in PPP terms should occur before the middle of next year.

Introduction

Two recent events have brought PPP — a theory of exchange rates based on relative domestic and foreign prices — out of the file cabinets and on to economists' desks. First, the significant decline in the value of the U.S. dollar during the past year to 42% below its peak in 1985¹ has raised the issue of whether the dollar is undervalued and, if so, by just how much. Second, the entry of the British pound into the ERM at a central rate of DM2.95/£ has raised the question of whether this rate is appropriate and/or sustainable.

Although PPP has an admittedly poor track record as a predictor of short-term movements in the value of the U.S. dollar, **we view it as a valuable tool — and one of the oldest — for assessing proper currency valuation and measuring relative competitiveness.** Furthermore, within the ERM and the hyperinflation countries, PPP has proved to have both policy and predictive applications. Although deviations from PPP can be significant and prolonged, we believe that PPP in fact represents the

¹ As measured by the Morgan Guaranty Trade-Weighted Index of the U.S. dollar.

long-run equilibrium value of the currency. Still, the process of reestablishing equilibrium can take several years.² Our analysis shows that over the long run, deviations from PPP tend to correct themselves. As a result, PPP is one tool that can be used effectively to address long-run value issues such as those posed previously.

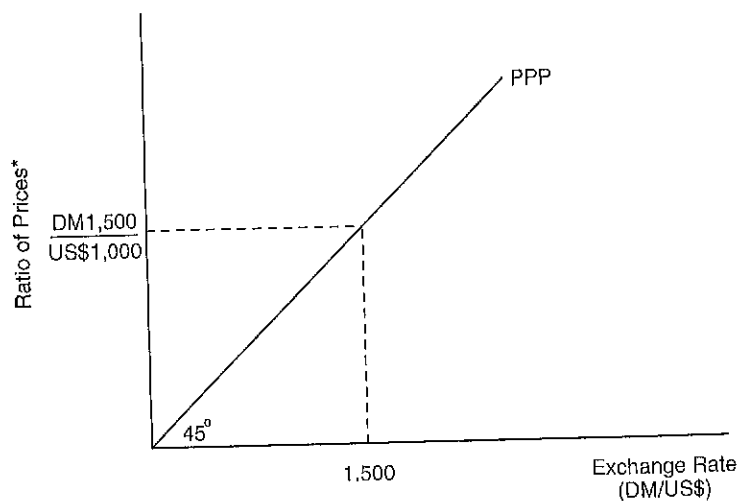
Following a brief overview of the theory of PPP — its premise, various forms and limitations — we introduce the Salomon Brothers's PPP model, which seeks to overcome some of PPP's major shortfalls. Applying our model, we summarize the implications of current PPP estimates for the U.S. dollar versus the Deutschmark and the Japanese yen, discuss some of the reasons that typical PPP measures may not be applicable for Japan and examine the implications of PPP for the British pound within the ERM.

The Basic Proposition — PPP in Its Absolute Form

The basic proposition of PPP is embodied in the "Law of One Price": That is, the same good cannot be sold at two different prices in a competitive marketplace. In its absolute form, PPP — similar to the Law of One Price — says that identical goods must sell at identical prices; otherwise, there will be opportunities for arbitrage. Competition will tend to equalize the price of identical baskets of goods in domestic and foreign prices through movements in exchange rates or through competitive bidding of the price of the commodities themselves.

For instance, if a bundle of goods in the United States was priced at \$1,000 and that same bundle of goods was priced at DM1,500 in Germany, the exchange rate that would equalize the prices of the two bundles would be DM1.50/US\$. If the actual exchange rate were to vary from that equilibrium exchange rate, arbitrage opportunities would exist. For example, if the exchange rate were to fall suddenly to DM1.40/US\$, U.S. goods would appear attractively priced compared with the German substitutes, and U.S. exports would rise. Money and goods would flow into the United States, bidding up the value of the U.S. dollar or raising the price of U.S. goods, until the PPP "equilibrium" exchange rate was reached. Put another way, in PPP's absolute form, the exchange rate is in

Figure 1. The Theory — PPP in Its Absolute Form



* Ratio of DM prices to US\$ prices.

² See "Purchasing Power Parity in the Long Run," Niso Abuaf and Phillippe Jorion, in *The Journal of Finance*, March 1990. An empirical test finds evidence against the hypothesis that the real exchange rate follows a random walk and estimates that it takes about three years to reduce deviations from PPP in half.

equilibrium when it equalizes the prices of a basket of similar goods and services in two countries. Thus, the PPP exchange rate simply will be the ratio of the level of prices abroad to the level of home prices (see Figure 1).

The Economist takes a more light-hearted approach to this theory, using its annually updated *Big Mac* "hamburger standard." The magazine takes an informal survey of McDonald's hamburger chains in various cities throughout the world, noting the local currency price of a *Big Mac* hamburger. The magazine then uses these prices as a one-commodity price index to calculate "equilibrium" PPP exchange rates. Because the implied PPP exchange rate in this form suggests that the equilibrium exchange rate is simply one that equalizes the price of a *Big Mac* in various countries, we need only two *Big Mac* prices to calculate a rough-and-ready measure of the correct value of the U.S. dollar. For example, in its most recent survey,³ *The Economist* found that the price of a *Big Mac* was DM4.30 in Germany, while in the United States, the sandwich sold for US\$2.20. If we take the ratio of the foreign price to the home price, we have the "equilibrium *Big Mac* PPP" level that would equalize prices — DM1.95/US\$. This type of back-of-the-envelope approach suggests that the U.S. dollar — currently at DM1.49/US\$ — is undervalued by about 30% against the Deutschemark.

Testimony to the importance placed on the notion of PPP is the use of similar casual measures of purchasing power equilibrium, especially during such periods as the Bretton Woods "adjustable peg," when even central bankers are said to have compared the cost of hotel rooms to gauge proper currency valuation. Some observers, for instance, use this comparison today to contend that sterling is grossly overvalued, noting that the price of a hotel room in London is roughly twice that in New York.

These simple calculations, however, show why absolute PPP frequently will not hold true and why we reject PPP in this form. The Law of One Price, although easily applied to standardized commodities, need not hold for all goods and services. For instance, the price of a bushel of wheat — a commodity with a well-established market — should be equal whether it is sold in London or Chicago, because even slight price differences will be quickly arbitrated. However, price differences may persist for other goods and services — such as the *Big Mac* — for several reasons.

Substantial transportation and distribution costs frequently make goods sold in the country of origin less expensive than the selling price of the same good abroad. Hence, the absence of these costs alone will make the Hong Kong-made suit or Italian-made shoes less expensive when purchased on a vacation in those countries.

Tariffs, subsidies and quotas also may impose costs that have the same effect. In Japan, bans on rice imports and large subsidies to farmers, for instance, explain why the Japanese pay up to six times the world price for rice.

For other goods that are produced most often domestically, such as *Big Macs*, "real" factors can create a market in which prices differ sharply across countries either temporarily or for extended periods. For instance, taste differences, technology, availability or cost of inputs, and product differentiation all contribute to the fact that in Moscow, a *Big Mac*, converted at the official exchange rate, costs \$6.25.

³ See *The Economist*, "The Hamburger Standard," May 5, 1990, page 92.

Price differences also may persist for some services and/or goods that typically are not tradable because the roots of the price disparities — often differences in labor costs or productivity — are not easily or quickly equalized through labor migration or technology transfer. These examples illustrate the reasons why the **absolute** version of PPP may fail to hold for long periods of time.

The Relative Version of PPP — The Preferred Extension

The relative version of PPP — an extension of the absolute version — seeks to overcome some of the obstacles that we have described. Instead of focusing on levels, the relative version focuses on changes in prices and exchange rates. **Specifically, without presupposing causality, the relative version of PPP predicts that changes in the nominal exchange rates will reflect differences in inflation rates among countries over time.** Suppose, for example, that the equilibrium exchange rate for the dollar versus the Deutschemark was DM1.50/US\$ today. If some disturbance caused the price level in Germany to rise by 10%, while prices in the United States remained constant, PPP in this form tells us that the equilibrium price of the U.S. dollar versus the Deutschemark should fall by 10% to DM1.65/US\$. Similarly, if inflation in the United States consistently runs 2% per year above that of Germany, devaluations of 2% per year would be expected.

Quality differences, transportation costs and other costs such as tariff and nontariff barriers can be ignored by applying this popular version of PPP. If we take the view that equilibrium is achieved through international trade in goods, services and factors of production, for instance, these factors can be circumvented by assuming that deviations from the Law of One Price are stable over time and that the structure of markets is not subject to large changes. If this is true, the relative or absolute version of PPP would be expected to hold rather well, regardless of the existence of quotas or tariffs. For instance, if U.S. consumers are paying 10% more for a U.S.-made good in the United States, the price of that same good exported to Germany should increase by 10% in Deutschemark terms as well, as long as the tariff structure or quota remains the same. The same line of thinking will make the inclusion of nontradable goods of little consequence: If nontraded U.S. goods were higher relative to traded goods last year, the assumption is that they also will be higher this year and by roughly the same amount.

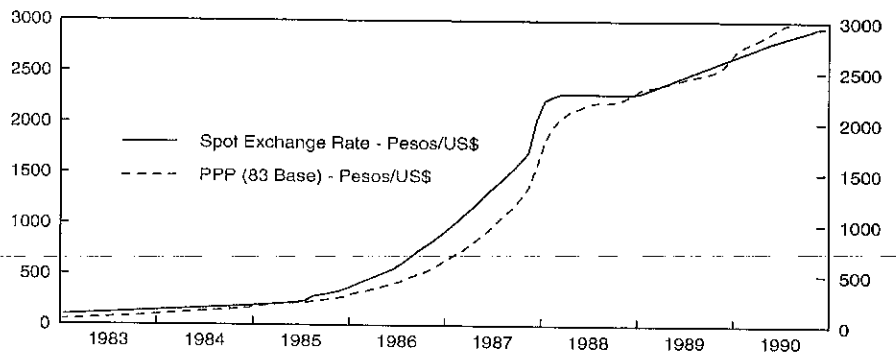
However, we do not need to make these assumptions about the structure of prices if PPP is viewed as an extension of the quantity theory of money. In this case, no assumption about the relationship of tradable to nontradable goods — or the structure of trade distortions — needs to be made. Instead, the relationships between the values of currencies can be projected based on the supply of money relative to demand. Trade flows play only a secondary role in determining currency movements, but the relationship between currencies and a broad measure of domestic prices — both tradable and nontradable — remains intact (see *Deviations from PPP — Why They Occur and How They Are Corrected*, page 6, for a discussion of the process by which exchange rates and prices interact in this framework).

PPP — How Well Does It Work?

The basic proposition embodied in the theory of PPP as outlined above is that countries in which inflation is persistently higher than that of their trading partners will experience predictable devaluations of their currencies. This relationship between domestic inflation and the exchange

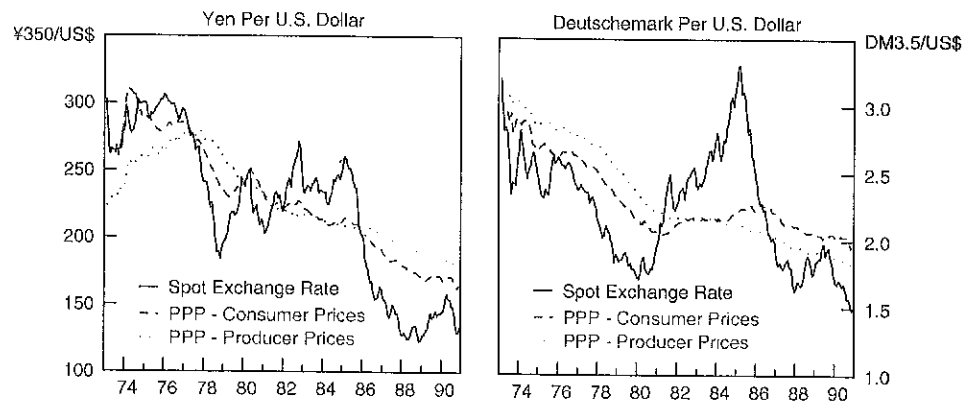
rate has been well documented for countries that have recorded hyperinflation periods (see Figure 2). Policies designed to resist nominal depreciation to keep import prices down soon will become unsustainable in a high-inflation environment. Either export competitiveness will be eroded, or — if exchange rates have been allowed to float — reserve loss will be too great to be maintained. Thus, by necessity, exchange rates often will be set at or around estimated PPP levels as a best proxy of correct currency valuation. In this way, erosion of the external trade position is avoided, while other less costly avenues to reduce inflation are pursued.

Figure 2. PPP in High-Inflation Countries — Mexico, 1983-90 (Base Year 1983)



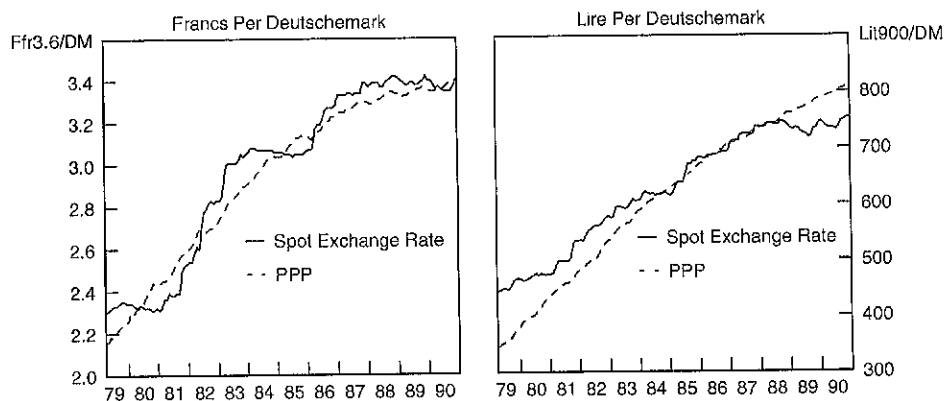
This proposition has not fared as well for the U.S. dollar relative to the currencies of other industrialized countries outside of the ERM. For instance, in March 1985, we estimate that the U.S. dollar was overvalued by approximately 30% versus the yen and by 25% versus the Deutschmark (see Figure 3). Such large deviations have provided fuel for a lively academic debate as to whether exchange rates do in fact revert at all toward the level estimated by PPP.

Figure 3. The U.S. Dollar — PPP Exchange Rates Against the Japanese Yen and the Deutschmark, 1973-90 (Base Year 1973-90)



In contrast, the PPP's track record has been rather good when applied to the ERM currencies. In the ERM, relative inflation performance effectively has dictated the timing and extent of realignments in the system (see Figure 4). Prolonged deviations from PPP in a pegged system, such as the

Figure 4. PPP Within the European Monetary System — The French Franc and the Italian Lira versus the Deutschemark, 1979-90 (Base Year 1979-90)



ERM, have proved to be neither financially nor politically sustainable. Protracted periods of undervaluation or overvaluation will result in a drainage of reserves as more frequent intervention proves necessary, while price distortions can cause unacceptably large trade imbalances and damage export industries.

Deviations From PPP — Why They Occur and How They Are Corrected

With deviations from PPP as large as 40% at times and lasting as long as three to five years, it is useful to question what the roots of PPP deviations are and what mechanisms — if any — will drive the exchange rate back to equilibrium. Tariff and nontariff barriers to trade, real preferences and other factors mentioned above are not the only factors that may interfere with the ability of international trade to react to differences in domestic and foreign prices. Goods markets by their very nature are sticky and resistant to change. Capital markets, in contrast, react quickly and instantaneously in response to changes in expectations, economic factors and political events. **Both asset and goods markets will adjust toward equilibrium in the long run. However, differences in the adjustment speeds between asset markets and goods markets can cause an overshooting or undershooting of the exchange rate that can be both persistent and large.**

The essential framework for exchange rate determination, elucidated more than 14 years ago by Rudiger Dornbusch, can be applied to recent experience if some license is allowed.⁴ Take, for instance, an initial monetary shock, such as an increase in the money supply, with demand held constant. The recent loosening of monetary policy in the United States in response to recession can be seen as analogous, although demand — and everything else — is never truly constant in the real world. Because goods markets are sticky, we can expect little effect immediately in the form of higher wholesale or retail prices. More often, these types of changes can take a year to fully work their way through the system.

Financial markets, however, will react quickly to news of an increase in the money stock. Short-term interest rates likely would decline, and inflation expectations would increase as a result of the new policy. The

⁴ See "Expectations and Exchange Rate Dynamics," Rudiger Dornbusch, in *Journal of Political Economy*, December 1976. The model, which is developed under the assumptions of perfect capital mobility, assumes a slow adjustment of goods markets relative to asset markets, consistent expectations and a small country that faces a given world interest rate.

immediate result would be a depreciation of the currency as financial markets react to the new policy and foreign investors turn their sights and wallets on more profitable markets in other countries. Once again, the recent U.S. experience is roughly mirrored: Declines in short-term rates in the United States brought real yields below those abroad. The predictable market response was a depreciation of the U.S. currency.

Because the domestic prices of goods and services will not react immediately to the new, easier monetary policy, the value of the currency in real terms will decline. Thus, the U.S. dollar was driven further below its equilibrium PPP value. In the standard analysis, depreciation will continue until a reversal of the currency's value is expected — a reversal that exactly matches the difference in interest rates in the two countries. Lower interest rates at home will begin to stimulate domestic demand. Similarly, as foreign buyers notice that goods sold by the home country are relatively inexpensive, exports will begin to pick up. In time, the increase in demand from both foreign and domestic sources will result in a decline in excess real money balances, and real interest rates will rise.

Foreign investors begin to notice the rising economic activity and climbing yields and will increase purchases of securities in the country once again. The process, once fully worked through, will appreciate the exchange rate until both goods and assets markets clear and PPP is met again. For the United States, this final process has only just begun, as investors anticipate an end to the U.S. recession and monetary easing appears to be winding down (see *Case Study — The U.S. Dollar*, page 10).

Measurement Problems and Introduction to the Salomon Brothers Measure of PPP

The Choice of a Price Index

Estimating both the absolute and relative versions of the PPP model introduces problems of measurement. The absolute version is not easily or practically measured, because it requires the comparison of prices of common consumption baskets in two countries. No such broad price index is readily available for major industrialized countries, and the common indexes of inflation are not suitable because of differences in consumption baskets and disparities of the commodity weightings.

As a result, the most frequently used measure of PPP employed is the relative measure, and the choice of the price index most often is based on one's view on how PPP disequilibriums are ironed out.

In its most narrow sense, PPP values are calculated using only tradable goods: commodities or export and import price indexes. For a wide range of tradable goods, the adjustment process can be accomplished through competitive international trade in the goods within the indexes.

In its broadest application, the relative measure of PPP applies to a variety of goods and services, whether tradable or not. This application implies the use of a broader price index — including tradable and nontradable goods or services — in the calculation. Most often, the Consumer Price Index (CPI) is used, although measures of underlying inflation pressures, such as labor cost indexes, can be used, as well. Those who believe that nontradable goods as well as and tradable goods prices move in tandem with exchange rates in the longrun and who view the path to equilibrium as not being restricted to trade flows prefer to use this version.

A middle-of-the-road, **less stringent version** typically uses the Wholesale Price Index to calculate PPP values. Containing a large share of tradable goods and readily available for most countries, wholesale price indexes also are appealing to those who prefer to put a heavier weight on the role of trade flows in exchange rate determination.

Regardless of one's position on whether asset markets or goods markets serve as the primary mechanism driving exchange rates toward PPP equilibrium in the long run, **we have found that the results of PPP calculations made with Producer Price Indexes are not appreciably different from those calculated with the CPI** (see Figure 3). However, we have found significant discrepancies when calculations are made using export price indexes in Japan (see *The Japanese Yen — A Second Look*, page 11).

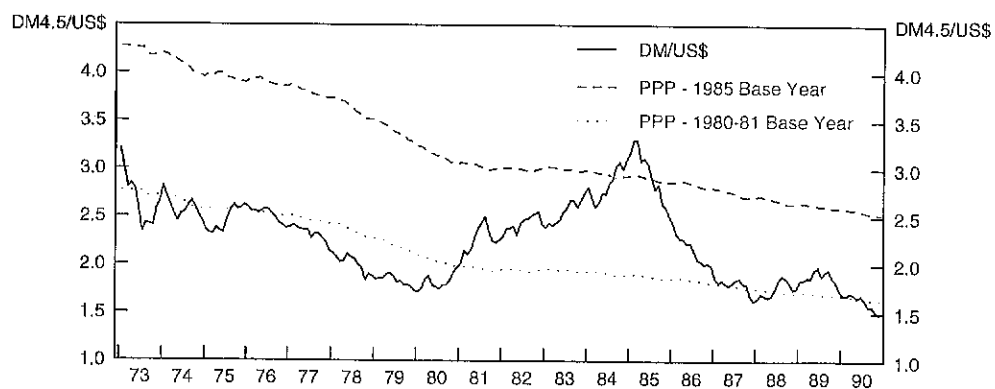
The Choice of a Base Period

Whether one chooses the broader or more narrow measure, the popular relative method of estimating PPP requires the selection of an appropriate base period from which subsequent equilibrium exchange rates are to be calculated. The base period itself must be a period in which the exchange rate is assumed to be in equilibrium. From that point on, deviations in inflation rates among countries dictate changes in exchange rate values.

As one might expect, the selection of the base period can significantly affect the calculated PPP results and the conclusions drawn from them. Typically, the base year will be a year in which the current account for the country in question is close to balance, such as in 1980-81, when the U.S. current account averaged a \$4-billion surplus. Figure 5 shows the effects of selecting 1980-81 as the relevant base year versus selecting 1985, when the U.S. current account had bloated to a deficit of \$122.3 billion and the dollar had peaked. Our calculations using 1980-81 and 1985 as base years yield significantly different results. A 1980-81 base-year calculation shows that the current PPP value of the dollar versus the Deutschemark is DM1.68/US\$, whereas the 1985 base year calculation yields a DM2.57/US\$ equilibrium exchange rate.

Short-term exchange rate volatility and the belief that there have been significant and prolonged periods in which exchange rates have deviated from their PPP values make the case against using a single period as an initial equilibrium point from which to calculate PPP

Figure 5. Base-Year Choices — 1985 versus 1980-81
(DM/US\$ Exchange Rate, 1973-90)



values. To avoid the risk of choosing a base period in which the exchange rate was in disequilibrium, we reject the method of making calculations based on single-year base periods. Although we acknowledge that there have been times of dollar overvaluation or undervaluation, we take the position that PPP in fact holds in the long run. However, we assume that these periods of disequilibrium cancel each other out if a long enough period of time is considered. **Thus, by selecting the entire period of floating exchange rates as the base period, we assume that the PPP value of the currency is best approximated by the average value of the currency for the entire period.** The PPP value of a currency at any point in time, then, is based on the relative inflation performance from the averages achieved for the entire period of floating exchange rates — 1973 to the present (see *Salomon Brothers PPP Calculation* for a detailed description of the model).

Salomon Brothers PPP Calculation

The Salomon Brothers's PPP is a CPI-based relative measure of exchange rate equilibrium values. The base period is the full period of floating exchange rates.

The model asserts that if PPP holds in the long run, it must have held, on average, over a period as long as 17 years — namely, since 1973.⁵ Unlike other PPP models, however, the Salomon Brothers model does not choose a specific short time period as the presumed period of initial equilibrium. Instead, it chooses the entire period since 1973 as the base period. Moreover, the length of our base period captures large swings in capital markets, as well as good markets.

At each point in time, an equilibrium PPP exchange rate is calculated based on changes in contemporaneous domestic and foreign price levels. Applying these price changes to the long-term average exchange rate yields the contemporaneous equilibrium PPP.

The model uses the CPI as the appropriate price level, because we believe that this broad index of goods and services prices most fully captures the general price level in an economy.

The equation below summarizes the Salomon Brothers PPP Model:

$$PPP_t = E_0 \times (P_t^*/P_0^*) / (P_t/P_0),$$

where

- PPP_t = The equilibrium purchasing power parity exchange rate in time t;
- E₀ = The average exchange rate since 1973, measured in terms of foreign currency units per unit of domestic currency;
- P_t^{*} = The foreign price level in time t;
- P₀^{*} = The average foreign price since level 1973;
- P_t = The domestic price level in time t.
- P₀ = The domestic price level since 1973.

⁵ See "Purchasing Power Parity in the Long Run" in *The Journal of Finance*.

The large swings in the U.S. dollar over the past decade are unmistakable: Since reaching its all-time high in March 1985, the U.S. dollar has come full circle, sliding by a cumulative 42% on a trade-weighted basis by year-end 1990.⁶ By early 1990, the U.S. dollar had fallen to a new postwar low against the Deutschmark and toward lows against the Japanese yen and other major currencies, provoking official intervention to stem the rate of decline. **The slide of the past year, on the heels of a comparatively stable period since year-end 1987, has raised questions about how far the dollar can decline and what the proper value of the currency should be.** More recently, upticks of the dollar have provoked speculation that the U.S. dollar is reaching a turning point and may have hit bottom.

Our calculation indicates that the PPP equilibrium value of the U.S. dollar at year-end 1990 was about ¥180/US\$ and DM1.85/US\$. Thus, the U.S. dollar is undervalued by almost 30% versus the Japanese yen and by 25% versus the Deutschmark. These estimates have important implications for competitiveness and the U.S. external balance of payments. They do not, however, represent a call for an immediate turnaround in the U.S. dollar to PPP levels.

Historical observation shows us that deviations from PPP can be large, and corrections typically are preceded by an overshooting that can last several years, such as occurred in the first half of the 1980s (see Figures 3 and 5). The current undershoot of the dollar, which has persisted with only brief and small corrections, has been associated with lower real interest rates in the United States than abroad. The current U.S. recession and the monetary policy response to it, moreover, added pressures on the dollar as capital flows favored non-U.S. dollar assets.⁷

In our view, the U.S. dollar has bottomed. However, the return of the U.S. dollar toward its equilibrium value will begin once other factors — such as interest rates, expectations about the value of the currency, confidence in the real economy, and trade flows — reverse the current slowdown in capital inflows from abroad. **We believe that this turnaround toward PPP likely will occur in 1991 — but not before U.S. interest rates near their lows.**

Current PPP estimates, nonetheless, have important positive implications for competitiveness that in time will complement the rise of the dollar motivated by capital flows. A value of the dollar consistent with equilibrium would make an overseas consumer indifferent as to whether to purchase an American import or its domestically produced equivalent — based on price alone. An overvaluation of a currency, as was the case through the early to mid-1980s, will make the price of imported goods attractive, while making exports uncompetitive. Our calculations show that at February 1985, the dollar was 35% overvalued versus the Japanese yen and 30% overvalued versus the Deutschmark.

⁶ Morgan Guaranty Trade-Weighted Value of the U.S. dollar.

⁷ See *The U.S. Dollar: An Undervalued Currency That's Headed Lower*, Nicholas P. Sargen and John Lipsky, Salomon Brothers Inc, September 20, 1990.

This striking lack of price competitiveness and the large capital inflows that helped to produce it partially explain the swelling of the current account from close to balance in 1980 to a deficit of \$122.3 billion in 1985.

Conversely, an undervaluation of a currency — as is the case today — will reduce the relative prices of imports from the United States for the foreign consumer and decrease the attractiveness of imports for U.S. consumers. Thus, the current dollar undervaluation effectively creates a 25%-30% discount sale for U.S. merchandise⁸ and marks up the prices of imports. **Partly because of this large undervaluation, the U.S. nonoil merchandise trade deficit had shrunk to \$43 billion by year-end 1990 from a peak of \$110 billion in 1987.** Further gains are expected in the year ahead, although there is little doubt that the improvement would be greater still if, over the next two years, external demand was not slowing because of recession and/or economic slowdown in Canada, France, Italy, Australia, and several other trade partners.

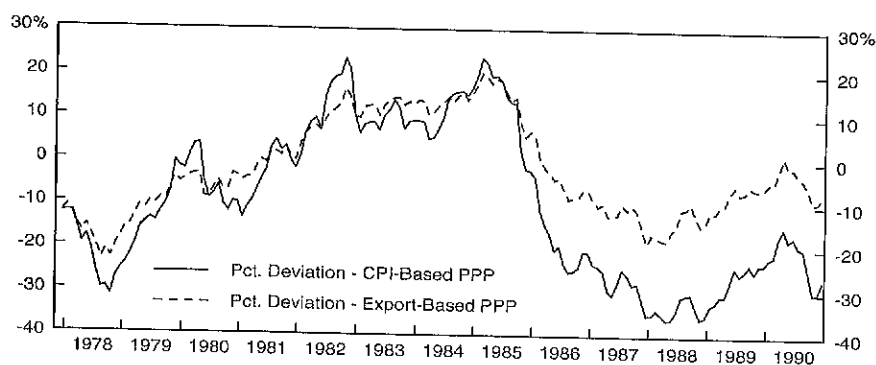
The Japanese Yen — A Second Look

Measures of PPP for the Japanese yen/U.S. dollar-relationship may be a special case, warranting closer scrutiny because of their implications for competitiveness. **We have found that segmentation of Japan's home and export markets may make larger overvaluations of the yen — when measured by CPI-based calculations of PPP — sustainable for longer periods of time.** When we employ the Salomon Brothers methodology using export price indexes, deviations from PPP become trivial compared with those based on consumer prices — particularly since 1985, when the dollar peaked (see Figure 6).

For instance, we estimate the current CPI-based PPP value of the dollar at about ¥180/US\$ at year-end 1990. However, when we recalculate the PPP using export prices in the United States and Japan, the current PPP value for the yen is ¥144/US\$, not exceptionally far from current levels.

One explanation for this large discrepancy can be found in the striking differences between Japan's export and domestic sectors. With a history of Government promotion and protection at home, the Japanese export sector is subject to intense international price competition. Conversely,

Figure 6. The Japanese Yen — Consumer and Export Price-Based Measures of PPP, Percentage Deviation from Spot Exchange Rates, 1978-90
(Base Year 1978-90)



⁸ This holds true to the extent that U.S. exporters do not raise prices on goods for export to increase U.S. dollar profit margins.

the domestic market for goods and services is highly inefficient and lacks the competitiveness of the export sector. A labyrinth of regulations and incentives — whose history dates back to the difficult period following World War II and was designed to safeguard the country from external disturbances — has reinforced these disparities. However, the same system that helped to speed up export-led growth in the 1980s and protected domestic agriculture and industry against imports and price fluctuations left little room for domestic or international price competition at the consumer level.

The resulting differences in price levels between the two sectors need not result in disparities in export price and CPI-based measures of PPP, as long as the differences are close to constant over time. For instance, relative PPP does not preclude a situation in which a television set in Japan sells at four times the export price for television sets. Extra costs incurred because of Japan's inefficient domestic distribution network may cause such an occurrence and prevent equalization of world prices for television sets (and, thus, the absolute version of PPP will not hold). Yet as long as costs savings or increases at the manufacturing level are passed on equally to goods for export and goods for internal consumption, the relative measure of PPP will continue to hold. Similarly, if price changes reflect monetary shifts or productivity growth, on average, all industries — whether tradable or not — will be affected equally. Thus, no large discrepancy between measures of PPP would occur, regardless of the price index used. Although changes in the structure of prices in Japan may account for some of the discrepancy, a better explanation lies in the pricing behavior of Japanese exporters during periods of dollar depreciation.

Conventional economic theory would predict that in times of dollar depreciation, manufacturers in Japan would raise the dollar prices of U.S.-bound exports to maintain profit margins (leaving yen prices unchanged). This was, in fact, the strategy that Japan pursued during the 1975-78 period, when the dollar declined by almost 40% against the yen and exporters passed through roughly the same amount in the form of higher export prices.

In the next dollar-depreciation period of 1985-87, however, Japan changed its pricing behavior, attempting to protect its share of the large U.S. market by limiting export price increases as much as possible. From February 1985 to the spring of 1987, export prices were slashed by 27% in yen terms, partially offsetting the effects of the 50% depreciation of the dollar. This same behavior reemerged in 1990, when Japanese businesses once again appeared to attempt to prevent the full pass-through effects of the U.S. dollar depreciation by reducing the yen price of exports.

Although lower oil prices and cost-cutting steps initiated by manufacturers were responsible for some of the export price declines during the 1985-87 period, discrepancies between domestic prices and export prices are just one indication that export margins were cut to limit price increases. Because of the record profits earned during the 1984-85 export boom, companies had the financial cushion to weather temporarily reduced export margins. Nonetheless, export price declines over the 1985-88 period consistently outpaced declines in domestic wholesale prices. Domestic manufacturing goods costs dropped by 10% in the 1985-87 period of U.S. dollar depreciation. However, export prices were reduced by more than 25%.

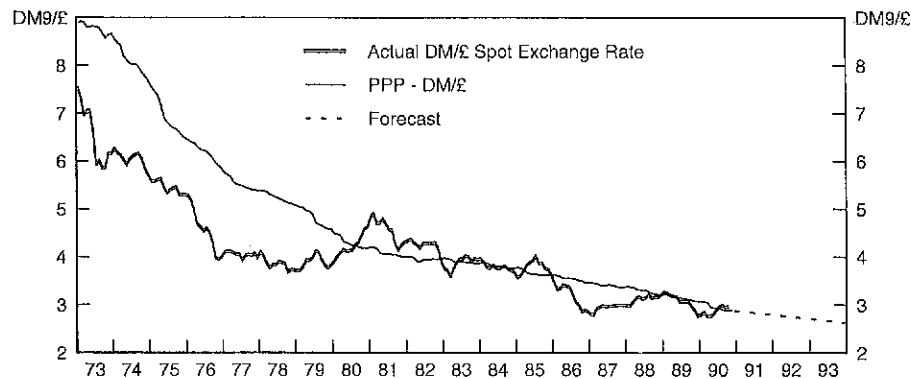
Thus, the margin-trimming behavior of exporters in Japan during the 1985-87 period arguably could be seen as the largest source of the discrepancy between CPI- and export-based measures of PPP. When Japanese exporters cut export prices declines to offset currency

realignments, the effectiveness of U.S. dollar depreciation in discouraging imports will be muted. For U.S. net exports, this pricing strategy implies that trade adjustments because of currency depreciation will be hindered. For this reason, among others, the U.S. trade deficit with Japan remains at \$44 billion, compared with its peak of almost \$60 billion in 1987, while the trade deficit with the European Economic Community (EEC) has reversed from a deficit of \$26 billion to a surplus of \$1.5 billion.

The British Pound in the ERM

Entry of the British pound into the ERM of the EMS at a central rate of DM2.95/£ late last year raised the question of whether this central rate is appropriate or sustainable. The timing of the move itself, on October 8, surprised the financial markets, which expected an early-1991 entry. Although appropriate from a political standpoint, the timing was unexpected from an economic perspective: Underlying inflation, at 8.4%, was just peaking, while the higher oil prices resulting from Iraq's invasion of Kuwait were supporting sterling.⁹

Figure 7. PPP Value of the British Pound versus the Deutschemark, Jan 1973-93 (Base Year 1973-90)



Nonetheless, its status as a member of the ERM will now require that the United Kingdom keep the value of its currency within plus or minus 6% of its central rates against that of the other eight ERM currencies. Because of this constraint and its implications for monetary policy, entry of the British pound into the ERM has been viewed favorably by currency and gilt markets alike for the monetary discipline that membership might instill. If it were to exceed the permissible divergence versus any other ERM currency, appropriate measures — either intervention or a change in monetary policy — must be taken. If measures are not successful, the country may request a realignment, in other words, a change in its central rate.

Apart from a brief appreciation upon entry into the ERM, sterling has traded below its central bilateral rate against the Deutschemark. A cautious pessimism had emerged regarding the proper valuation of the pound, leading to questions about whether the country will be able to maintain its ERM parity without undergoing significant economic hardship or eventual realignment.

⁹ See *Sterling in the ERM — Political Goals and Economic Uncertainties*, John Lipsky and Michael Saunders, Salomon Brothers Inc, October 5, 1990.

Our estimates of the PPP exchange rate of the British pound versus the Deutschemark show that the equilibrium DM/£ cross rate was DM2.90/£ at the time that The United Kingdom entered the ERM, or less than 2% from the central rate chosen. As a result, **the central parity rate for the pound within the ERM — DM2.95 — represents a relatively competitive exchange rate within the monetary system based on both countries' inflation records.**¹⁰ Thus, the pound is — for all practical purposes — correctly valued against the Deutschemark. The strength of U.K. exports relative to that of other European countries during most of 1990 supports this proposition. **Moreover, if current relative levels of underlying inflation are maintained, there is no reason to expect a realignment within the next year.** The sustainability of the pound within the ERM at the current central Deutschemark cross rate will hinge on the relative price performance between Germany and the United Kingdom. PPP calculations that incorporate modest inflation forecasts for the next several years (a deceleration of UK inflation toward 5.5%, while German inflation peaks at 3.8%) shows that **the PPP value of the pound will not breach the lower ERM limit before the middle of next year.** By implication, no realignment on the subpar inflation performance would be necessary before that time. A more rapid decline in U.K. inflation could make realignment completely unnecessary.

Although our PPP estimates of the pound against the Deutschemark imply that there is no need for realignment and that the currency is properly valued against the currencies in the ERM, it says nothing about its value against the U.S. dollar or the currencies of other non-European countries. With about 50% of U.K. exports destined for non-European countries, the real relative value of sterling versus currencies outside of the ERM becomes more important. **Looking outside of the ERM, sterling is not "correctly" valued based on PPP.** Rather, we have found that sterling is about 20% overvalued against the U.S. dollar. This overvaluation, which makes U.K. exports appear overpriced relative to those of its dollar-based and non-ERM trade partners, likely account for U.K. exporters' current dissatisfaction with the level of the exchange rate.

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¹⁰ This squares with statements by authorities in the United Kingdom who have asserted that the central rate is consistent with the average real exchange rate over the past 25 years.

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