CHAPTER 2

Gustav Cassel

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2.1 From Salamancans/Malynes to Cassel

Purchasing power and Gustav Cassel: the names are inextricably linked. Yet, between the Salamancans/Malynes (in the sixteenth century and 1601) and Cassel (in World War I), a considerable number of authors postulated the PPP theory. A summary of their work follows.

In 1761, during the Swedish bullionist period, Pehr Niclas Christiernin made explicit the concept of the price level—crucial for PPP. This distinguishes him from all other pre-twentieth-century proponents of the PPP theory, who, of course, had to understand the price-level concept in order to present the PPP theory, but did not formulate the concept in as explicit terms. In contrast to the views of other interpreters, I argue that Christiernin had both an absolute and a relative PPP theory (Officer 1982, pp. 37–42). The sole deficiency is that the commodity prices considered pertain only to the domestic country (Sweden). In this respect, Christiernin's analysis is inferior to that of Malynes, who incorporates price changes both at home and abroad.

Jean-Baptiste Mosneron, during the French Revolutionary period, stated a relative-PPP theory, with the same deficiency as that of Christiernin (Officer 1982, pp. 42–43).

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Henry Thornton was an English bullionist who, writing in 1802, presents a PPP theory that again ignores the foreign price level. He goes beyond all previous PPP writers in recognizing that the increase in domestic prices (which causes a depreciation of the country's currency in the foreign-exchange and bullion markets) need not arise solely from an expansion of the money supply. Any other cause of an increase in the domestic price level also leads to the PPP result of currency depreciation (Officer 1982, pp. 47–51).

Francis Horner, in reviewing Thornton's work, exposits a clear statement of the relative-PPP theory and is the first writer to distinguish between, or at least use the terms, "real" and "nominal" exchange rates (Officer 1982, pp. 51–53). With Thornton and Horner primary authors of the 1810 Parliamentary Bullionist Report, it is not surprising that this famous document offers a precise statement of the relative-PPP theory (Officer 1982, pp. 69–71).

A third English bullionist, John Wheatley, provides the first complete formulation of the PPP theory. He had in mind a firmer concept of the price level than predecessors, as he demonstrates understanding of an *index-number* representation of the price level. He presents a complete two-country formulation of the PPP theory. In operating without the assumption of a constant foreign price level, Wheatley goes beyond his immediate predecessors and reverts to the less-restrictive, two-country formulation of the Salamancans and Malynes (Officer 1982, pp. 53–61).

John Leslie Foster, an Irish bullionist, asserted the PPP theory in 1804. The 1810 work of William Blake, another bullionist writer, centers on the distinction between real and nominal exchange rates. He anticipates modern PPP analysis in postulating that, in the short run, both PPP and real factors determine the market exchange rate, whereas, for the long run, Blake is a true believer in PPP (Officer 1982, pp. 61–64).

David Ricardo made many original contributions to economics, but his treatment of PPP, in 1810 and 1811, went little beyond that already reached by his contemporaries. There is no doubt, however, that Ricardo was a firm believer in PPP. In view of Ricardo's fame, he was perhaps the most conspicuous proponent of the PPP theory prior to the twentieth century. Cassel (1922) credits Ricardo with the first "scientific" theory of the foreign-exchange market, and recognizes his anticipation of Cassel's PPP theory (Officer 1982, pp. 64–69). Cassel was thereby unfair not only to the other English bullionists (Thornton, Horner, Wheatley, Foster), who had prior claim on the theory, but also to earlier writers in Spain

(the Salamancans) and England (Malynes), and to Swedish and French bullionist authors (Christiernin and Mosneron).

Following the tumultuous PPP literature of the English bullionist period, nearly a full century was to pass before PPP analysis was again in the forefront of theories of exchange-rate determination. In the meantime, the PPP approach was confined to four economists: John Stuart Mill, Viscount Goschen, Alfred Marshall, and Ludwig von Mises.

Mill's exposition of the PPP theory (in 1848) is less advanced than some earlier literature. He presents only the relative—and not the absolute—PPP theory. He considers a change in the price level in only the domestic, and not also the foreign, country. The real-versus-nominal exchange-rate distinction is implicitly assumed, rather than developed or extended (Officer 1982, pp. 73–76).

Writing in the 1860s, Viscount Goschen presents the PPP theory for an inconvertible paper currency (floating exchange rate) through the usual mechanism: the quantity theory of money leading to a relative-PPP result (Officer 1982, pp. 76–77).

In testimony before Royal Commissions in the late nineteenth century, Alfred Marshall displayed both the PPP theory, in absolute form, for a floating exchange rate, and its weaker variant, the law of one price, under a fixed exchange rate. More than a quarter-century later, in 1923, Marshall saw fit to reprint verbatim that part of his testimonies relating to PPP. It is intriguing that he does not take the opportunity to mention the intervening (and great!) work of Gustav Cassel. Marshall was toward the end of a long life and career. Perhaps he had not kept up with the literature. Possibly the issue of PPP was deemed too obvious and/or too unimportant to warrant more than reprinted testimony in an appendix in a new book. The unfairest speculation is that Marshall was reciprocating Cassel's neglect to mention Marshall's antecedent work on PPP.

Marshall's original contributions were imposition of balance-of-trade equilibrium as a condition for the absolute-PPP theory to hold, inclusion of international capital flows as an inhibitor of a strict-PPP determination of the exchange rate, and a careful analysis of adjustment to the law of one price under a rate constrained between specie points (a "fixed" exchange rate). All discussed in Officer (1982, pp. 77–79).

Prior to World War I (in 1912), Ludwig von Mises, writing in German, has only the relative—and not the absolute—PPP theory, with his contribution the proposition that exchange-market adjustment to an altered PPP can be either immediate or delayed (Officer 1982, pp. 80–81).

Except for the four cited authors, the PPP literature was basically dormant from the end of the Bank Restriction Period to World War I. The reasons are several: the role of Goschen in the 1860s in shifting attention from the PPP theory to the balance-of-payments theory of exchange-rate determination, the dominance of the gold standard by 1880, the narrowing of specie points during the century, the emergence of speculation to explain variations in floating exchange rates (Officer 1982, pp. 81–84). By the time of World War I, mainstream economics literature had ceased to incorporate the theory. Not for the first time in its history, the PPP theory awaited rediscovery.

Gustav Cassel rediscovered the PPP theory after the theory's long-dormant period. That is the proximate reason why it is Cassel, writing during World War I, whose name is almost invariably the first connected to the theory. Indeed, the PPP theory is sometimes called, simply, "Cassel's theory."

2.2 The Impact of Cassel

> If these critics, who express themselves in such vague general terms, were allowed to have their own way, the entire theory of the purchasing-power parity would have to be thrown to the winds, and we should be left in as much doubt as ever as to the real basis of the rates of exchange. (Cassel 1924, p. 68)

Einzig (1970, p. 264) states the reason for the association of Cassel's name with PPP:

> Neither Ricardo nor any of the earlier economists had succeeded in developing the purchasing power parity theory sufficiently, or in making a strong enough impression with their exposition of that theory, to ensure its adoption by textbook-writers before the first World War. Cassel succeeded in doing so to a remarkable degree.

One should go further than Einzig's statement. The impact of Cassel on bringing about the economics-profession's awareness of PPP analysis was greater than that of any other person in the history of PPP development. No predecessor of Cassel, no contemporary, no later individual implanted the PPP theory so broadly and firmly in the economics-profession's domain and also the public domain. Cassel was the supreme publicist of the PPP approach. Indeed, it is fair to describe that successful

promotion effort as perhaps his most important contribution to the PPP literature. After Cassel, the PPP approach was sometimes neglected, but never forgotten.

What were the reasons for the success of Cassel's publicity work on behalf of PPP? First of all, no other author—again, not before Cassel, contemporaneously, or after him—wrote so prolifically on the topic. Cassel devoted a total of at least 25 English-language publications, in whole or in part, to the PPP approach. This list includes 15 articles: seven in the *Economic Journal* (1916a, b, 1917, 1918, 1919, 1920a, 1928c); five in Skandinaviska Kreditaktiebolaget *Quarterly Report* (1923a, 1924, 1925b, c, d); and one each in *Annals of the American Academy* (1920b), *Economica* (1923b), and the *Encyclopedia Britannica* (1926). Also included in these writings are eight books authored by Cassel (1916c, 1921, 1922, 1925a, 1928a, 1932a, 1932b, 1936) and two volumes in which he served as a contributor (1925e, 1928b).

The second reason for Cassel's success as a PPP publicist is that he disseminated all his PPP writings in the English-language mainstream of economics. His works on PPP were either published directly in English or translated into that language.

Third, Cassel exposited the PPP approach in an extremely forceful and assertive style of writing. It is apparent to the reader that Cassel is both exuberant about the explanatory power of the PPP hypothesis and determined to carry out a mission of replacing other exchange-rate theories with the PPP theory in the professional and public domains. This tone of Cassel's writings on PPP contrasts with the matter-of-fact or coldly analytical treatment of his immediate predecessors, that is, Mill, Goschen, Marshall, and Mises. Even the English bullionist economists did not exhibit anything like Cassel's verve, excitement, and sense of mission in their PPP writings.

Fourth, Cassel's wartime and postwar publications on the subject stimulated a controversy on the merits of PPP analysis that was even more powerful than the bullionist controversies of earlier centuries. Unlike the several bullionist debates, the reaction to Cassel in the economics literature was international in scope—with publications not only in England (the place of Cassel's earliest writings on PPP), but also in several European countries and the United States. This controversy also differed from the previous debates in its exclusive focus on PPP analysis.

Fifth, the sheer number of publications involved in the controversy exceeded, by my count, the world total of all previous writings on PPP. It

is not surprising that, in Officer (1982), following essentially the present chapter—devoted to Cassel's contribution to the development of PPP theory—I abandon the approach of considering, chronologically, each and every publication dealing with PPP.

Sixth, Cassel wrote at a time of *international* ferment in foreign-exchange markets. The Swedish, French, and English/Irish bullionist experiences, in contrast, were purely domestically oriented events. The background to Cassel's publications was the First World War and the early postwar period, with inflation and large-scale exchange-rate movements spanning a large number of economies.

Seventh, Cassel gave the PPP theory its name. He did not do this until his fourth article (1918) on the topic, where the term "purchasing power parity" was used for the first time. In his first article (1916a), the equivalent term "theoretical rate of exchange" was employed. As a descriptive device, "purchasing power parity" explains the theory precisely and it immediately was adopted by the economics profession. The nominal-versus-real exchange-rate *terminology* invented by Horner and Blake a century earlier was entirely supplanted and, in fact, had never been fully incorporated in the literature.

Finally, the substantive contributions of Cassel to PPP analysis cannot be overlooked as a powerful reason for his successful implantation of the theory firmly in the economics consciousness. There were predecessors to Cassel in developing the PPP approach, but he was the first to place PPP within so systematic a framework that a clearly operational theory resulted. He distinguished carefully between the absolute and relative versions of the theory, although he did not provide them with names.[1] Also, Cassel was the first to express the theory formally in terms of statistical averages of prices. Not only did Cassel make PPP an operational theory, but also he was the first to use PPP to obtain estimates of exchange-rate disequilibria and the first to test the theory empirically. In this chapter, only theoretical aspects of Cassel's work on PPP are considered; his empirical use of PPP and his testing of the theory are discussed in Officer 1982, Part III. Further specific contributions of Cassel to PPP theory are presented in later sections of this chapter.

Persuasive as Cassel was, his PPP work gave rise to criticism as well as adoption. For surveys of the decade or more of published conflict between critics of PPP analysis (opponents of Cassel) and its proponents (followers of Cassel), the studies of Angell (1926), Ellis (1934), and Einzig (1970) may be consulted.[2]

2.3 Motivation for Cassel's PPP Theory

As far as Cassel was concerned, the *proximate* motivation for his theory was the dislocations of exchange rates during the World War combined with his disagreement with the general view that prewar exchange values of currencies (mint parities under the gold standard) would be reestablished after the war. In one of his earliest works, he writes: "All the combatants wish the world to believe that after the war their currencies will resume their normal value. But, in all probability, this problem will possess far different features from those it now presents" (Cassel 1916c, p. 57).

This situation occurred, according to Cassel, in an atmosphere of ignorance concerning the determination of exchange rates. "The discussion on the variations in exchange rates and their true explanation, which has been going on the whole world over since the outbreak of the War, has been chiefly characterized by a remarkable lack of clearness on the question as to what really determines the exchange rate between two independent currencies" (Cassel 1922, pp. 137–138). Twelve years after his initial publication on PPP, Cassel (1928a, p. 24) reflected on the background for his theory:

> During the War it was generally believed, and even officially preached, that exchanges were only disturbed by the obstacles which the War put in the way of international trade, and that exchanges must therefore be expected to revert to their normal pre-War levels as soon as peace was in sight. The fundamental wrongness of this view was made manifest by the Purchasing Power Parity theory.

There is evidence, though, that Cassel had developed the PPP theory even before the war. Meinich (1968, p. 159) declares: "Cassel says that he got the principal ideas of this theory [PPP] during his lectures at Stockholms Högskola in 1905." The reference is to a footnote in the Swedish (but not the English) edition of Cassel's *Theory of Social Economy*. Also, in beginning his first article on PPP, Cassel confirms that he possessed the theory in the prewar period; for he presents "the theory of the foreign exchanges *which I have given for some years in my lectures*" (Cassel 1916a, p. 62; italics added). If Cassel's lecture notes, perhaps as taken by a student, were found, they might indicate the precise timing of his origination of the PPP theory.

Was Cassel influenced by his antecedents in the PPP literature? In only one of his 25 publications on PPP does he allude to predecessors; only Ricardo, Mill, and Goschen are acknowledged. It is strange that Cassel does not mention the PPP discovery during the Swedish bullionist controversy of the eighteenth century; for his fellow Swede, Sven Brisman, noted that fact during Cassel's lifetime.[3]

Cassel (1922, p. 170) credits Ricardo with "the first theory of exchanges of a scientific character." He acknowledges that Ricardo applied the relative-PPP theory to a floating-exchange-rate situation and also sees him as having the law of one price (subject to transport costs) under a fixed-rate, metallic system. His reference to Goschen indicates that Cassel sees him as having a PPP-like theory only for a metallic standard, with the exchange rate under a paper standard determined by the demand for and supply of foreign exchange. This interpretation is incorrect; Goschen did apply the PPP theory to a paper currency.[4]

As for Mill, Cassel does not appear to credit him with any PPP theory at all. Mill is correctly viewed as having the "nominal" exchange rate determined by the amount of currency depreciation. However, quite unfairly, the latter is interpreted by Cassel as referring to depreciation with respect to the metal parity and not (or not also) the rise in the price level.

So Ricardo is considered by Cassel to be his true predecessor. Cassel (1922, p. 172) writes: "Ricardo finally draws various conclusions which in reality contain much of what a true theory of exchanges should contain." Perhaps other contemporary bullionist proponents of PPP, such as Wheatley and Blake, were ignored by Cassel because Ricardo was the most-prominent English economist of that time.

2.4 Quantity Theory of Money

According to Schumpeter (1954, p. 737), Cassel's PPP theory (as that of Ricardo) appeared "in characteristic association with a strict (and crude) quantity theory." It is true that Cassel adhered to the quantity theory of money throughout his writing. In fact, he was regarded as a quantity theorist of Irving Fisher's stature! However, Cassel never expounded a *simple* quantity theory. Even his first article on PPP qualifies the theory: "Now, according to the quantitative theory of money the general level of prices varies, other things being equal, in direct proportion to the quantity of the circulating medium in a country" (Cassel 1916a, p. 62).

In his subsequent writings, Cassel explained what "other things" are kept equal. Changes in output affect the price level (in the opposite direction), but money-supply changes are by far the more-important factor. Changes in the demand for money (sometimes taking the form of changes in the velocity of circulation, in Cassel's later work) are explicitly considered, including effects on the price level as well as on real output. Also, causation can move in the opposite direction, with velocity affected by changes in the price level or the money supply.

Even the essence of the quantity theory admits of a two-way causation, as the demand for money increases proportionately to the rise in prices and the supply of money passively adjusts to the demand. However, Cassel is emphatic that the initiating cause of any inflationary process is always increases in the money supply, what he calls "the creation of artificial purchasing power." Continually increasing the money supply results in *inflation*, as distinct from a once-and-for-all change in the price level. It is always within the power of the government to restrict the money supply and thereby stabilize the price level.

Cassel states the unqualified quantity-theory relationship only as a long-run proposition: "In the long run, of course, the internal purchasing power of a currency must, after all, always be determined by the amount of money in circulation" (Cassel 1925d, p. 56).

In summary, far from being a believer in a crude quantity theory, Cassel was a *sophisticated monetarist* ahead of his time. As Holmes (1967, p. 688) writes: "The idea that changes in the monetary sector would cause changes in the non-monetary sector is expressed so often in Cassel's writing…that it is amazing that one could think of him as a naive theorist—quantity or otherwise."

2.5 Price-Level Concept

Cassel is well aware of the index-number problems involved both in computing a domestic price index and in constructing relative price levels (absolute PPP). Relative-price changes and movements in the general price level, he notes, are commingled. A price index seeks to measure "how far a shifting of the center of gravity of the price-level has taken place" (Cassel 1932b, p. 463). Cassel notes that, in generating a relative-PPP measure, the index-number problem is compounded.

In constructing absolute PPP, one can obtain a precise comparison of price levels in the two countries only in the limiting case of all individual

prices in one country differing from corresponding prices in the other by the same multiplicative factor; that is, all relative prices are the same in the two countries. In that case, Cassel correctly points out, there will be no international trade. With differing relative prices in the countries (the realistic circumstance), only "an approximate comparison between the purchasing power of the one currency and the other" is possible (Cassel 1928b, p. 8).

What price measure should be used in the PPP theory and for PPP computations? The issue is discussed mainly in terms of price indexes (with reference to the quantity theory of money and relative PPP), rather than in terms of price levels (absolute PPP). In forming a price index, price relatives of individual commodities are logically weighted according to their importance. Cassel suggests that the weighting pattern reflect either production or consumption of commodities.

In particular, price indexes limited to traded goods (exports and imports) are emphatically rejected. Several reasons for this decision are provided. First, such indexes "are limited to a small class of commodities, and are therefore subject to variations" (Cassel 1922, p. 47) that presumably would not be present in a broader-based price measure. Second, traded and nontraded goods are not unvarying collections of commodities. "There is never a definite group of commodities that can be exported. Even a small alteration in the rate of exchange may widen or restrict the group of exportable goods" (Cassel 1928a, p. 33).

Third, Cassel hints that the "law of one price" applies to traded-goods prices, so that they tend to move together in different countries irrespective of the amount of deviation of exchange rates from their purchasing power parities. He writes: "if export commodities have risen in relative value in the exporting country, they have probably in the importing country also risen in desirability, and therefore in value, as compared with other commodities. The higher price of the export commodities, therefore, need not necessarily cause the value of the exporting country's exchange to be reduced on a like scale" (Cassel 1922, p. 155).

Cassel contends that a *general* price level is required to define absolute PPP and a *general* price index is needed for relative PPP. He writes: "the height of the general price level in different countries…[is needed] to make a real calculation of the purchasing power parities" (Cassel 1922, p. 182) and "The whole theory of Purchasing Power Parity essentially refers to the internal value of the currencies concerned, and variations in this value can be measured only by general index figures representing as

far as possible the whole mass of commodities marketed in the country" (Cassel 1928a, p. 33).

The most-logical interpretation of the general price index envisaged by Cassel for relative PPP would be the gross-domestic-product (GDP) deflator and its analogue—the GDP price level—for absolute PPP. Certainly, the very concept of the internal purchasing power of a country's currency implies that Cassel means to exclude import prices from the measure and to include export prices. National accounts had not yet been developed at Cassel's time of writing, so the precise concept of a GDP price measure was alien to him. He declares that one must consider all available general price indexes: the wholesale price index, retail price index, cost-of-living index, and wage-rate index.

At one point, Cassel suggests that the wholesale price index is most suitable to measure long-run price movements, the reason being: "We must confine ourselves to typical standard commodities of a practically fixed quality" (Cassel 1932b, p. 463). This passage is clearly an aberration. Elsewhere, Cassel notes: "An index for wholesale prices may be based on statistics of general prices or else on statistics of the prices of import and export goods" (Cassel 1922, p. 47). The latter-type index is rejected.

Ultimately, Cassel leans in favor of a cost-parity concept. He writes: "Only when prices have adjusted themselves to one another so as to make prices of products correspond to their cost of production, can we regard the usual index number of wholesale prices as a fairly reliable index of the movements of the general level of prices" (Cassel 1921, p. 110), This statement is supported elsewhere: "The level of wages in the country, therefore, is always a very important factor—in the long run may be the predominating one—in determining the international value of the country's currency" (Cassel 1922, p. 144).

2.6 Absolute-PPP Theory

Cassel's theory of PPP is appropriately named; for its foundation is the idea that the value of a currency—and therefore the demand for it—is determined fundamentally by the amount of goods and services that a unit of the currency can buy in the country of issue, that is, by its "internal purchasing power." The internal purchasing power of a currency is sometimes called simply its "purchasing power" or—as in Cassel's early writings—its "buying power" or "paying power." Irrespective of the term

used, the domestic purchasing power of a country's currency is defined as the inverse of the price level.

One of Cassel's many contributions to PPP analysis is that he was the first author to formulate his theory in terms of a schemata much-later outlined in Officer (1982, chapter 2). The long-run equilibrium exchange rate— called by Cassel the "equilibrium rate of exchange," "normal rate of exchange," "equilibrium position" of the exchange rate, "normal position" of the rate, "normal parity"—is defined as the value of the exchange rate that yields balance-of-trade equilibrium. It is fair to interpret Cassel's balance-of-payments concept more broadly so that he means equilibrium in the current account. He writes: "The main reason why we pay anything for a foreign currency is of course that this currency represents in the foreign country a purchasing power which can be used for acquiring the goods or for paying for the services of that country" (Cassel 1926, p. 1086). For simplicity, Cassel sometimes assumes that trade consists entirely of "commodities," that is, goods rather than services. This procedure justifies use of the trade rather than current account as the balance-of-payments concept in the definition of the equilibrium exchange rate.

Cassel points out that if the actual exchange rate (price of B-currency in terms of A-currency) exceeds (falls below) the equilibrium rate, then country A would have a trade surplus (deficit). Only when the actual rate is at equilibrium is there a trade balance. Now, the principal—though not the sole—determinant of the equilibrium exchange rate is the ratio of the internal purchasing powers or price levels of the two countries, that is, the absolute PPP. Though Cassel does not use the adjective "absolute," he defines and uses the absolute-PPP concept correctly and consistently.

Why is the PPP the main determinant of the equilibrium exchange rate? Since the value of a given currency is basically determined by its domestic purchasing power (inverse of the price level), the equilibrium value of one currency (relative to another) is fundamentally determined by, and in a limiting circumstance equal to, the ratio of the internal purchasing powers of the currencies, that is, the (absolute) PPP. As Cassel (1928b, p. 7) writes: "Obviously, in the state of equilibrium a certain sum of money must have about the same purchasing power if converted into the one currency or into the other."

In Cassel's most-thorough analysis, there is both an f function and a g function, in the terminology of Officer (1982, chapter 2).[5] The long-run

equilibrium exchange rate tends to equal the PPP (the f function)—"The internal purchasing power of the two currencies contemplated determines only the equilibrium of the rate of exchange" (Cassel 1926, p. 1086)—and the actual exchange rate (short-run equilibrium exchange rate) under a paper standard and floating exchange rate tends to equal the long-run equilibrium rate (the g function). In each case (f function, g function), there may be deviations of the dependent variable (long-run equilibrium rate, actual rate) from its ultimate determinant (PPP, long-run equilibrium rate). These deviations are discussed in Sect. 2.9.

As a short-cut in his analysis, Cassel *equates* the PPP with the equilibrium exchange rate. "In order to emphasize this dominating influence of the internal purchasing power in fixing the equilibrium rate of exchange, we call this rate, as here defined, the purchasing power parity between the two currencies" (Cassel 1926, p. 1086). He combines this simple f function with the g function to obtain an h function in which the exchange value of a floating currency is a function principally of the PPP and, in the limiting case, equals the PPP. As Cassel (1916a, p. 62; 1932b, p. 513) writes:

> Thus the rate of exchange between the two countries will be determined by the quotient between the general level of prices in the two countries...Thus the price of the bill on country B must, as an expression of the value of the currency of country B in terms of the currency of country A, be directly determined by the relation existing between the value of money in countries B and A respectively. This relation is the purchasing power parity of the two currencies.

Cassel states a neutrality theorem for the absolute-PPP theory. High prices within a country will not encourage imports or discourage exports, as these prices will be counterbalanced by a low exchange value of the domestic-country's currency, and the equilibrium balance of trade is maintained. Similarly, the level of the exchange rate is irrelevant for real behavior, providing only that the exchange rate reflects the PPP. So Cassel (1920b, p. 262; 1922, p. 157) can comment: "In reality the purchasing power parity represents an indifferent equilibrium of the exchanges in the sense that it does not affect international trade either way…But as soon as this parity [PPP] has been established at a certain level it is of no importance whether this level is high or low."

An effective adjustment mechanism preserves the tendency of the exchange rate to equal the PPP. Cassel uses the term undervalued (overvalued) exchange rate to denote an exchange value of a country's currency below (above) its PPP. An undervalued (overvalued) exchange rate encourages (discourages) exports and discourages (encourages) imports, thus increasing (decreasing) the demand for the country's currency in the foreign-exchange market and restoring the equality of the exchange rate with the PPP. At this time, what Cassel calls the "artificial" stimulus or hampering of trade, ceases and equilibrium in the balance of trade is restored.

Though not formally using the elasticity concept, Cassel is an "elasticity optimist," believing in high price elasticities for exports and imports and, therefore, in a relatively large response of the balance of trade to a change in the exchange rate. His belief is especially strong for countries at a high level of development engaged in close commercial relations. Not only will a small deviation of the exchange rate from the PPP significantly affect the amount of trade in existing commodities, but also previously untraded commodities will become exported or imported (and some kinds of previously traded commodities will cease to be imported or exported).

High elasticities imply a great stability to the exchange rate at the equilibrium (PPP) level. Cassel (1932b, p. 661) declares: "the rate of exchange in its equilibrium position—always on the assumption of a constant value of money—possesses a great stability, that is, a great power of resistance against changes in the real conditions of international trade which tend to shift the rate in one direction or the other."

The ability to use currency to purchase goods and services in the country of issue is the foundation of Cassel's PPP theory. So he notes that the theory works best—that is, that the short-run equilibrium exchange rate is expected to have minimum deviation from the PPP—under conditions of free international trade. Cassel also states that the theory holds when trade restrictions have equal impact in both directions, that is, on both imports and exports of a country.

Under normal conditions, Cassel's theory involves a strict direction of causation, from a country's money supply to its price level and thence (given the foreign price level) to the exchange rate. "The sequence of cause and effect is incontestable" (Cassel 1924, p. 68). In particular, a rise in the foreign price level cannot affect the domestic price level, providing the exchange value of the domestic-country's currency appreciates in the

same proportion as the PPP (ratio of the foreign to the domestic price level) rises.

However, Cassel mentions several exceptions to the strict chain of causation. First, if the domestic currency is undervalued (overvalued) on the foreign-exchange market with respect to the PPP, then imports are made more expensive (cheaper) domestically and exports encouraged (discouraged) because of their lower (higher) price in foreign currency. The higher (lower) price of import goods spreads to the general price level, and the increased (reduced) exports also acts to increase (decrease) the price level. Cassel notes that it is still within the power of the country to prevent the stimulating (depressing) effect on the domestic price level by suitably controlling the money supply, restricting or expanding it as the case may be.

Second, in a period of moderate and relatively stable inflation, the valuation of the exchange rate will anticipate the future currency depreciation over, say, the next year or several months (rational expectations). In principle, notes Cassel, the PPP theory still holds; as the exchange rate is affected by the expected domestic (relative to foreign) price level.

The third case of reverse causation occurs under hyperinflation.[6] In this situation, "the causal connection between the rise of prices and the rate of exchange is reversed, that is to say, the falls in the rate of exchange now become the basis for new rises of prices" (Cassel 1924, p. 69). The reasons are that the domestic currency becomes subject to adverse speculation by foreigners and that the currency becomes replaced by foreign currencies in its domestic roles of medium of exchange and unit of account. When the currency loses its domestic functions, Cassel observes, one cannot reasonably expect the PPP theory to be applicable.

It goes without saying that Cassel rejects the balance-of-payments approach to exchange-rate determination, in particular, "the popular fallacy that the movements of the exchanges could be explained by the balance of trade" (Cassel 1920a, p. 44). The adjustment mechanism that makes PPP a stable equilibrium value of the exchange rate would correct any undervaluation (overvaluation) engendering a balance-of-trade surplus (deficit).

Another argument Cassel employs against the balance-of-payments theory involves, in effect, expanding the concept of payments balance underlying the equilibrium exchange rate from the trade or current account to the basic (or perhaps official-settlements) balance (though these payments terms are, of course, not used). He declares that a deficit

or surplus on current account would be fully compensated in the capital account. Cassel believes in a well-functioning transfer mechanism; so that a current-account deficit (surplus) is balanced by a surplus (deficit) on autonomous capital account: "For if a country buys more from another than it sells to it, the balance must be paid in some way; say, by export of securities or by loans in the other country. Thus the balance of payments must on the whole equalize itself, and there is no reason for a definite alteration in the rates of exchange" (Cassel 1921, p. 47).

In the language of the transfer problem, Cassel (1928b, pp. 17–18) states: "a real transfer of capital will not affect the equilibrium of the rate of exchange, which will continue to be determined by the Purchasing Power Parity." He writes: "an export of capital is always counterbalanced by an export of goods to the same value. Goods may, of course, be replaced by services" (Cassel 1928b, p. 20). This statement is a good indication that Cassel had a basic-balance payments concept in mind.

What if there is a fixed exchange rate (for Cassel, taking the form of the gold standard) rather than a floating rate? Purchasing power parity remains the principal determinant of the exchange rate. If PPP represents the long-run equilibrium exchange rate, then it must be contained within the gold points. Otherwise, over time, the country will either gain or lose international reserves without limit. In a passage vaguely anticipated by Malynes, Cassel (1928a, pp. 31–32) writes:

> The purchasing power of each currency has to be regulated so as to correspond to that of gold; and when this is the case, the Purchasing Power Parity will stand in the neighborhood of the gold parity of the two currencies. Only when the purchasing power of a currency is regulated in this way will it be possible to keep the exchanges of this currency in their parities with other gold currencies. If this fundamental condition is not fulfilled, no gold reserve whatever will suffice to guarantee the par exchange of the currency.

Cassel argues that what caused an exchange-rate change under a floating rate now brings about a corresponding change in the domestic price level under a fixed rate. This maintains the law of one price, though not the strict direction of causality postulated by the PPP theory for a floating rate. Ultimately, though, even under the gold standard, the country can determine its price level by controlling its money supply.

Cassel rejects the modern monetarist view that a country completely loses the ability to determine its money supply under a fixed rate. He writes:

> But it would be impossible to keep up the gold standard if the purchasing powers of the currencies were not maintained at a corresponding level and if the supply of means of payment in both countries were not regulated to that end. (Cassel 1926, p. 1086)

2.7 Relative-PPP Theory

Cassel's PPP theory is basically a theory of *absolute* PPP. He justifies a theory of relative PPP on the *empirical* grounds that measures of price levels—required to apply the absolute-PPP theory— are virtually impossible to obtain. It is much easier to use a relative-PPP approach, since the only price data required are measures of inflation (price index numbers) in the countries considered. He writes: "We have no trustworthy measure for the absolute purchasing power of a currency in its own country. With index numbers, we are only able to determine the relative changes in this purchasing power from time to time" (Cassel 1932b, p. 660).

Cassel's theory of relative, like that of absolute, PPP is consistently presented throughout his writings. A succinct statement of his theory is "the rates of exchange should accordingly be expected to deviate from their old parity in proportion to the inflation of each country" (Cassel 1918, p. 413). A comprehensive description of his theory begins with the actual exchange rate in a base period, which must be a "normal" period. This exchange rate is multiplied by the ratio of proportionate changes in price levels in the countries concerned. The result is the (relative) PPP in the current period.[7] The ideal base period for Cassel is one in which the exchange rate is at its equilibrium level, best of all when that level is the absolute PPP in the base period. He writes that one must:

> start from a given equilibrium at a time when the exchange rate is presumed to be known, and on the basis of this rate calculate that rate which corresponds to the same equilibrium if an inflation of the currencies has taken place without any change having otherwise occurred. (Cassel 1922, pp. 175–76)

The question arises as to whether the PPP so calculated, that is, the relative PPP in the current period, is equal to the absolute PPP newly

calculated for this period, presumed to be the new equilibrium exchange rate. The answer is affirmative, according to Cassel, only if the changes in the economies that occurred since the base period were purely monetary in nature. Cassel notes that real changes may occur in this connection: "Strictly speaking, one must take into consideration the possibility that the normal levels [of exchange rates] might be altered somewhat as a result of changes in the entire economic situation of the countries in question, and also in the conditions of trade between them" (Cassel 1932b, p. 515).

Cassel correctly points out that real changes in an economy will be associated with changes in relative prices. Only under a uniform inflation, where all prices change proportionately, is the calculated relative PPP necessarily equal to the new absolute PPP. This is a neutrality hypothesis for relative PPP. As Cassel (1922, pp. 141–142) writes:

> If in each country prices are unaltered in their relation to one another, but have only undergone a common rise, then there is nothing to prevent our supposing the balance of trade between the countries to be unaltered. The equilibrium of the exchanges must, then, have been dislocated in the manner shown by the ratio of the deterioration of money in the two countries. If, on the other hand, the different prices have moved in their relation to one another, this circumstance may possibly in itself have affected the equilibrium of international trade and have caused some dislocation of the equilibrium of the exchanges.

2.8 Digression: Error Term in PPP Theory

It is a ridiculous caricature of PPP to formulate that the exchange rate cannot deviate even temporarily from the PPP. In a sense, this relationship is the most-extreme form of the PPP theory; but it has never been advocated by a proponent of the theory. Yet Nobel Laureate Paul A. Samuelson (1964) attacked the PPP literature on the grounds that it posits an unqualified equality between the exchange rate and the PPP. Considering the equation:

$$\text{R index} = \left(\text{American Export Price Index}\right)/\left(\text{European Export Price Index}\right) \quad (2.1)$$

where R is the exchange rate, and assuming that the United States exports good 3 and Europe good 1, he comments: "Obviously, a point-of-time

equality like (2.1) is complete nonsense, since $R = P_3/p_1$ is like saying that the \$2.80 price per £ must equal the ratio of the price of a California sherry to the price of a European Volkswagen" (Samuelson 1964, p. 149). More generally, Samuelson (1964, p. 153) concludes:

> Unless very sophisticated indeed, PPP is a misleadingly pretentious doctrine, promising us what is rare in economics, detailed numerical predictions. Few doubt that long-run wheat prices are determined by supply and demand equations rather like the one above [not shown here]; but whoever expects from this analysis detailed numerical predictions based upon simple historical calculations?

Fifteen years later, this position was supported by Katseli-Papaefstratiou (1979), who ends her study with the observation: "In conclusion, I am afraid there is an important element of truth in Samuelson's (1964, p. 153) statement that 'unless very sophisticated indeed, PPP is a misleadingly, pretentious doctrine, promising us what is rare in economics, detailed numerical predictions'" (Katseli-Papaefstratiou 1979, p. 29).

Samuelson's assertion that PPP theory is generally devoid of an error term is incorrect. Rather, the strictest form of the (absolute-PPP) theory postulated by proponents is the h function taking the form:

$$\text{short-run equilibrium exchange rate} = \text{PPP } \textit{plus} \text{ error term} \qquad (2.2)$$

and similarly for the f and g functions, and the entirety also for relative PPP and for other functional forms (such as logarithmic).

True, advocates of strict PPP do not generally state the error term in mathematical symbols: a literary acknowledgment of a random error in the relationship might suffice. Even if a verbal discussion of an error term is absent, it is unfair to project the absurdity of an *exact* theory on PPP theorists in general, and on Cassel in particular (see Sects. 2.8–2.9). Unless a statement is made to the effect that the exchange rate equals PPP in any time period, always and everywhere, a random error term should be viewed as implicit in the relationship.[8] And this is true of Cassel's work (again see Sect. 2.9).

At the opposite extreme to Eq. (2.2), one can envisage a multivariable multi-equation explanation of the exchange rate, which includes PPP as but one variable with no overriding importance in determining the exchange rate. Decidedly that model is outside the rubric of Cassel's theory. For Cassel, PPP is the most-important—but not necessarily the

sole—determinant of the equilibrium exchange rate (once more, see Sect. 2.9).

2.9 Flexibility of PPP

Cassel's form of the f, g, h functions (in the symbology presented in note 5) involves the PPP not as the only systematic variable explaining the exchange rate but rather as the most-important such variable. He allows room both for random influences and for other (though less-important) explanatory variables in the f, g, h functions. There are many ways in which Cassel makes clear that his PPP theory takes a less-restrictive form than strict equality.

First, throughout his writings, the effect of the PPP on the exchange rate is described in terms suggestive of a non-restrictive influence. Cassel states that the exchange rate is "determined essentially" or "governed essentially" by the PPP; or determined "in the main," "principally," "approximately," "in a rough sense," or "broadly speaking" by the PPP. He writes that PPP is the "essential factor" or "fundamental factor" or "dominating influence" on the exchange rate. The PPP theory is said to hold "broadly speaking" or in a "rough sense." Holmes (1967, p. 692) notes that "Cassel *always* had such qualifying phrases." While this statement is an exaggeration (note the quotations from Cassel in Sect. 2.6 on the absolute-PPP theory), it is true that it is difficult, if not impossible, to find entire passages in Cassel's work in which no qualifying language appears.

Second, there are two intriguing passages in Cassel—one relating to absolute, the other to relative PPP—in which the theory is described in weak terms indeed. He writes that absolute PPP "presents a solution of the exchange problem in only a first and quite rough approximation" (Cassel 1922, p. 139). Ten years later, he argues that relative PPP is "satisfactory for a first rough calculation of the new equilibrium level of the rates of exchange after big monetary changes have occurred" (Cassel 1932b, p. 661).

Third, Cassel allows for a random error term in the f, g, h functions, so that the exchange rate does not equal the PPP even if no other systematic influence is present. It is true that Cassel does not express his equations, and therefore their error terms, in mathematical language. Holmes (1967, p. 693) argues convincingly, however, that Cassel "did discuss random

fluctuations in a literary context" and so included "randomly distributed error terms in the equations of his operational theory."

Cassel (1928a, p. 32) writes of "small fluctuations in the rate of exchange…caused by fluctuations of demand and supply of bills on the exchange market." He declares that, even if non-PPP variables that systematically influence the exchange rate are absent or dormant, there may be divergences (described as small and/or temporary) of the exchange rate from the PPP. For example, abstracting from non-PPP factors, he argues that "the rate of exchange…cannot show more than small and quite temporary deviations from this level [PPP]" (Cassel 1928b, p. 17). These are all allusions to a random-error term.

Fourth, Cassel acknowledges that there are lags in the adjustment mechanism that corrects an undervaluation or overvaluation of a country's currency with respect to the PPP. In this context, he writes: "In reality, however, this restoring of the equilibrium may take a long time, especially if the forces which keep the rate down are powerful and are continually at work" (Cassel 1922, p. 158).

Fifth, Cassel makes the general qualification that, in principle, any real change in the economy can affect the exchange rate. "Theoretically, any change in the economic conditions in the two countries or in the trade relations between them may cause an alteration in the rate of exchange" (Cassel 1928c, p. 589). He argues that real changes ("the effects of economic causes on the rate of exchange") are generally dominated by monetary changes ("those of monetary causes, i.e., of alterations of the price levels"):

> Alterations of the price level in one country may easily cause the rate of exchange to rise ten or a hundred times or even much more above its former height; whereas, if the general levels of prices in both countries remain constant, only extraordinary perturbations of the economic conditions are likely to call forth movements of the rate of exchange of any practical importance. (Cassel 1928c, p. 590)

Sixth, Cassel explicitly discusses the non-PPP variables in the f, g, h functions. He provides a large number of reasons why a floating exchange rate may systematically diverge from the PPP. These reasons may be summarized as follows[9]:

1. Trade restrictions may be more severe in one direction than in another. For example, if a country's imports are more restricted than its exports, the exchange value of the country's currency may exceed the PPP.
2. Differences in countries' situations regarding transport costs may also cause the exchange rate to diverge from the PPP.
3. It is possible that speculation in the foreign-exchange market is against a country's currency and therefore reduces the currency's exchange value below the PPP. However, speculation usually plays a stabilizing role in the exchange market, moderating fluctuations in the exchange rate.
4. Anticipated future inflation in a country may lower the exchange value of its currency below the PPP. Similarly, the expectation of domestic deflation—for example, in order to restore a prewar gold parity of the currency—may lead to a currency overvaluation.
5. While the PPP is the primary determinant of the equilibrium exchange rate, a secondary influence is the pattern of relative prices in each country (domestic and foreign).
6. The equilibrium exchange rate is also affected by structural variables in the countries, that is, by the demand and supply of factors of production and by production functions.
7. Changes in relative prices within a country are an indicator of real changes in the economy from a base period, and so involve a divergence between relative PPP and the exchange rate. In particular, if its export prices increase more than prices in general, a country's currency will become undervalued with respect to the PPP.
8. Long-term capital movements can drive the exchange rate away from the PPP. For example, a net long-term capital outflow may depress a country's currency below the PPP. This effect can occur only until the transfer of financial capital is fully realized in real terms, that is, in a corresponding change (in this case, an improvement) in the country's current account.
9. A private short-term capital outflow induced by the desire to evade taxation at home will cause an undervaluation of the country's currency in relation to the PPP.
10. There may be a situation in which a country cannot readily obtain capital inflows to finance a balance-of-trade deficit, and yet the commodity imports are price-inelastic (perhaps because imports of necessities are involved). In this circumstance, both the

private sector and government will bid up the price of foreign exchange above the PPP by demanding a specified amount of foreign currency irrespective of price. Here the short-term capital outflow depressing the exchange value of the domestic currency is both private and official in nature.

11. The case of a managed float is recognized. The domestic government, possibly supported by credits from abroad, can intervene in the foreign-exchange market and peg the exchange value of the country's currency above the PPP.

2.10 Policy Implications

Cassel draws a number of policy implications from his PPP analysis. These guides to government policy may be summarized as follows.

1. The PPP is the ideal rate of exchange from the standpoint of good international relations. For example, if a country's currency is undervalued with respect to the PPP, its exports are effectively subsidized and its imports hindered, much to the annoyance of traders abroad.
2. Direct measures to improve a country's trade balance are an ineffective means of increasing the exchange value of a country's currency. Given stable monetary conditions abroad, the external value of a country's currency will be largely determined by its internal value.
3. Similarly, exchange control should not be used to counter adverse speculation against a country's currency. First of all, speculation has little influence on the exchange rate. Second, exchange control can have deleterious effects and is ineffective insofar as it attempts to prevent a falling internal value of the country's currency from manifesting itself on the foreign-exchange market.
4. Writing in the early and mid-1920s, Cassel warns against countries returning to the gold standard at the prewar parities (referring not to the PPP but to the rate of exchange or mint parity). If countries are to revert to a gold standard, they should do so by fixing the exchange rate (or mint parity) at the level of the current PPP. Otherwise, for countries that have experienced large-scale increases in their price level since 1913, a severe deflationary process will be required to drive the price level down to support an exchange rate set at the prewar parity. This deflation will involve a substantial decline

in output and serious unemployment. Again, Cassel is recognizing real effects of a monetary change, in this case, a severely restrictive monetary policy.

5. If the gold standard is re-established, the spread between buying and selling points should not be reduced. A narrower band would restrict the scope of the adjustment mechanism that counteracts deviations of the exchange rate from the PPP.
6. Instability in exchange rates and in internal values of currencies should be avoided. To stabilize their exchange rates, each country must select an internal value for its currency, that is, a particular price level, and support it by suitable control of the money supply.
7. Because purchasing power parities represent equilibrium exchange rates, they should be computed and placed in the public domain regularly on a monthly basis. To this end, suitable price indexes measuring the extent of inflation in different countries and calculated on a uniform basis should be provided.

In tribute to Cassel's great accomplishment of making the PPP theory fully operational, this chapter closes with his plea for more and better data for use in applying the theory.

Notes

1. The first to do so was A. C. Pigou (1922), who used the terms "positive" and "comparative." These terms came to be replaced with "absolute" and "relative," respectively.
2. Of course, not all participants in this discussion can be readily classified into one group or the other. More interesting, only one writer apparently moved from one camp to the other. John Maynard Keynes was editor, later co-editor, of the *Economic Journal*, at the time that Cassel's first writings on PPP were published, principally in that journal. As editor, Keynes presumably played an important role in accepting Cassel's articles for publication. He also commented favorably on Cassel's theory, in two editorial notes—one appended to Cassel's first article (Cassel, 1916a), the other independently written by Keynes (1919) in the same issue as Cassel's fifth article (1919)—and in Keynes' *Tract on Monetary Reform* (1923). By the time of his *Treatise* (1930), however, Keynes had become a severe critic of PPP theory.
3. See Officer (1982, chapter 4).
4. See Officer (1982, chapter 6).

5. The f function relates the long-run equilibrium exchange rate (number of units of foreign currency per unit of domestic currency) to the PPP (foreign-country/domestic-country price-level ratio) and other variables *plus* an error term. The tendency is for the long-run equilibrium exchange rate to equal the PPP.

   The g function relates the short-run equilibrium exchange rate to the long-run equilibrium exchange rate and other variables *plus* an error term. Again, the tendency is for the short-run equilibrium exchange rate to equal the long-run equilibrium exchange rate. The logical definition of the *short-run* equilibrium exchange rate is the rate that would exist under a freely floating exchange-rate system. The *long-run* equilibrium exchange rate is discussed in Officer (1982, chapter 2, Sect. 2).

   The h function, derived as g · f, relates the short-run equilibrium exchange rate to PPP and other variables *plus* an error term. Thus the short-run equilibrium exchange rate tends to equal the PPP.

   Therefore PPP theory asserts that the exchange rate has a *tendency* to equal the PPP. This does *not* mean that PPP theory in general—and Cassel's theory in particular—has strict-equality form (long-run equilibrium exchange rate exactly equals PPP, short-run equilibrium exchange rate exactly equals long-run equilibrium exchange rate, short-run equilibrium exchange rate exactly equals PPP)—see Sects. 2.8–2.9.
6. The term is not used by Cassel; he refers to "cases where inflation proceeds with great violence and is so irregular that its progress cannot be foreseen" (Cassel 1924, p. 69). The experiences of Germany and Austria after World War I are used as empirical examples.
7. This is the "second concept" of relative PPP exposited in Officer (1982, chapter 2).
8. Typically in economic analysis, relationships—whether functional or equilibrium—are presented void of an explicit error term. (This is not true of econometric work, of course.) The question of whether a random-error term is implicitly incorporated in the relationship is never raised, because an affirmative answer is so obvious! It is strange that, of all economic theories, only PPP has been attacked for established practice.
9. Summaries of Cassel's acknowledged non-PPP influences on the exchange rate are also provided by Angell (1926), Bunting (1939), Sadie (1948), Holmes (1967), and Myhrman (1976).

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