Italy, the fiscal dominance model, and the gold standard age

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from 1807), as the United States was caught in the middle of Anglo-French wars, and the American-British War of 1812–15. Anglo-American specie flows under these circumstances were subject to great difficulty not reflected in arbitrage/transfer costs. Second, data on such costs are virtually nonexistent for these decades, as they are for 1919–25 (until Britain returned to the gold standard).

8 For details, see Officer (1996).

9 Perkins (1975: 155–6) and Officer (1983: 607). The latter author has since changed his view.

10 For explanation, see Officer (1996).

11 Among the ideal assumptions are zero transactions cost, zero interest-rate differential between the two countries, no taxation in the countries, and risk neutrality on the part of the speculators. For details on this speculation and its effect, see Officer (1996).

12 For discussions of the role of the Second Bank and House of Brown, see Perkins (1975) and Officer (1996).

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9

ITALY, THE FISCAL-DOMINANCE MODEL, AND THE GOLD-STANDARD AGE[1]

Giuseppe Tattara and Mario Volpe

Large government deficits experienced in recent years in various countries, mainly developing economies, and evidence of a positive relation between government deficits and the growth of money and prices are at the heart of the debate on fiscal policy.[2] The situation is rather similar to that experienced by many European countries just at the beginning of their industrialization process. Many countries lacked a single central bank and had a plurality of small banks of issue, the government was frequently pressed by new tasks and by the need to face large infrastructure expenditures, and it lacked an efficient fiscal administration to raise the required taxes.

The connection between the budget deficit and inflation can be articulated as follows (Buchanan and Wagner 1977). At first, a very direct link arises when the central bank is not independent of the government, so that at least part of the deficit is financed, through government pressure, by printing additional money. In the same vein, when finance is raised through debt creation, the government competes with private borrowers for scarce loanable funds; this will drive up interest rates and crowd out private spending on both consumer and capital goods.[3] Although government and central banks are completely independent, the high interest rates due to the large government borrowing are an incentive to the central bank to purchase at least part of the newly issued government debt through open-market operations. This reduces pressure on interest rates but at the same time leads to a more rapid growth of the money supply and prices; the result is money growth and inflation, and the outcome is not very different from financing the budget deficit through the printing of money.[4]

Barro (1987) used long-term British data, spanning from the first years of the eighteenth century to World War I to assess the effects of temporary changes in government purchases on interest rates, the quantity of money, the price level, and the budget deficit. He found that temporary spending increased interest rates, but raised prices and the quantity of money only when the gold standard was suspended, i.e.,

during two wars, in 1797 and in 1914. In peacetime the ratio of public debt to GNP tended constantly to fall.

Barro's results are grounded on two main points. First, the gold-standard fixed-exchange regime pegged domestic prices to the international level and enforced a strict control over the money supply.[5] A flexible-exchange regime would have provided room for much greater flexibility: different monetary-expansion rates and different price levels are brought to compatibility with external equilibrium via exchange-rate variations. Second, in an open economy with high capital mobility – as under the gold standard (Fishlow 1985) – a temporary increase in government purchases shows up in borrowing from abroad rather than high interest rates at home and there is no incentive for the central bank to change its portfolio composition and inflate circulation (Ahmed 1987).

Fratianni and Spinelli claim that Italian historical development provides a good illustration of the fiscal-dominance model, as in the long period Italian monetary policy proved endogenous to fiscal policy and such endogeneity explains the process generating Italian inflation (Fratianni and Spinelli 1982; Spinelli and Fratianni 1991; Favero and Spinelli 1992).

The mechanism hypothesized by the authors is based essentially on evidence from two historical periods: the years from the reunification of the kingdom to World War I and the more recent period from the early 1970s up to the mid-1980s. During both periods the state deficit proved significant, and for the larger part of both periods the lira exchange rate was not formally tied either to gold or to other currencies.

Italy, from the unity of the kingdom in 1861 to 1913, provides an interesting case because it was a small, open economy and the lira had no fixed link to gold. The Italian government ran a deficit for two-thirds of the period, although the main deficits were clustered in 1861–70 and 1886–91. Open recourse to the printing press was the way used to finance the first deficit; government debt financed the second.

The government shifted readily off commodity standard toward paper standard during the Austrian war in 1866 and the domestic credit crisis of the 1890s. In this it paralleled movements out of gold in other countries – Austria-Hungary, Greece, the United States, etc. – during wartime or other emergencies (Eichengreen and Flandreau 1996; Bordo and Rokoff 1995; Bordo and Schwartz 1996). Unlike many other European countries, Italy did not come back to gold once the bad years had passed away. It stayed on gold for a very limited period, from 1861 to 1866, and for a short time in 1883, but it maintained a remarkably stable exchange rate and price level so that it is commonly said to have "shadowed" gold for the 52 years under scrutiny, notwithstanding government deficits (Bordo and Rokoff 1995; Bordo and Schwartz 1996). The exchange never departed measurably from the gold-standard currencies and relative prices kept rather stable: the lira depreciation was limited and the exchange fluctuated for more than four-

fifths of the whole period within a hypothetical ± 5 per cent band with respect to the average quotation.

This puzzle is specifically addressed in this chapter. Only under the gold-standard myth is there postulated a strict relationship among the exchange, metal reserves, and circulation – working mainly through the price level and the following balance-of-payments adjustment. In reality, the gold standard worked mainly through capital movements in an integrated financial market. An excess demand for or supply of money in one country leads to a once-and-for-all re-allocation of money and assets and to a one-shot transfer of gold as world portfolio equilibrium is re-established. The differential between domestic and foreign interest rates does not move, except for a change in the risk perception of international investors. This balance-of-payments adjustment is largely independent of relative price levels and commodity flows (Dick and Floyd 1992).

A stable exchange rate system was compatible with an expansion of the role of the state in building infrastructure and adding to global demand in the early phases of development in the Atlantic economies – as well as in Italy – where new unemployed resources were brought to work and money issued on account of the Treasury did not put too much pressure on relative prices. Eventually the excess supply of money was disposed of through assets purchases from abroad. There were minor reflections on interest rate differential and on the exchange, as budget deficits were huge but limited in time and foreign investors' long-term confidence was never shaken.

This vision provides a very different framework from the explanation of the Italian inflation in more recent years – when capital flows were restrained and the exchange was explicitly allowed to depreciate – and fails to support the Fratianni and Spinelli long-run vision of the relationship between budget deficit and inflation. At the same time, it enlightens some neglected points on how the gold standard functioned in the European periphery.

The chapter is organized in four main sections. First, the link between the money supply and the state budget deficit in the Italian historical context is described. Second, the process of monetization of government deficit is related both to the fixity of the exchange and the situation of free capital mobility typical of the 1860–1913 period. These two elements are, as is well known, the gold standard's two fundamental principles. Third, the empirical evidence supporting the view of Italy "shadowing" gold is discussed. The effect of government financing on the money supply is tested. Finally, the fundamental difference of the process of financing government deficit in the gold-standard age and in the more contemporary period is outlined.

BUDGET DEFICITS AND MONETARY CIRCULATION: HISTORICAL EVIDENCE

The Italian budget deficit

With the reunification of the kingdom, Italy adhered to the bimetallic regime of French origin and the lira rate of exchange was fixed with respect to both gold and silver at an established ratio. The largest part of domestic circulation was metallic (Tattara 1997).

Immediately after unification, Italian public finance had to face new problems. Public administration was to be completely reorganized: the debts of the various component states were undertaken by the new state (the capital value of the old debts amounted to 50 per cent of the country's national product); the country was in need of the most basic public services and a permanent revolt – *brigantaggio* – inflamed the south for more than five years.[6] Public expenditure over national income varied between 15 and 20 per cent, a relatively high level in comparison with other European countries with larger wealth (Brosio and Marchese 1986: 51, Table 3.1).

Expenditure growth went very high just after reunification; as expected, interest on the debt stock made up a large part of it. From 1867, under the conservative government, expenditures declined, although the political program of "state restraint" of the right was based more on raising taxes (tax on wheat milling) than on contracting expenditures.

The left-wing government of Agostino Depretis (1879–87) was characterized by a climate much more favorable to industry and developed in a decade of relatively high economic growth. Expenditure composition changed. Military expenses declined and government intervention in the economy, mainly to build railway infrastructure, increased. Depretis was succeeded by Francesco Crispi, whose government was characterized by a new surge in military expenditures (in 1888–90 due to the military convention with Germany and later on to the African campaign).[7]

During the Italian take-off in the first years of the twentieth century, government expenditure rose less than proportionate to national product, and government surplus added to private savings and relieved global demand in a period of rapid export growth. Military expenditures were still at the root of the new expansion after 1905; railway expenditures had two peaks in 1905 and 1908 corresponding to the indemnity paid to the railway companies.

Taxes deviated from expenditures basically in two periods: the early 1860s and the 1880s and the 1890s (1883–97). The budget deficit consequently reached high levels in 1866–70 and in 1888–90 (see Figure 9.1). An immediate increase in taxation just after the reunification of the country was politically unfeasible, and the same fiscal system was inadequate to the new tasks posed by the country's reunification. In the early 1860s only 50

per cent of state expenditures were covered by fiscal revenues, and the budget deficit rose in the early years of the decade to about 7 per cent of the national income; it was financed by public-estate sales and by an increase in public debt.[8] State debt started at about 45 per cent of GDP to reach 80 per cent in 1865 and almost 100 per cent five years later (debt data from Spinelli and Fratianni 1991: 66–77).

After an initial slow start, taxes jumped in 1870 to almost 11 per cent of national product and maintained roughly the same level until 1887, when they reached a level of 15 per cent. Direct and indirect taxes shares remained approximately constant through time (with a quota of about 50 per cent each). Among indirect taxes, the left-wing government abolished the tax on wheat milling and substituted it in 1878 with a new, higher, tariff (Federico 1996).

In 1872 the current budget was almost brought under control and the deficit remained very limited from 1874 to 1885. From 1897 it turned into a surplus, and remained positive to 1904 (Figure 9.1).

Other European countries ran deficits during the nineteenth century, mainly connected with episodes of war finance or railways and public-work construction, not very dissimilar from the Italian ones. In a comparative perspective, the ratio of Italian debt to GNP looks rather high and the way it was financed appears important in understanding Italian inflation, or better the lack of it. In Europe, Italian debt stock per head can be valued third, after the French and the Portuguese (*Fenn's Compendium* 1889).

Deficit finance

The Italian budget deficit in the early 1860s was largely financed through debt. Most of the Italian debt was represented by irredeemable consols, the Rendita Italiana: a part of these was subscribed on the internal market, with the active participation of the main banks of issue – particularly the Banca Nazionale – that operated a sequence of rather profitable "open market" operations (Di Nardi 1953: 76–7). A large part – more than half – was placed abroad, mainly in Paris through the Rothschild's intermediation (Luzzatto 1968: 44). The Paris market at that time was a big source of foreign funds, financing mainly the government expenditures of European nations (Fishlow 1985: 392–400). The effective rate of interest paid on Italian debt during the 1860s varied from 7 to 13.5 per cent, and the Rendita was placed easily on the international market. In the Paris stock market the Rendita had a yield premium in relation to the French and the English state funds, because of the larger risk attributed by foreign investors to a new debtor state with uncertain repute, as was the case of the new Kingdom of Italy.

In a decade the Rendita stock piled up to around 5 billion lire face value, corresponding to 3.3 billion market value: half of this stock was probably

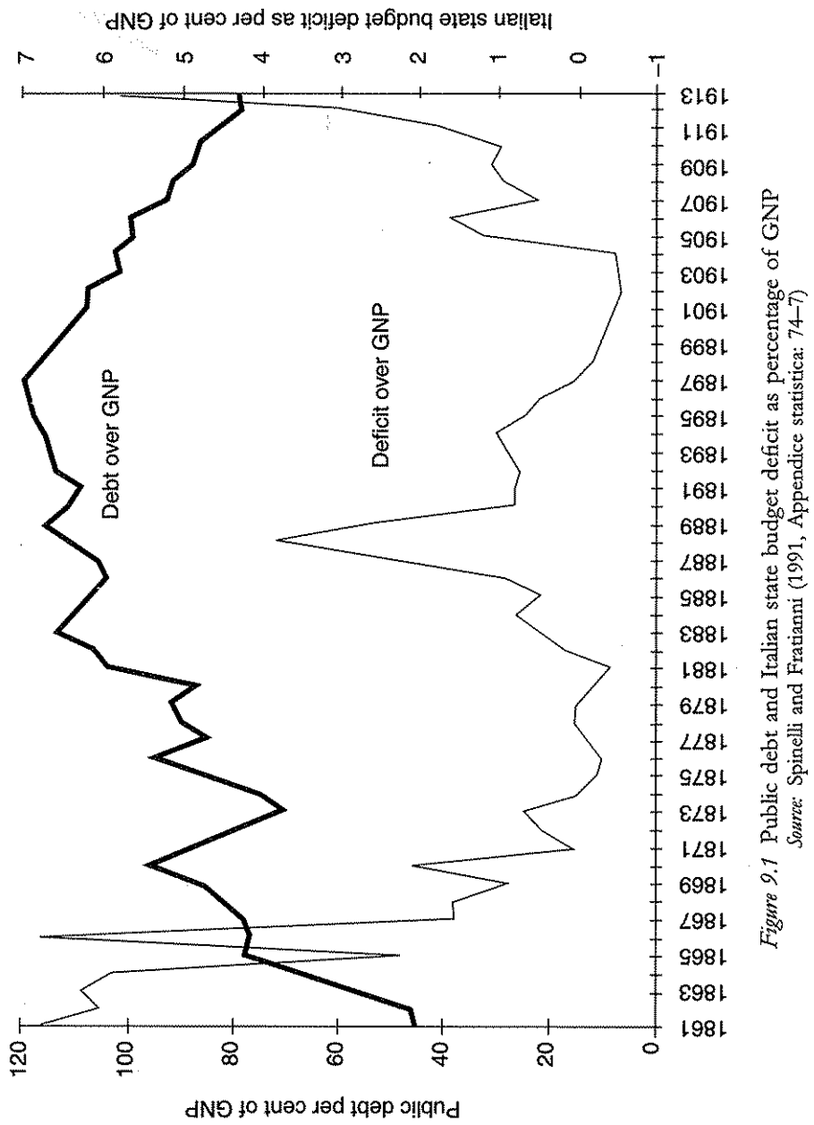

Figure 9.1 Public debt and Italian state budget deficit as percentage of GNP
Source: Spinelli and Fratianni (1991, Appendice statistica: 74–7)

kept abroad (Gille 1968: 211). On average during the nineteenth century, no less than one-third of the entire stock was kept abroad.

At the beginning of 1866, with the incipient war against Austria-Hungary, the budget situation deteriorated rapidly and the price of the Rendita halved, making external finance extremely expensive. In December 1865 Rendita prices in Paris went as low as 36.[9] In Spring 1866 a law was passed giving the government full powers in financial matters; the following day the government issued a decree arranging a large loan from the Banca Nazionale to the Treasury at a very low rate of interest and, at the same time, declared the *corso forzoso* (forced currency, namely suspension of convertibility of bank notes) for the notes of the same bank and introduced legal tender for some debt certificates issued by southern banks. Inconvertibility marked the clear pre-eminence of the Banca Nazionale on the Italian financial market.[10] Its notes could be used to settle any obligation once negotiated in commodity money and gave a big impulse to the diffusion of the paper currency among the population (see Figure 9.2).

After 1869, Finance Minister Sella[11] signed four agreements with the Banca Nazionale allowing it to finance the Treasury and widen the circulation.[12] As a result, circulation "by the Treasury" increased continuously until 1873 (Figure 9.3), although metallic reserves had been drastically curtailed.[13] The budget deficit had been reduced to low levels, but in the

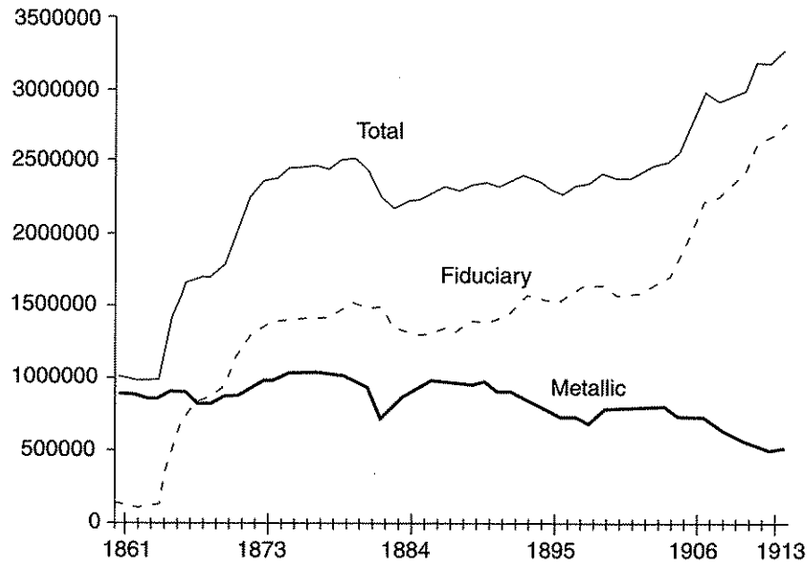

Figure 9.2 Metallic and paper circulation (thousands of lire)
Source: De Mattia (1967, vol 1: Tables 5, 13)

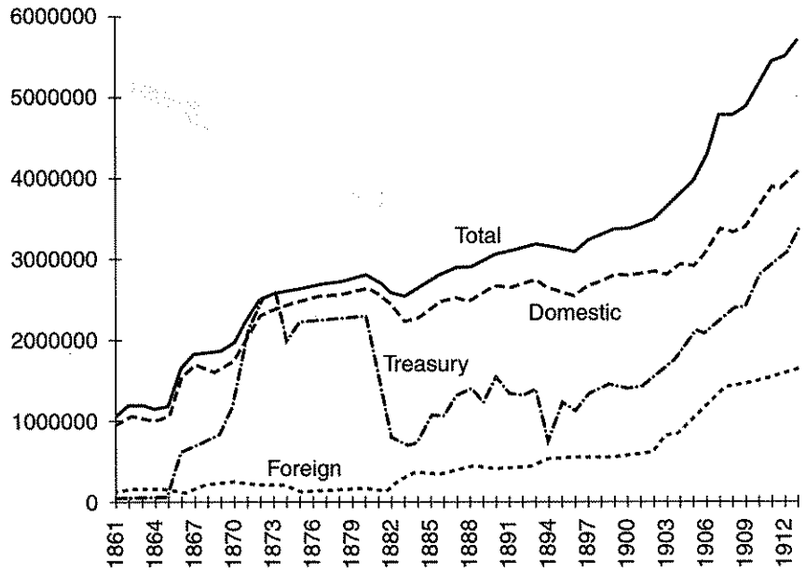

Figure 9.3 Circulation (M1): total, domestic, foreign. Circulation issued on behalf of the Treasury (thousands of lire)
Method: Monetary base is defined as the sum of its domestic and its foreign component. The domestic component is split into the monetary base created by the Treasury (monetary finance of the budget) and a residual component (central bank credit towards other banks and the public) not shown in Figure 9.3 (Fratianni and Spinelli 1991: 58, 60)
Source: Fratianni and Spinelli (1991, Appendice statistica: 52–3, 76–7)

1870s the Treasury did not renew all the debt coming to maturity and monetized part of the stock, because of the high cost of new Rendita placements both on the domestic and foreign markets (Ministero del Tesoro 1969, vol. 4: Table 5). The importance of the monetization process is visible from the lack of correspondence in the early 1970s between the deficit and the debt-stock variation. It appears much more clearly from monetary statistics, considering the amount of money advanced directly to the Treasury by the banks of issue (Figure 9.3).

It is questionable, and was questioned by the Parliamentary Commission on Forced Currency, whether the abandonment of convertibility in 1866 was an inevitable consequence of war expenditures or whether it was the first lender-of-last-resort operation undertaken by the government in favor of the banking system. The Commission argued for the latter. Circulation in 1866 had increased to finance four important banks (Credito Mobiliare di Torino e Firenze, Banco di Sconto e Sete di Torino, Cassa Generale di Genova and Cassa di Sconto di Genova) the activities of which were locked

up, and were not able to face the run of depositors (Di Nardi 1953: 122ff). The Banca Nazionale – to which these banks were tied – devoted to them the largest part of its operations (discount and advance operations) and the credit market experimented an unprecedented stringency. This raised strong demand for new monetary issues and the abandonment of convertibility. Instead, the members of the Commission had viewed rather tranquilly the Treasury financial situation in 1866.

Although the origin of *corso forzoso* is debatable, the Treasury was very quick to thread its way through it and get cheap finance out of monetary issues, disconnected as they were from any metal backing.

In principle, freedom for the banks of issue was never without limits: the law enforced a proportional backing and a ratio of one-third between gold and silver reserves,[14] and in 1868 a maximum amount of issues of the Banca Nazionale at approximately the amount then in circulation was established. But the law allowed the loans to the Treasury to be accounted as a reserve component (Di Nardi 1953: 143) and the rigid control of money supply lasted only few months, after which the limit to the new issues was raised and the Banca Nazionale was authorized to print additional currency. Abusive circulation by the minor banks – the number of which virtually quadrupled over the decade – was tolerated and control over the plurality of banks of issue was rather wanting. No wonder that circulation increased even when the current budget was once again balanced. We can estimate that from 1866 to 1881 circulation (M1, namely circulation of paper and metal) increased by 67 per cent and total money creation (M3, defined as M1 plus postal and bank deposits) by 113 per cent (De Mattia 1990, vol. 2, part 3: 1324–31, Tables 3, 4.1).

As Minister Sella said to the Deputy Chamber in 1872:

> I know that paper currency is no more than paper . . . but circulation did not grow too much and the exchange against gold did not depreciate too much from 1865 onwards. But this system was an evil incomparably less serious than the one we would have faced if we had gone on issuing public debt certificates. In such a case, in a couple of years, the Rendita quotations would have reached a quotation below that reached at the end of 1869. [Rendita price in Paris at that date was around 55, i.e., interest was 9 per cent.]
>
> (Tivaroni 1908, vol. 1: 76)

During the second period, the government deficit was financed exclusively through debt creation. Debt stock grew rather rapidly, reaching 120 per cent of GNP in 1897 (see Figure 9.1).

The domestic situation was now profoundly different. The government had announced the return to convertibility in 1881 and had backed it with the issue of a large loan in Britain in 1883: gold entered the Treasury coffers (about 640 million lire) and built a metallic base over which to increase

circulation. Private short-term capital flowed from foreign to Italian banks roughly in the same amount (500 million lire), anticipating an appreciation of the lira. Convertibility was declared in 1883. In fact, convertibility was never effective and throughout the 47 years from 1866 to 1913 the lira remained inconvertible.

Money (M3) and prices increased rapidly in 1884 and in 1885.

The situation deteriorated in one year, the exchange tended to exceed the lower gold point and gold and short-term capital started to flow out of the country as rapidly as they had entered. Banks restrained reserve reduction in several ways. They openly refused to convert paper money into gold, converting only to silver – for which nobody was willing to ask. Opening hours and days of operations were contracted, bank employees were asked to queue outside in an attempt to discourage the public from withdrawing their deposits (Di Nardi 1953: 348).

As gold continued to flow out of the country two options remained. First, reduce credit to the economy and make it more expensive, as the gold standard rules would have recommended. Second, purchase gold on the market, provide the required backing, and do not contract credit.

The second option was, of course, not profitable, because banks would have paid for gold with depreciated lire and converted them back at par on demand. It might have turned out to be profitable if banks had been allowed to print additional money from their reserves while convertibility requests were in practice denied. Many banks were as locked up as their customers and, with the tacit consent of the government, they pursued the second option, at first timidly, and later more openly.[15]

Banks had a limit to circulation expansion not exceeding three times the minimum of the two ratios: reserves to circulation and nominal capital to circulation. Additional issues should have full gold coverage. Fiduciary money substituted metal on the domestic market, reserves overall increased, and circulation (M3) did even more but banks overissued with respect to the nominal capital limit without the necessary backing. The attitude of the government was very tolerant, and in 1891 the existing situation of excess money creation was openly recognized and the legal ratio of circulation to the banks' nominal capital was increased to four to one.[16]

As Minister Luzzatti said to the Deputy Chamber in 1890:

> If banks were to comply with all private claims, all claims from abroad, the exchange would not exceed the gold point, but they would be compelled to reduce monetary circulation and reduce discount operations; but this they would not be able to do without limits because of their capital locking up due to the present economic and financial crisis.
>
> De Cecco (1990b: 715, doc. 140)

Government deficit, the printing press and inflation

When inconvertibility was declared in 1866, money supply grew six-fold but did not degenerate under high inflation. Making payments in paper lire legal generated a sudden rise in money demand and enlarged the monetized part of the economy. Diffusion of paper over metallic money had a sharp increase, as Figure 9.2 shows.

A new market, that for paper currency, was created that did not exist; and an increase in money supply was made possible, granting new profitability to the active operations of the Banca Nazionale. Loans to the government were remunerated at 1.5 per cent, rather low in respect to the 7–10 per cent banks could get from the Rendita. But banks were allowed to count advances to the Treasury as reserves and could lend out of them and made remarkable profits. This advantage, granted to the Banca Nazionale by the 1866 law, was extended in 1874 to all the banks of issue, and during the period 1874–84 about 50 per cent of banks-of-issue reserves were paper money. The Banca Nazionale, Banco di Napoli and Banca Nazionale della Toscana had the largest quotas (De Mattia 1967, vol. 1, part 2: Table 23).

Possibly, the banking system – pressed to finance current deficits and to monetize the debt stock by the Treasury – created more money than domestic residents wanted to hold and the latter reestablished their portfolio equilibrium by exporting gold to buy assets in the world market, mainly Rendita Italiana in Paris. From 1864 to 1876 the estimated share of the Italian Rendita kept in Paris declined rather continuously (see Figure 9.4).[17] Capital outflows reduced domestic money and brought it in line with demand. Fiscal incentives made profitable the repurchase of the Italian Rendita and at the same time the *affidavit* (see p. 241) made investing in Rendita abroad less lucrative. As substitution among different assets was not perfect we could expect some reflection on domestic interest and prices.

Various sources, reported by Luzzatto (1968: 69), estimate the outflow of metal from 1866 to 1873 at about 600 million lire, more than half of the stock of metal estimated to be used as money. According to Romanelli, much of the Italian debt previously abroad was repatriated, also as a consequence of sales from the French as a consequence of the war with Prussia (De Cecco 1990b: 633, doc. 123).

In the 1880s state finance was raised through debt creation and the government competed with private borrowers on the domestic capital market. The fiscal-dominance literature predicts a consequent increase of private spending on both consumer and capital goods. Banks of issue have an incentive to rearrange their portfolio and purchase part of the newly issued government debt through open market operations. This reduces pressure on interest rates but at the same time leads to a more rapid growth of the money supply and prices.

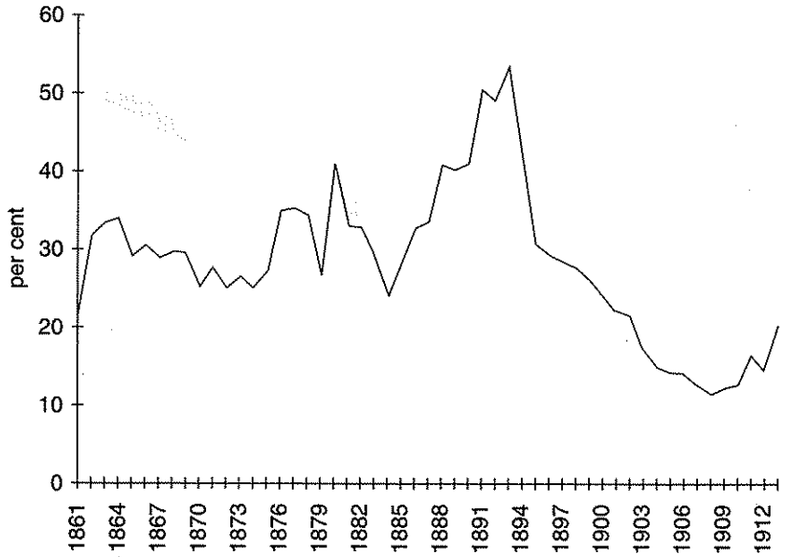

Figure 9.4 Estimated share of Italian Rendita held in France (percentage of total interest payments paid in Paris)
Source: Zamagni (1988)

However, when the country is part of the international capital market, the situation can evolve along an entirely different path. The government pressure on the financial market in the late 1880s did show up in borrowing from abroad, while domestic rates of interest remained rather stable. Credit to the government from all banks of issue declined in the same period from 26 per cent to 9–10 per cent of total asset value (computed from De Mattia 1967, vol. 1, part 1: Table 2)[18] while short-term credit that had been granted from foreign banks to the Italian banks of issue just after convertibility, in the form of commercial-paper discounts, had been recalled. There was more a change in portfolio composition than an injection of fresh finance from abroad. Banks substituted private for state financing and the state raised funds abroad that had previously flown into the banks.

The banks of issue did not inflate circulation because of the budget deficit. Then money supply appeared completely endogenous and independent of the budget deficit, and no relation with the level of prices could be expected after a limited burst in 1884.

The domestic long-run rate of interest grew later on, in 1891–2 and 1896, when the state deficit had already reduced, because of the domestic banking crisis. The Rendita yield increased because the risk of default had

augmented, state solvency was jeopardized, and the quantity of debt certificates abroad experienced a sudden drop.[19]

ASSET MARKETS, CAPITAL MOBILITY AND MONETARY EQUILIBRIUM

Italy and the international financial market

As we have already mentioned, a large part of the Italian public debt was issued in foreign markets – mainly in Paris – and was represented by a consolidated bond, the Rendita Italiana. Capital was transferable and flowed in large amounts between the Italian market and foreign markets for a large part of the period, and by far the largest part of the Italian portfolio investment abroad went on the Rendita.

The stock of the Italian public debt held abroad was very big in relation to other items affecting the exchange; it was approximately ten times the average annual current-account balance and double import value. In such a situation, even a small shift in asset preferences could lead to a capital transfer that was very large in relation to what could be effected through the current account, and expectations on the exchange were much more dependent on the mood of the international financial markets than on arbitrage on the commodity markets. Rendita purchases and sales in and out of Italy were the real factors moving the lira exchange (De Cecco 1990a: 269).[20]

Capital invested in the Rendita was subject to some changes in tax regime during this period. Rendita yields were subject to a specific 8 per cent tax in 1868, subsequently increased to 13.2 per cent in 1871 and to 20 per cent in 1895 (De Cecco 1990b, docs 64 and 123).

Interest paid on the Rendita varied according to where it was paid. Interest in foreign markets was paid in gold at a fixed rate of exchange while in Italy it was paid in paper lire. For a long time Rendita owners could transfer their consols abroad, without actually selling the original certificate for a new one, and have interest paid in gold.

Investments in the Rendita in Paris and domestic financial investments were very close substitutes, as facilities in such transactions were rather well organized and free transferability of capitals across national borders was never denied.

The possibility for Italian citizens to receive interest in gold abroad was removed with the introduction of the *affidavit* in 1874, abolished in 1881, reestablished in 1894 and removed again 10 years later (De Cecco 1990b, doc. 123; editor's note: 37). *Affidavit* was a sworn declaration that the bond presented to the foreign bank did not belong to an Italian citizen, and was requested when collecting interest abroad.

The *affidavit* never prevented capital from flowing out of the country.

Figure 9.4 might suggest a possible correlation between the reintroduction of the *affidavit* in 1894 and the sharp decline in the estimated Rendita quota abroad and attribute to the *affidavit* an efficacy that it never had. But other important factors had intervened: by the end of 1894, expectations on the exchange started to turn towards appreciation and people were now transferring back capital previously held abroad.

The price approach suggests that the internationalization of a market is complete when its prices are brought into international equilibrium. Many authors use the interest-parity relationship as a measure of price equilibrium; when deviations from covered-interest parity are small, markets are assumed to be integrated under the price approach (Cosh *et al.* 1992: 24–5).

Since it is especially in the nature of financial-asset prices to adjust swiftly to important developments, it appears appropriate to examine those prices, rather than inter-country capital flows. Integration in capital markets does not require a large volume of cross-border transactions. The necessary price adjustments in interdependent financial markets often take place without any transaction occurring. Financial-asset prices can change to incorporate new information, changes in legal or institutional arrangements and the like, before any new transaction takes place, or can eliminate the profit of arbitrage before any arbitrageurs have traded (Zevin 1992: 43–4).

With a well-integrated capital market, *ex post* differences in yield represent differences in the perceived risk of default among various classes of assets. In equilibrium the yield premium on Italian bonds was a measure of the perceived possibility of default on the Italian debt; an increase in the premium means that equilibrium had changed and risk had increased (Fenoaltea 1988: 624ff; Dick and Floyd 1992: ch. 3).

Italy's international financial position can be discussed taking into account three different kind of assets: (1) Rendita priced on the domestic market, (2) Rendita priced abroad, that was exactly the same certificate as before but negotiated in foreign currency abroad (in Paris, Berlin and London) – buying Rendita abroad was a safeguard against lira devaluation and (3) British consols acting as safe-reference bond against both devaluation and default.[21]

The Rendita yield premium is defined as the difference between the Paris Rendita interest and the Rome Rendita interest and measures a currency risk premium. It varied from zero to about 1 per cent.

The consols yield premium is defined as the difference between the Rome Rendita and the British interest and measures both a currency risk and a default risk premium. It was positive and varied between 0.5 per cent and 6 per cent throughout the period.

Whenever the Italian domestic situation was perceived as very risky, to be on the Rendita in Paris did not provide any reasonable hedge against the risk of default. The fear was state bankruptcy, not the lira losing value on the foreign-exchange market. People able to move funds in the interna-

tional market abandoned Italian bonds in favor of foreign government bonds, the Paris Rendita prices decreased, and the consols yield premium increased (in the 1890s).

In this situation the *affidavit* never prevented arbitrage, although it made it more expensive: arbitrage could take place only through purchases and sales of consols in the international capital market, not just moving them around and collecting interest in different currencies.

The endogeneity of monetary policy

Monetary policy in a small country, with interest rates determined in world capital market and integration of assets markets, is endogenous. This is a well-known result, due to the seminal works of Mundell (1968), McKinnon and Oates (1966), and Fleming (1962).

The model is strictly short term: there is no consideration of price adjustment or of the implications of balance of payments disequilibrium regarding the ability of the monetary authority to finance these flows (Dornbusch 1980: 175). The model introduces two assets: money and bonds. Bonds are an aggregate of all interest earning assets.

We consider the implication of asset-market integration for the small-country case and assume that individuals are free to buy and sell a wide variety of domestic and foreign bonds in an international market. If holders of securities are indifferent between domestic and foreign bonds, their yields must be equalized, taking account of risk divergence and exchange uncertainty. We assume that portfolio adjustments are instantaneous. These two assumptions imply that yields are continuously equalized and that asset holders are in portfolio equilibrium.

Consider *monetary equilibrium*. Let us start from a bookkeeping identity representing the active and passive side of a bank-of-issue assets and liabilities account.

$$(1) \quad R_t + D_t = C_t$$

where D_t is the domestic source of monetary base, R_t reserves or the foreign component of the monetary base, and C_t circulation (monetary base) within the public.

We assume that at each point of time (t) money demand is represented by the familiar relation

$$(2) \quad M_{td} = P_t L(Y_t, i_t)$$

where M_{td} is the demand for money balances, Y_t real income, P_t the price level, and i_t the rate of interest in the domestic market. We now look at (1) as an equilibrium relationship. Monetary equilibrium requires that money demand (M_{td}) equals supply (M_{ts}) and that both these are "desired" levels, given income, interest rates, and all other independent variables. Money

(monetary-base) supply is equal to foreign assets (reserves) R_t plus the domestic component D_t.

Let us take domestic monetary base (D_t) and income (Y_t) as given at each moment of time. The equilibrium stock of reserves R_t is a function of the rate of interest.

$$(3) \quad R_t = P_t L(Y_t, i_t) - D_t$$

We prefer not to model the real side of the economy, mainly on the grounds of the rather questionable estimates available for Italian national income. The ISTAT (Italian Institute for National Statistics) figure is basically a trend with a white noise added; we rather refer to Maddison's constant-value figures (Maddison 1991) after transformation at current prices. For the time being let us assume Y_t as exogenous.

The capital market integration assumption constrains the domestic interest rate in relation to interest rates in the international market. It results in the uncovered interest-parity condition:

$$(4) \quad i_t = i_t^* + \rho_t + (S_t^e - S_t)/S_t$$

where i_t^* is the foreign interest rate, ρ_t the risk premium on domestic assets, S_t the current rate of exchange, S_t^e the expected one.

Given ρ_o, S_o, S_o^e, a given level of the world rate of interest, i_o^*, establishes the domestic rate of interest. Given Y_o, P_o, D_o, (3) determines the reserve level (R_o) at which we have asset-market equilibrium and the magnitude of the endogenous supply of money. In other words equations (3) and (4) solve for the two variables R_t, i_t (or P_t), given Y_t, P_t, D_t, (or i_t), i_t^*, ρ_t and $(S_t^e - S_t)/S_t$.

Money being created on account of the Treasury or the banking system does not affect the result. Total money supply is endogenous, because of the endogeneity of its foreign component, due to the effect of world capital market equilibrium on the domestic interest rate in equation (4). What we observe empirically is substantially the money–demand relationship.

If the banking system, through its domestic loan and discount policies, creates less money than domestic residents want to hold, domestic residents re-establish portfolio equilibrium by selling non-monetary assets on the world market. As the foreign currency acquired is converted into domestic currency at the banks, the domestic banking system is forced to create additional domestic money balances to meet the demand for them and to acquire international reserves in the process. The banking system has no control over the money supply. The latter always equals whatever domestic residents want to hold (Dick *et al.* 1996: 2, 9).

If the nominal exchange rate is stable and if we believe purchasing power parity to hold, given the level of prices abroad, the domestic price level will depend on the foreign money stock and foreign prices but will not depend on the domestic stock of money (Dick *et al.* 1996: 9). These assumptions

are hard to verify even in the long run, and some limited effect on prices can be expected.

The model does not require *perfect substitutability* of domestic and foreign assets in portfolios accounts: domestic and foreign securities bear different interest rates and a different degree of risk. The previous equation (4) takes all that into account and expresses an equilibrium condition in the international capital market; the interest rate differential can change only when wealth owners perceive that the relative risk of the two countries has changed. Capital does not flow between countries in response to interest rate differentials.

Let us now assume that *portfolio adjustments are not instantaneous.* The mechanism through which monetary expansion occurs, following a budget deficit is as follows. An increase in public debt is financed through selling bonds to the banks of issue. Banks sell their international reserves and add domestic assets to their portfolios with a consequent expansion of domestic money – money that is not wanted. Private asset holders – at home and abroad – reduce their net domestic asset holdings and increase their reserve assets, for example buying Rendita in Paris for the same amount. If domestic and foreign assets are not perfect substitutes, an increase in interest-rate differentials can occur, as banks will have to give the public an inducement to alter its portfolio mix. *Variations in the spread between domestic and foreign rates of interest* can allow some degree of flexibility for monetary policy and explain some possible differences in relative price trends and in exchange expectations.

The fundamental argument of the portfolio theory is that the basic capital-mobility model holds without essential modifications when capital is not perfectly mobile internationally (Dick *et al.* 1996: 12–13).

In Italy the government lacked control over the stock of money through its note issue. The quantity of government notes held depended on the public's and the banking system's demand for them – any excess would be converted into Rendita abroad. Fiscal and legislative measures introduced to discriminate between the domestic and foreign capital markets had some temporary effects, but did not alter the results.

THE EMPIRICAL EVIDENCE

We now turn to our empirical tests. First, the claim that the Italian lira, although inconvertible during almost all the period, "shadowed gold" is discussed. Second, stationarity of money (M1) is tested and the proposition that monetary expansion was compatible with exchange and relative prices stability is examined. Then the reserve-flow equation suggested by portfolio theory is estimated and shown to be consistent with empirical evidence. Substitutability between domestic and foreign assets is considered. The final section concludes summarizing time series and estimation results.

The shadow of gold

As we said, the lira exchange rate with gold standard countries showed a remarkably stable pattern around the mean within a rather narrow band. Stationarity of a time series means that its mean, variance, and autocovariances are independent of time. Informal examination of data in Figure 9.5 suggests that the lira exchange rate is a typical stationary series, or a I(0) series.[22]

The meaning of the phrase "gold shadowing" is nonetheless more complex. It implies some assumptions about the mechanism under which exchange stationarity has been achieved.

A rather general starting point is to look at domestic prices relative to competitors' prices. A country is said to "shadow the gold standard" if relative prices are stationary over time for the whole period, independently of any change in the exchange regime. Relatively stable prices and a stable real exchange allow for different "mechanisms" at work, which can be investigated in various historical situations.

Figure 9.5 plots the lira nominal exchange rate and Italian wholesale prices relative to foreign prices. In building the indexes we consider two foreign countries – the United Kingdom and France (weighted) – as their

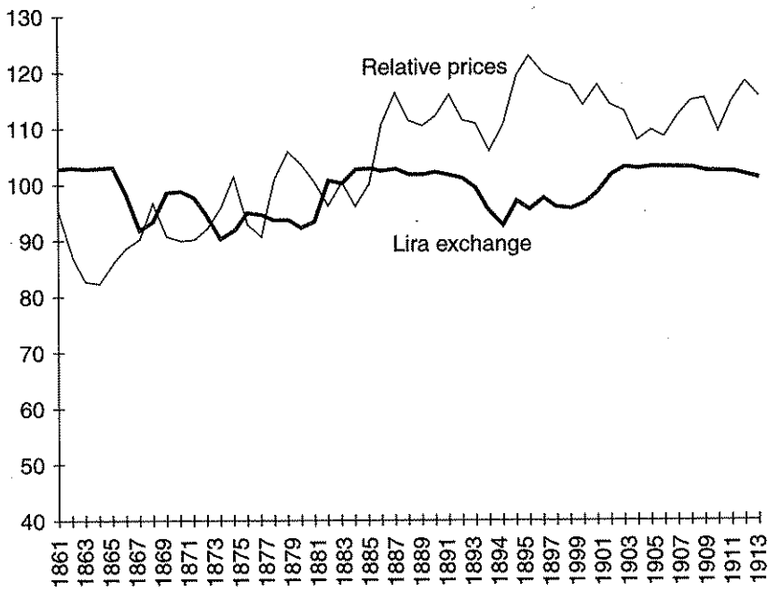

Figure 9.5 Italian prices and lira exchange relative to UK and France (index numbers, 1882=100)
Source: Ciocca and Ulizzi (1990: Tables 2,4)

rates of exchange were stable against gold and our claim is to test Italian prices relative to the prices of the gold-standard countries: other countries used to compute the lira effective exchange rate by Ciocca and Ulizzi (USA, Germany, and Austria) were discarded, as their currencies fluctuated against gold for part of the period.

Tests for unit roots for the two series were performed using DF, ADF, and the Za test suggested by Phillips and Perron (Perron 1994). The null hypothesis is that the exchange rate has a unit root, against the alternative that it has not. Test values do not lead to the rejection of the null, and both exchange rate and prices series are possible stationary series, I(0).[23]

As the series include the years of the lira inconvertibility, the formal return to bimetallism, and the 1890s international financial crisis, it seems sensible to evaluate the unit root hypothesis in a setting that allows for the possibility of structural breaks. We used a recursive technique that allows for structural breaks at any point in time: a model that permits an exogenous change in the level of the series (a "crash" or additive outlier model), a model that permits an exogenous change in the rate of growth (a trend model) and a mixed model were tested (Holden and Perman 1994; Perron 1994). Our results are then reinforced: the assumption of a unit root is not rejected, and the "trend stationary" hypothesis is the most appropriate (Holden and Perman 1994).

Money creation and money demand

Investigating the relationship through which price and exchange stability have been achieved is, of course, much more troublesome. The classical gold-standard myth assumes a direct connection between metallic reserves and money, and money and prices, through the price-specie-flow mechanism.

The introduction of capital movements into models of the gold standard has drawn attention to the role of central banks in managing the monetary mechanism. Nurske (1944) and Bloomfield (1959) studied the 1920s and 1930s and demonstrated that the domestic and foreign assets of central banks moved together – as required by the "rules of the game" – on only a minority of occasions. Nurske's analysis was replicated by Bloomfield for the pre-1914 period, and he found no greater propensity to obey these rules. These results raised the question of how the gold standard worked so successfully if central banks systematically sterilized reserve flows.

Goodhart (1972), studying the behavior of the Bank of England, found little evidence that the Bank played by the "rules of the game." The same was claimed with respect to Germany (Gall *et al.* 1995). Pippenger (1984) suggested a way to reconcile the paradox, claiming that there was considerable sterilization in the short run but that in the long run central banks had to reduce monetary liabilities in response to a decline in gold reserves. It

comes as no surprise to know that Italian banks of issue, not formally linked to gold, did sterilize the two big declines in metallic reserves experienced in the early 1870s and in 1885–6, with complacency from the Treasury. They did not play by the "rules of the game" in the 1890s either, when they increased paper issues to face the domestic emergency and did not check overall credit expansion.

In Italy the quantity of money in circulation, M1, appears to have drifted upward over time, and it does not look to be stationary at all. Our battery of integration tests partially confirm the result (except for the non-trended case) and points to the rejection of the null hypotheses. The additive outlier model, the trend model, and the mixed model do not change our conclusions.[24] Testing the first difference of M1 rejects the null hypothesis of a unit root. These tests are broadly consistent with the hypothesis that the M1 time series is I(1).

The trending nature of M1 and the stationary trend in relative prices and the exchange suggest much more cautious conclusions about the process generating domestic inflation. A six-fold increase in money supply accompanied by rather stable relative prices was already explained by a parallel increase in demand reflecting the ample monetization of the economy that followed the inconvertibility law of 1866. Portfolio adjustment supplies a compatible explanation, as capital outflow possibly took care of the excess money supply with only a limited effect on relative prices. A similar shift in portfolio composition was also at the heart of the 1887 expansion in public debt.

From (3) and (4) we get the reduced form equation for estimation in current prices:

$$(5) \quad R_t = a_o Y_t + a_1(i_t^* + (\Delta S_t / S_t) + a_2 D_t + u_t$$

Expected variations in the exchange are approximated by actual spot-rate variations.

The following variables are used in estimation:

R_t is defined as foreign metallic reserves, from De Mattia (1967, vol. 2: Table 5).

Y_t is the value added of Italian manufactures, from Maddison (1991), reflated with the wholesale price index from Ciocca and Ulizzi (1990).

S_t is the lira rate of exchange with gold-standard countries. It is defined as lire per unit of foreign exchange, the British–French average. Basic series are from Ciocca and Ulizzi (1990).

i_t^* is the long-run rate of interest in the United Kingdom – the leading financial center – from Spinelli and Fratianni (1991). We also computed the interest rate on Rendita Italiana in Paris, and called them $RendP_t$ and $RendR_t$. $Rend_t$ is the difference between them.

D_t is the currency in circulation, from De Mattia (1967, vol. 2: Table 13), which is C_t circulation, net of the foreign component, R_t.

$Deficit_t$ is the budget deficit over GNP, from Spinelli and Fratianni (1991).

The following signs of the coefficients are expected: $a_o > 0$, a_1, $a_2 < 0$.

We do not expect the state deficit to enter significantly into (5), both because money creation by the Treasury did not reflect the current deficit and because any shift in the source of monetary expansion does not affect the result.

The strategy followed for estimation is reported only very briefly and the more technical points are given in the appendices.

Money, income, reserves, foreign interest rate net of exchange variation, and risk variables are I(1) variables.[25] All I(1) variables have been tested for broken-trend stationarity and all series entering our reduced-form equation are represented by stochastic nonstationary processes. Differentiated series have been tested to be I(0) – the null hypothesis. Results are reported in the appendix.

As our variables cointegrate and trace, and maximum-eigenvalue tests indicate a unique cointegrating vector, a linear combination between them, exists that is stationary. The cointegrating vector, normalized in R_t, estimated through the Johansen FIML procedure, is reported in Table 9.1 (equation 1).

OLS estimation of the cointegrating vectors are a super-consistent estimate. Test statistics with appropriate asymptotic distributions can be computed using the Phillips-Hansen modifications – Fully modified OLS estimators. Various equations estimates were run following this procedure and are reported in Table 9.1 as equations (2), (3), (4), (5), (6).

We can distinguish between a long-run relationship between metallic reserves and the other explanatory variables, that is, the manner in which the two sets of variables drift upward together, and the short-run dynamics, that is, the relationship between deviations of the variables from their long-run trend.

In the long-run function, the highly significant and positive coefficient of income points to the strong transaction motive for holding money. The

Table 9.1 Equation 5: long-run foreign reserves function, 1862–1913

Eq.		*Constant*	*Y*	*D*	*RendP*	*i**	*ΔS*	*i*+ΔS/S*	*Deficit*
1	coeff.		0.008	−0.05		−246.50	−100.55		
2	coeff.	452.79	0.001	−0.12	−87.74		−14.80		
	t-value	*1.81*	*6.99*	*−1.90*	*−4.36*		*−1.41*		
3	coeff.	677.41	0.001	−0.18	−22.77	−282.17			
	t-value	*4.11*	*15.43*	*−4.85*	*−1.60*	*−4.83*			
4	coeff.	740.71	0.001	−0.22	−23.21	−260.86			−7.44
	t-value	*4.64*	*15.98*	*−4.47*	*−1.68*	*−4.22*			*−1.14*
5	coeff.	678.14	0.001	−0.17	−22.77			−282.16	
	t-value	*4.13*	*14.43*	*−4.85*	*−1.59*			*−4.83*	
6	coeff.	741.38	0.001	−0.23	−23.21			−260.86	−7.44
	t-value	*4.64*	*15.98*	*−4.47*	*−1.68*			*−4.22*	*−1.11*

Note: t statistic based on Phillips-Hansen FM estimator is N(0,1) (see Phillips 1990)

conditions of the international capital market are seen in variations in the exchange variable and by the level of the interest rate in the leading financial market at that time – the United Kingdom – and by the interest rate on the Rendita in Paris net of the risk element, measured by the exchange variations. Long-run interest rates (in London and on the Rendita in Paris) and interest net of the variation in the exchange appear with the expected sign.

The negative coefficient of the domestic-circulation variable verifies the portfolio assumption: an increase in circulation by the banks of issue that is "not wanted" flows abroad through a decrease in metallic reserves. If people want more money than is created by the banks of issue, they obtain it by selling assets on the foreign markets.

The budget deficit is never significant. Reserve movements are indifferent to the reason why an excess demand or supply of money is created, and money created by the Treasury reflects monetization of the debt stock and not solely the current budget deficit.

The positive sign of the income coefficient allows us to say something on the question of whether the data support our portfolio model against the traditional price-specie-flow adjustment mechanism.

Under the price-specie-flow mechanism, the income term in (5) might be assumed to represent the real side of the economy, so that reserves reflect the adjustment in the commodity market. Capital flows are induced by the deficit or surplus on current account: an autonomous increase in domestic activity will have a consequent increase in import demand, and a deficit in the commodity account will result. This would generate a long-run decline in reserves and show up in a negative income coefficient.

Additionally, the stationarity behavior of relative prices seems at odds with the price-specie-flow mechanism, as one would expect higher money circulation to be reflected in a reserve decline through an explicit relative-prices movement.

Residuals of the cointegration relationships pertaining to our model have been computed and are symmetrically distributed around zero with constant variance. They represent the stationary series obtained as a linear combination of the cointegrated series, i.e., a long-run equilibrium position to which a possible short-run model adjusts. We represent the short-run dynamics through an error correction model (ECM).

Let us recall equation (3). A rather general ECM formulation of the dynamics is

$$(6)\quad \Delta R_t = \alpha_o \Delta Y_t + \alpha_1 \Delta(i_t^* + \Delta S_t/S_t) + \alpha_2 \Delta D_t + \alpha_3 [R - (i^* + \Delta S/S) + D]_{t-1} + u_t$$

The difference in the foreign-reserves function is modeled and estimated as a function of the differences in the explanatory variables, of lagged values of both these variables, of the lagged value of the long-run residuals and possibly of lagged values of the same reserves.[26]

Economic theory does not give us many hints about short-run dynamics. The procedure we followed starts from a model with a rather general form, and moves along more reduced models. The final parsimonious function is listed in Table 9.2, together with a set of diagnostic statistics.

The plot of actual versus fitted variables, according to the ECM equation, for the whole period, can be seen in Figure 9.6.

A measure of the leverage of the data – which is not reported here – assures us that no particular data points have a disproportionately large influence on the coefficient estimates of the model (Otto 1994).[27]

The process of money creation and the reserve policy of the banks, during this period, has been influenced by various institutional arrangements and the total variance is only partially explained by our "long-run level variables." Banks tend to adapt their reserve policy to the circulation according to a proper "reaction" function. Short-run behavior explains a large part of the phenomena, and describes the short-run adaptation. As

Table 9.2 ECM of the reserve function based on long-run equation 3 (Table 9.1), 1864–1913

Variable	*Coefficient value*	*t-value*
const	108.26	2.49
R(−1)	0.41	3.32
R(−2)	−0.40	−3.30
ΔY(−1)	−0.0001	−1.94
ΔY(−2)	−0.0001	−1.87
Δi*(−1)	−37.79	−2.16
ΔRend	35.79	4.12
ΔRend(−2)	−31.92	−4.39
ΔRend(−3)	−23.10	−3.09
ΔΔS	32.25	3.59
ΔΔS(−1)	44.75	4.14
ΔΔS(−2)	19.11	2.53
ΔRendP(−2)	63.41	4.12
ΔD	−0.23	−4.48
ΔD(−1)	0.25	3.02
ΔD(−2)	−0.34	−3.92
ΔD1(−1)	−0.99	−2.44
ΔD1(−2)	0.24	5.63
Res(−1)	−0.13	−2.26

Notes: i is the long-run interest rate in Italy (on the Rendita)
D1 is defined as M3–R. M3 is from De Mattia (1967, vol. 2: Table 13)
Res(−1) are lagged residuals from long-run equation (3)

Statistics	
R^2	0.788
adj. R^2	0.650
D.W.	2.00
F stat.	5.68
Log. lkh.	−225. 21

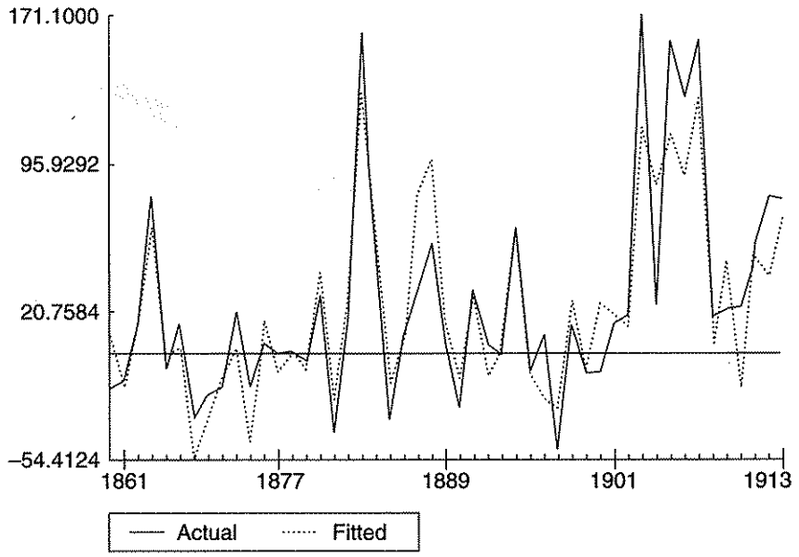

Figure 9.6 Yearly variations of metallic reserves: actual and fitted values
Source: see text

expected from the plurality of forces at work and their, sometimes, contradictory behavior, the movement toward the long run level is rather slow.

CONCLUSIONS

The fiscal-dominance model has reinterpreted Italian monetary experience during the "gold-standard" age as supporting the general view of a positive relation between government deficits and the growth of money and prices. Can this model fit Italian history in a period unanimously regarded as a period of stability of the exchange rate and integration among the international markets?

The lira maintained its metallic anchor during only 5 years out of the 52 years from the declaration of the unification of the country to World War I. When it was necessary, recourse to limited flexibility of the exchange was preferred to strict adherence to the gold-standard rules that would have required more severe limits to circulation. Several elements conjured up to a rather loose regulation of the money supply. The plurality of banks of issue made controls difficult to implement. The huge stock of public debt made the government attentive to the cost of financing, so that an atmosphere of solidarity developed between banks and the government to keep

stable or to depress the rate of interest and not use it to protect metallic reserves and control credit.[28] The fiscal structure was rather fragile: banks of issue were much involved in business financing, with a large part of their assets locked up in industrial and commercial activities, and a monetary restraint could develop into a liquidity crisis for the whole financial system. They were, in fact, the most important commercial banks of the time, at least until the late 1890s.

Lack of control of the money supply and the recurrent monetization of the state deficit did not develop into depreciation and inflation. The lira exchange rate never departed significantly from stability with the gold-standard countries, so that the lira is correctly said to have "shadowed" gold along all the period.

The very rapid growth in the money supply in 1866–8 was accompanied by an increase of the monetized part of the economy, so that demand increased with supply; the unwanted money was sold abroad in exchange for foreign bonds, mainly purchasing Italian Rendita in Paris. This is why there was no price explosion when the money supply grew six-fold in a few years in the early 1870s.

In 1885 financing of the state deficit was done through debt ultimately provided by the international markets through purchase of Rendita Italiana abroad and capital imports. Foreign capital did not create excessive money supply and, within the banks' balance sheets, substituted for short-term capital that had entered the country in 1881–3 and had left at the rising of the first political and economic uncertainty. It did not show up in domestic interest-rate movements.

In the following years, during the 1890s domestic crisis, capital left the country and only gradually returned to Italy, once the external situation was brought to surplus by the huge capital inflows due to emigrant remittances around the turn of the century.

The money supply in a small country such as Italy, open to international financial markets, is endogenous. Variations in its Treasury component do not show up either in a variation in money supply or in relative price differentials.

Our study suggests one plausible interpretation for the role of capital mobility and endogenous money in the context of the gold-standard international monetary arrangement. It was the international mobility of capital rather than adherence to any automatic proportion between metal and paper that made the gold-standard system work smoothly (Dick and Floyd 1992: 170–4). Any foreign account imbalance was wiped out not in the commodity market through relative prices variations but mainly in the capital market through asset movements. The presence of some element of imperfection in international financial markets, such as the *affidavit* on the Rendita certificates abroad, does not alter this general view of the equilibrium process.

The empirical evidence we have provided is conditioned by the institutions and the history of the time. Government deficits never exploded and their duration was limited in time, although their amount was of a large magnitude, in comparison with other European countries of the time. Liberal attitudes favoring limitations on the scope of government activity (on this general point, see Yeager 1984) were a deep part of Italian policy-makers' training and education, both from the right and from the left. As soon as possible, policy-makers made strong efforts to cut public expenditure and return to balance. A very different attitude from that prevailing among Italian politicians in the more recent period!

APPENDIX 9.1: ORDER OF INTEGRATION OF TIME SERIES

Unit root tests: variables in levels

Constant

Variable	*DF*	*ADF(1)*	*L*	*ADF(L)*	*Za*	*L*	*Za(L)*
Y	1.91	2.55	3	2.80	4.08	3	4.71
R	1.91	1.18	2	1.18	2.52	2	2.37
Prices[a]	−2.34	−2.43	4	−1.78	−4.02	4	−2.82
i	−1.39	−1.92	4	−3.03*	−1.66	4	−2.45
i*	−0.40	−1.01	6	−1.54	−0.93	6	−3.14
RendP	−1.20	−1.26	2	−0.86	−1.42	2	−1.90
RendR	−1.10	−1.14	2	−0.99	−1.01	2	−1.56
Rend	−1.90	−2.07	9	−2.26	−10.07	9	−11.48
S	−1.71	−1.96	9	−2.77**	−8.97	9	−10.60**
D[b]	−1.33	−2.00	3	−4.02*	−5.57	3	−6.49
D1[c]	4.34	2.77	3	1.18	1.87	3	1.76
Deficit	−0.24	−1.15	3	−1.70	15.41	3	−12.54
Res	−6.60*	−5.71*	10	−3.84*	−46.64*	10	−39.11*

Notes: [a] Italian relative prices, from Ciocca and Ulizzi (1990)
[b] D = M3 − R
[c] D1 = M1 − R
* *values are accepted at the 5 per cent significance level.*
** *values are accepted at the 1 per cent significance level.*

Constant and trend

Variable	*DF*	*ADF(1)*	*L*	*ADF(L)*	*Za*	*L*	*Za(L)*
Y	0.09	0.83	3	1.53	1.34	3	2.49
R	−0.67	−0.98	3	−0.67	−0.18	3	−0.97
Prices	−2.82	−3.19**	3	−1.81	−15.95	3	−17.22**
i	−2.25	−1.92	4	−3.01	−5.59	4	−9.36
i*	0.96	0.12	6	−0.57	2.54	6	1.21
RendP	−1.94	−1.72	2	2.66	−9.04	2	−11.02
RendR	−2.03	−1.97	2	−2.48	−7.27	2	−9.82
Rend	−2.19	−2.43	10	−4.38	−12.16	10	−10.03
S	−2.24	−2.56	9	−4.42*	−10.60	9	−9.97
D	−1.86	−2.69	3	−4.20	−4.73	3	−5.34
D1	1.13	0.31	3	−0.17	2.16	3	1.10
Deficit	−0.56	−1.47	3	−1.09	−13.88	3	−10.05
Res	−6.67*	−5.80*	2	−4.42*	−46.17*	2	−41.92*

Notes: DF = Dickey, Fuller (tau) test
ADF = augmented Dickey-Fuller test
L = optimal lag according to the AIC2 (Akaike Information Criterion)
Za = Phillips-Perron variation of the Dickey-Fuller (z) test
L = number of lags, equal to the order of the autocorrelation-robust long-run variance estimate
* *values are accepted at the 5 per cent significance level.*
** *values are accepted at the 1 per cent significance level.*

Unit root tests: first difference of variables

Constant

Variable	*DF*	*ADF(1)*	*L*	*ADF(L)*	*Za*	*L*	*Za(L)*
ΔY	−6.45*	−3.58*	2	−3.37*	−52.78*	2	−55.80*
ΔR	−4.58*	−3.15*	2	−3.00*	−34.51*	2	−35.73*
ΔPrices	−5.93*	−6.19*	4	−4.72*	−46.49*	4	−33.55*
Δi	−11.41*	−10.77*	2	−3.40*	−36.34*	2	−35.57*
Δi*	−3.52*	−2.64*	5	−1.34	−29.59*	5	−32.65*
ΔRendP	−8.50*	−6.65*	2	−3.37*	−40.09*	2	−38.29*
ΔRendR	−8.65*	−7.29*	2	−3.34*	−37.02*	2	−36.04*
ΔRend	−6.07*	−4.83*	9	−2.41	−45.31*	9	−35.62*
ΔS	−6.02*	−4.41*	9	−2.47	−41.73*	9	−32.85*
ΔD	−5.05*	−4.52*	2	−3.67*	−28.77	2	−29.52*
ΔD1	−3.92*	−2.66	3	−2.01	−26.36*	3	−25.83*
ΔDeficit	−3.44*	−3.67*	3	−2.73	−72.75*	3	−73.46*

* *values are accepted at the 5 per cent significance level.*
** *values are accepted at the 1 per cent significance level.*

Constant and trend

Variable	*DF*	*ADF(1)*	*L*	*ADF(L)*	*Za*	*L*	*Za(L)*
ΔY	−7.63*	−4.64*	2	−4.28*	−59.34*	2	−60.79*
ΔR	−5.07*	−3.58*	2	−3.69*	−39.74*	2	−40.81*
ΔPrices	−5.91*	−6.23*	4	−4.93*	−45.87*	4	−32.42*
Δi	−11.47*	−10.86*	2	−3.37*	−35.82	2	−35.02*
Δi*	−4.33*	−3.48*	5	−1.73	−32.56*	5	−34.18*
ΔRendP	−8.36*	−6.56*	2	−3.32	−39.83*	2	−37.98*
ΔRendR	−8.44*	−7.06*	2	−3.27	−36.65*	2	−35.67*
ΔRend	−5.98*	−4.74*	9	−2.28	−45.13*	9	−34.51*
ΔS	−5.93*	−4.32*	9	−2.34	−41.57*	9	−31.69*
ΔD	−4.94*	−4.36*	2	−4.20*	−30.64*	2	−31.20*
ΔD1	−5.20*	−3.79*	2	−3.35*	−29.93*	2	−30.80*
ΔDeficit	−3.62*	−4.02	3	−3.37*	−75.69*	3	−72.27*

Notes: DF = Dickey, Fuller (tau) test
ADF = augmented Dickey-Fuller test
L = optimal lag according to the AIC2 (Akaike Information Criterion)
Za = Phillips-Perron variation of the Dickey-Fuller (z) test
L = number of lags, equal to the order of the autocorrelation-robust long-run variance estimate
* *values are accepted at the 5 per cent significance level.*
** *values are accepted at the 1 per cent significance level.*

Tests are based on the following alternative models for any variable y:

$$\Delta y_t = a_0 + a_2 y_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta y_{t-j} + u_t \qquad H_0: a_2 = 1 \quad H_1: a_2 < 1$$

$$\Delta y_t = a_0 + a_1 t + a_2 y_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta y_{t-j} + u_t \qquad H_0: a_2 = 1 \quad H_1: a_2 < 1$$

The search for a trend break and test for a unit root with a trend break were performed using a sequential procedure. Tests are available from the authors.

An AR model with drift and trend has been defined as

$$\Delta y_t = a_0 + a_1 d_t^b + a_2 t + a_3 t d_t^b + e y_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta y_{t-j} + u_t$$

where d are the lag differences to eliminate the residual autocorrrelation.

$d^b_t = 0$, $t < 6$, $t \geqslant 40$

$d^b_t = 0$, if $b < t$, $7 \leq t,b < 40$

$d^b_t = 1$ otherwise.

The AR model with drift and trend has been estimated. H_0 is that the process has a unit root. Informative summary statistics from these sequences are the minimum ADF; if looking at the minimum we do not reject it, we can be quite confident about the stochastic non-stationarity of the series.

APPENDIX 9.2: COINTEGRATION AMONG MODEL VARIABLES (VAR 2)

Johansen maximum likelihood procedure, trended case, with trend in data generation process

Cointegration LR test based on maximal eigenvalue of the stocastic matrix.

Fifty observations from 1864 to 1913. Maximum lag in VAR=2.
List of variables included in the cointegrating vector: R, i*, Y, D, S
List of eigenvalues in descending order: 0.66349 0.37015 0.26972 0.25375 0.053659

Null	*Alternative*	*Statistic*	*95% critical value*	*90% critical value*
r = 0	r = 1	54.46	33.46	30.90
r ≤ 1	r = 2	23.11	27.07	24.73
r ≤ 2	r = 3	15.72	20.97	18.60

Johansen maximum likelihood procedure, trended case, with trend in data generation process

Cointegration LR test based on trace of the stochastic matrix.

Fifty observations from 1864 to 1913. Maximum lag in VAR=2.
List of variables included in the cointegrating vector: R, i*, Y, D, S
List of eigenvalues in descending order: 0.66349 0.37015 0.26972 0.25375 0.053659

Null	*Alternative*	*Statistic*	*95% critical value*	*90% critical value*
r = 0	r = 1	110.68	68.53	64.84
r ≤ 1	r = 2	56.22	47.21	43.95
r ≤ 2	r = 3	33.11	29.68	26.78

NOTES

1 We thank Stefano Fachin, Marc Flandreau, Diego Lubian, Cristina Marcuzzo, Lawrence Officer, Annalisa Rosselli and the participants to the Perugia workshop for very helpful discussions. We are grateful to the Consiglio Nazionale delle Ricerche (1994) and to the Ministero per l'Università e la Ricerca Scientifica (1993, 1994) for supporting our research.

2 For evidence that the association between deficit and money growth is common and is present particularly when the central bank is politically and economically not independent. See Alesina (1988).

3 Barro defines conditions under which government borrowing does not crowd out private spending but erodes private savings: when a larger deficit today is accompanied by lower current tax revenue. See Barro (1974).

4 Part of the relationship between variations in money and the budget deficit can prove a little spurious. Barro (1978) presents a model in which a positive relationship between government deficit and money growth is observed even if the government does not monetize its debt. The government is assumed to be concerned with the real rather than the nominal value of its debt; consequently it allows its nominal debt to grow by 1 per cent (as compared with what it otherwise would have been) for each anticipated 1 per cent increase in the price level. This leads to a positive association between the rate of inflation and the nominal government deficit, and if the rise in prices and in money are positively related, then one would observe a positive association between money growth and nominal government deficit.

5 The fixed exchange constraint might not have been binding in the case of England, the currency of which enjoyed an international-reserve status sufficient to explain both the Bank of England's leadership role in monetary management and the powerful effects of variations of bank rate on gold flows (Eichengreen 1987). But it was certainly binding for a small economy at the periphery of the system, as in the case of Italy.

6 According to Carocci (1975: 366) the repression of *brigantaggio* occupied more than half of the Italian army and cost more than the Italian Risorgimento.

7 Crispi was in power from 1887 to 1891 and from 1893 to 1896.

8 Official national-accounts data are from Istituto Centrale di Statistica (1957). Unification took place on March 17, 1861 and immediately afterwards Finance Minister Bastogi asked Parliament to issue the Rendita – a consolidated Treasury bond – in the internal and foreign markets. On financial problems in the 1860s, see Izzo (1962).

9 The yearly rate of interest on Italian consols reached almost 10 per cent in 1867. In a single day the rate went as high as 14 per cent.

10 The two other banks of issue could enjoy the advantages of inconvertibility only in a rather indirect way because they were obliged to convert their paper money on demand into the paper money of the Banca Nazionale. They were also much less important and had a much more limited territorial diffusion.

The Parliamentary Commission, established in 1868, to investigate the forced currency, defined it as a "hateful device" supported by the Banca Nazionale to bring to a practical solution the problem of the single bank of issue. See Sannucci (1990: 187).

11 Sella was Finance Minister in 1862, 1864–5, and 1869–73.

12 Di Nardi (1953: 138–45). The increase in circulation was mainly due to the financial needs of the state and this operation was not included in the reserve requirement. On some occasions the Banca Nazionale was allowed to count

Treasury money orders among metallic reserves, and during the same period other banks overissued in limited amounts. See Di Nardi (1953: 150–60).

13 Reserves decreased because of a flight of metal and a high commodity deficit in the Italian external accounts. They declined from 35 per cent of paper circulation in the late 1860s to around 20 per cent in the 1870s. See De Mattia (1990, vol. 2, part 3: Tables 3 and 49.2).

14 The regime was that of the old Piedmont state, as usual, see Martello and Montanari (1874: 10–11). Before that, different banks of issue operating in different states had different statutory rules; some had a proportional backing, others had to keep a ratio between the stock of currency issued and the bank's capital stock.

15 This was the case of the Banca Nazionale, which was authorized by the government to increase issues by 50 million, without any backing at all, to refinance the Banca Tiberina. See Di Nardi (1953: 332).

16 Monetary issues were not completely out of control, and the ratio between reserves and circulation was kept to around 3 to 1.

17 The amount of the Rendita in Paris is inferred from interest paid abroad, as Paris was by far the most important market for the Rendita. At first only coupons could be transferred, just to collect interest, and there was no connection between interest paid abroad and capital movements; but from 1872 the government required that coupons be accompanied by the debt certificate. See De Cecco (1992, doc. 123).

18 Credit to the Treasury was granted by domestic as well as foreign institutions. The most important were Società ordinarie di credito, Banche Popolari, Casse di Risparmio, etc., but these were not banks of issue and could not monetize government debt.

19 The debt burden as a percentage of GNP was at a maximum from 1892 to 1897 (see Figure 9.1), mainly due to the GNP decline. In the late 1890s the interest quota of public debt paid abroad declined from 50 to 25 per cent of the total (Zamagni 1988: Table A.6.1).

20 The causal link from capital imports to the current-account balance was put forward by Williamson (1964) in his pioneering study on American growth. Williamson speculated that cycles in capital imports were caused by cycles in domestic construction, through an upward pressure on the level of the interest rate. Fenoaltea (1988) believes that what was valid for the countries of the Atlantic economy also held true for Italy.

21 On the importance of the British market, as a point of reference, see Fenoaltea (1988: 629).

22 For a more precise statement, see Dickey *et al.* (1994).

23 Our sample is 52 annual observations, which can be considered not a large number. But, as discussed in Perron (1994) the power of the unit-root tests depends much more on the span of the data than on the number of observations *per se*. Our data span over a significant – relatively homogeneous – period in world monetary history.

We have tested stationarity of the level variables about a non zero mean, stationarity about a deterministic time trend, and stationarity about a time trend and a drift.

Tests performed on the difference of the variables lead to the rejection of the null hypothesis of a unit root.

24 Only when a very specific outlier is used – an exogenous shift in M1 level for the period 1866–8 – is the null hypothesis rejected and the series apparently stationary. Removing the big increase in money supply after the late 1860s

devaluation, through "appropriate dummies", leaves us with an "almost stationary" series, but this, of course, misrepresents the "real" story. Statistically, a too-constrained model implies a substantial loss of power and even tests that are inconsistent. See Perron (1994: 121).

25 Currency risk can be measured as the yield difference between the average Paris and Rome Rendita prices. General risk is measured by the interest yield between Italy and the UK, as already noticed.

Exchange expectations are assumed to equal actual spot variations and are also stationary, as the exchange itself is stationary. The difference between foreign interest and the yield difference and/or exchange expectations is I(1), as the difference between I(1) and I(0) series.

26 Differenced variables are I(0). Obviously, one needs to be careful about nonstationarity of the lagged dependent variable. Particularly, inference on the stationary variables coefficients can be conducted according to standard distributions, while inference on lagged reserve coefficients relates to a non standard unknown distribution, approximated by Dickey and Fuller.

27 The ECM model provides better fit for the period 1861–1904, avoiding the 1907 financial crisis. In the most recent period reserves were composed both of metal and of foreign bonds, and an explicit policy for the stability of the exchange had been undertaken by the Bank of Italy. Both elements influenced particularly the short run dynamic of the model, leaving the long-run formulation unchanged.

28 There was also a very practical formal reason to prevent it. For most of the period banks had to ask the Finance Minister's consent each time they wanted to vary the rate of discount. See Di Nardi (1953: 187–8 and 281–4).

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CONTENTS

FIGURES