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<tr>
<td>Authors(s)</td>
<td>Ó Gráda, Cormac</td>
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<tr>
<td>Publication date</td>
<td>1989-07</td>
</tr>
<tr>
<td>Series</td>
<td>UCD Centre for Economic Research Working Paper Series; WP89/11</td>
</tr>
<tr>
<td>Publisher</td>
<td>University College Dublin. School of Economics</td>
</tr>
<tr>
<td>Item record/more information</td>
<td><a href="http://hdl.handle.net/10197/1947">http://hdl.handle.net/10197/1947</a></td>
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<td>A hard copy is available in UCD Library at GEN 330.08 IR/UNI</td>
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The Paper Pounds of 1797-1821:
A Co-Integration Analysis

by
Cormac O Grada

Working Paper No. WP89/11

July 1989

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THE PAPER POUNDS OF 1797-1821: A CO-INTEGRATION ANALYSIS

Cormac O Grada, University College Dublin

INTRODUCTION:

The Bullion Report of 1810 may lack the subtlety and elegance of Henry Thornton's Paper Credit or David Ricardo's High Price of Bullion, but it is nevertheless justly regarded as a classic in the history of monetary analysis (Fetter, 1959; 1965; Perlman, 1986; Laidler, 1987). However, the Bullion Report was anticipated both in its analysis and its policy conclusions by the Report of the Committee on the Circulating Paper, the Specie, and the Current Coin of Ireland, better known as the Irish Pound Report of 1804 (Fetter, 1955). Both Reports contain clear articulations of the monetarist orthodoxy regarding movements in exchange rates and the price level.

The Irish Pound and Bullion Reports are products of events following the suspension of the gold standard in England and Ireland early in 1797. Suspension of gold payments made money largely a matter for the Banks of England and Ireland, and a system of two autonomous paper pounds was the result. For several years after 1797, Bank of Ireland note circulation rose faster than the Bank of England's. Between early 1797 and the end of 1803, the Irish bank's note circulation rose from about £0.6 million to almost £2.6 million, while that of the Bank of England rose from ten to seventeen millions. Undoubtedly, the faster rise

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1Preliminary version, not for quotation. The comments of Gerry Boyle, Michael Moore, and especially Rodney Thom are hereby gratefully acknowledged.
in Ireland is partly explained by the far greater dependence there on bullion before 1797; about one-half of the Bank of Ireland note-issue in late 1803 was in notes of under £5, presumably replacing gold that had been withdrawn from circulation (Hall, 1949: 392; Petter, 1955: 34). Still, even allowing for this, the Irish bank expanded its circulation more rapidly than its English counterpart. When the value of the Irish pound began to drop significantly in 1803, inducing parliament to set up an inquiry, it seemed natural to blame the bank of Ireland's excessive note-issue. However, while the depreciation provoked considerable controversy in late 1803 and early 1804, by the time the Irish Pound Report had been completed in June the crisis had passed. Six years later, it was the fall in the specie value of the English paper pound that provoked parliament's attention. This time, according to the Bullion Report (Cannan, 1919), the Bank of England was the guilty party. In this paper the link between note issue and the value of the paper pounds is reassessed, using the technique of co-integration developed by Engle and Granger (1987).

1. THE IRISH POUND REPORT:

Though the value of £1 English dipped below its traditional par level of £1.0833 Irish in the wake of the Restriction and stayed there for the rest of 1797, the 'exchange' against the Irish pound rose thereafter, and was to touch £1.16 briefly in mid-1801. It then fell back, but began to mount again in the spring of 1803, and the sterling premium reached 18.5 percent by August 1803. (Throughout I follow the convention of indicating
depreciation of the home currency by a rise in the home-currency price of the foreign country's currency, or a 'rise' in the exchange. Par is denoted by 8.33; so, for example, a rise to 18.5 represents an Irish pound depreciation of \([(118.5-108.33)/108.33]\) or about ten percent.)

Official concern was signalled by the flurry of letters between the Bank of Ireland, Dublin Castle, and London in early 1803. These emphasized 'real' factors, though in no systematic manner: poor harvests, an adverse balance of payments (or 'balance of debt' in contemporary parlance), absentee, even a conspiracy among foreign exchange dealers who "raised the market by a sort of combination". The views of John Foster, speaker of the old Irish House of Commons, and soon to become a leading actor in the public controversy about the Irish exchange, are worth noting. In April 1803 Foster supported the 'balance of debt' line: "while the interest of our debt payable in England continues to increase, and while the remittances to absentee don't lessen, we require a balance from trade equivalent to counteract those two drains. But unfortunately that balance has failed us for some years past...". Some months later, he thought the adverse exchange rate would continue, blaming in unsystematic fashion the suspension, "the horrors of the late rebellion", "the difference of the interest of money", and the decay of the Irish cotton and thread-manufacturing industries. But Foster's

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2 Public Record Office of Northern Ireland (PRONI), T2627/5/K/44, Marsden, Dublin Castle, to Wickham, 2 March 1803.

3 PRONI, T2627/5/I/1, copy of a minute by Charles Lindsay, Dublin, regarding of his conversation with J.L. Foster at Collon. According to Francis Horner, Foster at this stage "knew only the facts and details of the business, and of course had very
views would change radically in the space of a few months. Soon, he would be a proponent of the monetarist interpretation articulated in the Irish Pound Report.

The Bank of Ireland produced its own shopping-list of early explanations. These included the claim that the note issue had been kept down in the base year (1797), since "the disaffected pushed at the Bank, and the Directors thought it their duty to contract the issue of their notes". Fetter (1955: 13) rejects this claim, but McCavity (1981: 310-3) has provided ample substantiation for it from the private papers of those concerned. The Bank also claimed that the suspension had brought a demand for notes as an alternative to specie. Moreover, in 1801 the Bank had increased its capital to £1.5 million, "which enabled the Directors to extend the issue of their notes in a prudent proportion". Meanwhile, economic activity was increasing; according to the Bank, the country's revenues increased "a full fourth or more" between 1797 and 1802. An added factor was that country banks held Bank of Ireland notes in reserve, thereby further increasing the demand for Bank paper. Finally, the Bank made the "strictly confidential" point, that it held in specie and "of course out of circulation" £1.3 million. A further reason given for the depreciation, though not by the Bank at this stage, was speculation. Those bearish about prospects in Ireland demanded English bills so as to have "the whole or some part of [their] property to be out of the reach of risks then peculiar

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confident prejudices and errors" (cited in Fetter, 1955: 28).

4PRONI, T2627/5/Q/132, 3 March 1803.
to that part of the Empire" (Coutts Trotter in Ricardo (1810) : III, 399). Curiously, the list of reasons given here does not include the "balance of debt" argument, later the main plank of these defending the Bank, nor the notorious "real bills doctrine" (unless the Bank's argument about the rise in the country's revenues be so interpreted). Nor is the undoubted pressure brought to bear on the Bank of Ireland to lend to government mentioned. Indeed McCavery (1981: 312) has argued that the Bank Directors "were attempting to conduct moderate credit policies but were urged by a lean and importunate Irish Treasury to increase their note issue". In this view, the Bank was torn between its responsibility to ministers as a proto-central bank and to its shareholders as a commercial banking concern.

The 1790s had brought prosperity to Irish farmers, but high food prices and rising taxation probably meant lower living standards for the mass of the population. Historians consider the resulting social and political tension one of the causes for the rising of 1798. Poor harvests in 1799 and 1800 produced widespread and acute hardship, significantly reducing government revenue and agricultural exports. Economic crisis ensued, with substantial excess mortality. The economy turned round in 1801,

5Note the following from Hardwicke, the Irish Lord Lieutenant, to Wickham, the Chief Secretary, on 2 June 1803 (P.R.O.N.I., T.2627/5/624):

"I heard yesterday that Corry had written to the Governors of the Bank to desire them to postpone the repayment of the debt of £700,000, and to lend a million to government. I understand they are much annoyed at it, both by the substance and the manner, the letter having been written from a coffee house, and an answer desired by return of post. The effect would certainly be to increase the number of notes in circulation..."
and 1802 was a good year.

The depreciation soon became a stick with which to beat the Bank of Ireland. The Bank was a highly 'political' institution, and therefore an obvious target for opposition venom. According to Lord King, the depreciation, engineered by the Bank, constituted "an indirect tax for the benefit .. of individuals" (King, 1804: 52-3). Fetter refers to "behind-the-scenes manoeuvring" between December 1803, when Sir Archibald Hamilton made a political issue in the Commons of Isaac Corry, Chancellor of the Irish Exchequer, being paid in specie rather than in depreciated Bank of Ireland notes, and early March 1804, when Foster, a long-standing adversary of Corry, moved for a select committee. According to Fetter (1955: 28-9), Hamilton and Henry Petty, 'young turk' members of the opposition, talked a reluctant Foster into demanding a committee. This, however, is only partly correct: it overlooks Foster's rivalry with Corry, whom he replaced as Chancellor and, indeed, some suspected Foster of using the select committee as a plank to forward his own career. When Pitt's administration replaced Addington's in May 1804, Foster replaced Corry (Malcolmson, 1974: 28-31; 1978: 87-90; McCavery, 1981: 93, 335).\(^6\)

The depreciation and the Report are important milestones in the history of monetary economics. Besides anticipating the main findings of the Bullion Report (Cannan, 1919), both in terms of causes and policy recommendations, the Irish Pound Report

\(^6\)Sir Henry Parnell also sought the job on hearing of Corry's imminent ouster (PRONI, Parnell to Wickham, 17 March 1803, T.2627/5/K/82).
provides an early and clear articulation of hardline monetarist views. The Report's message stems from a largely implicit short-run model of the economy, which assumes both a stable demand for money and purchasing power parity. Fending off all explanations resting on 'real' factors, the Report thus found that the depreciation of the Irish pound "arises almost entirely, if not exclusively, from an excess of Paper". For this, it put the blame squarely on the Bank of Ireland as determinant of Ireland's money supply. Witnesses appearing for the Bank of Ireland repeatedly stressed the 'real bills' justification for their increased issues, but Henry Thornton's presence on the committee was presumably enough to smother such arguments. Prior to the Restriction, the Report reasoned, the threat of demands for cash ensured that the Bank reduced its issues as soon as the exchange rose, but the Restriction Act "freed the Directors of the Bank of Ireland from that necessity". The policy implication was almost inescapable: the Bank of Ireland must be disciplined by forcing it to pay, if not gold, then Bank of England notes for its own on demand at the previous par of exchange (Fetter, 1955: 71, 72, 82).

The Report, succinct and cogent, earned a considerable reputation in its day, and was officially republished twice, in 1810 as an appendix to the more famous Bullion Report, and again in 1826. It was 'rediscovered' by Frank Fetter, who produced a

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'Roll (1979) and Adler and Lehman (1983) dispute the presumption of purchasing power parity on the grounds of intertemporal commodity or bond arbitrage, and argue that bilateral real exchange rates should follow a random walk. Maybe so, but it is the bullionist model of the Irish Pound Report that is at issue here.
new edition with selections from the minutes of evidence (Fetter, 1955).

The select committee did its work quickly. Foster moved for a committee on March 2 1804, and was chosen chairman of the large body of members nominated. The committee heard witnesses on twenty-six days, and on June 13 submitted its Report to the Commons. It was not discussed in parliament, partly because other crises intervened, partly because of the dramatic improvement in the exchange, which between early April and early September 1804 (in terms of 21-day sight bills on Dublin) fell from 18.125 to 12.75 (Fitzpatrick, 1973: 380).

It has often been claimed that the Bank's hand was forced by the Report. The evidence for this is mainly circumstantial: at the end of 1803 the Bank's note circulation had been £2.636 million, a year later it had dropped slightly to £2.601 million, and by late 1805 it was down to £2.060 million (compare O'Brien, 1927: 257; Cannan, 1925: 39-41). The exchange meanwhile returned to near its traditional par of £1.0833. But whether the Report's message was responsible remains a moot point.

The rationale and consequences of ministerial action in the wake of the Report are subtler than the simple monetarist interpretation of the Bullion Report and George O'Brien allows (compare Fetter, 1955: 50). First, Foster's decision in July 1804 to replace the traditional annual fixed charge of £1,500 paid by the Bank of Ireland by stamp duties on bank notes was interpreted as a way of reducing the money supply. But as McCavery (1981:

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8By contrast, the House debated - and overwhelmingly rejected - the conclusions of the Bullion Report.
336-7] has pointed out, Foster's motivation here was purely fiscal. Second, the replacement of low-denomination notes by silver and copper tokens explains some of the fall in note-issue: the fall in aggregate money supply was less (Hall, 1949: 98-100; 392). Third, and much more important, was Foster's ploy of using loan transfers from London to stabilize the exchange rate (again, McCavery, 1981: 337).

Foster, in effect, was using the proceeds of the loan to drive down the exchange. Why such a policy did not immediately create a rush for English notes was blamed on Foster's bungling (Marsden to Vansittart, 3 May 1805, cited in McCavery, 1981: 339):

When Mr. Foster says he could not get purchasers at 11 Exchange, and at 10, it was because he had announced his plan: to be reduced at intervals of weeks, the rate to par; and everyone expected to get his remittance, by waiting a while, at that rate. The whole as been mismanaged..

The policy, of course, could not persist, but what is important here is the temporary success of Foster's reliance on non-monetary means of bringing down the exchange. The Bank of Ireland played little part in these developments. Indeed, as McCavery (1981: 343) has shown, Foster's exchange stabilization methods angered and disillusioned some of his former select committee colleagues. McCavery also corrects the impression left by Petter that the Treasury played no further part in the exchange market after 1804-5, arguing that, it was the very success of its intervention that silenced controversy (McCavery, 1981: 350-2). Foster, in charge of Irish finance again in 1807-11, managed transfers so as to keep the exchange just slightly above par.
The Report's arguments convinced historians of the episode. George O'Brien's backward look was entirely uncritical of it; he praised the Report for its findings, for its pluckiness in reaching conclusions opposed to the views urged upon it by the majority of witness whom it had heard, and for showing that the 'balance of remittances' was in favour of Ireland, and not against as many had argued (O'Brien, 1927: 254-5). Hall (1949: 94-7) simply reported the select committee's findings, but provided no analysis of them. Still, a re-examination leaves room for some agnosticism.

Modern renditions of the Bullionist controversy of the early nineteenth century pit Henry Thornton, the moderate monetarist, against the hardliner David Ricardo (e.g. Perlman, 1986; Laidler, 1987). For Ricardo, the cause of a balance payments surplus or deficit is always monetary, and the depreciation of paper currencies was solely due to the over-expansion of bank notes. In an important passage, Thornton (1802 (1939): 143) agreed that this was so in the long run, but stressed that in the short run real factors might produce a different result:

But though the value of the commercial exports and imports of a country will have this general tendency to proportion themselves to each other, there will not fail occasionally to arise a very great inequality between them. A good or bad harvest, in particular, will have a considerable influence in producing this temporary difference. The extra quantity of corn and other articles imported into Great Britain in this and the last year, with a view to supply the deficiency in our crops, must have amounted in value to so many millions. If the harvest fails, and imports are necessary, in order to supply the deficiency, payment for those imports is almost immediately required: but the means of payment are to be supplied more gradually through the limitation of private expenditure, or the increase of individual industry. Hence a temporary
pressure, and how to encounter it, is a great part of the wisdom of a commercial state.

Historians of monetary thought tend to side with Thornton (Fetter, 1965: 43-8; Perlman, 1986). Curiously, though Thornton was a member of the Irish Pound select committee, the committee's Report had no time for the interpretation just quoted. Even before discussing why the Irish pound had depreciated, it ruled out an adverse balance of payments as a candidate (Fetter, 1955: 66-7, my emphasis):

Exchange becomes unfavourable to any country when that country, being in debt to another on the whole sum of its money transactions, including all items of Remittance, balance of Trade, &c. has occasion to transmit more than it is to receive; the expense of transmitting which surplus it must of course defray, and the Exchange is of course against it; this expense (while Guineas can be supplied by the debtor country) ought only to amount to the actual cost and commission on transporting Specie from it to the other, and does not amount to 1 per cent between Dublin and London, including insurance; but any excess in the Rates of Exchange beyond this expense forms a separate consideration, and must arise from other causes ....

Instead, the Report provided a monetarist explanation of the depreciation.

2. A STATISTICAL TEST OF BANK CULPABILITY:

The chief accusation against the Bank of Ireland was that by expanding note issue faster than its English counterpart, it forced up the note exchange and depreciated the Irish currency. The accusation implies a relation such as:

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9 Perhaps, like Ricardo in his defence of the Bullion Report, Thornton decided that this was no time for fine theorizing.
\( i \quad EX_t = a + b \cdot RN_t \)

where \( EX \) is the natural logarithm of the nominal exchange rate and \( RN \) the natural logarithm of the ratio of Irish to English note issues, so that (1) implies that a one percent rise in \( RN \) depreciates the equilibrium value of the nominal exchange rate by \( b \) percent. Interpreting (1) as a long-run equilibrium relationship we may model the observed relation between \( EX \) and \( RN \) in any period by the error process :

\( 2 \quad u_t = EX_t - a - bRN_t \)

where \( u_t \) is the extent to which the system is out of equilibrium, or the equilibrium error. If (1) is a valid equilibrium relation, then (2) must have several special properties. Specifically the generating mechanism for \( u_t \) must be a stationary process with a time invariant mean and variance. That is, the mean or expected value and variance of \( u_t \) must be constant with respect to time so that the expectation of \( u \) at time \( t+k \) is independent of shocks at time \( t \) for 'large' \( k \).

As a simple example consider \( (a, b) = (0, 1) \), so that a one percent relative rise in the Irish note issue eventually leads to a one percent depreciation in the equilibrium value of the nominal exchange rate. If the adjustment process is spread over time \( u_t \) defines the extent of disequilibrium in any period \( t \) and will eventually tend to zero, its expected value as the adjustment proceeds. If, on the other hand, \( u \) does not revert to
zero but increases over time then the assumed equilibrium between EX and RN will not be attained, and a relationship such as (1) will be statistically invalid.

Drawing on the work of Engle and Granger (1987), (1) can be interpreted a valid equilibrium relationship if: (a) EX and RN are integrated of the same order, and (b) $u_t$ is a stationary series. If these conditions hold then EX and RN are said to be co-integrated variables. A variable is integrated of order zero, or $I(0)$, if it is stationary in its levels and is integrated of order one, or $I(1)$, if it is non-stationary in levels but stationary after first differencing. If EX and RN are both $I(0)$ then $u_t$ will also be $I(0)$, and (1) can be said to describe a statistically valid relationship. If, however, EX and RN are each integrated of order one, then (1) is only statistically valid if there exists a co-integrating vector $(a^*, b^*)$ such that the error process

$$e_t = EX_t - a^* - b^*RN_t$$

is $I(0)$. Given, as is demonstrated below, that we cannot reject the hypothesis that both EX and RN are $I(1)$, then the validity of the accusation against the Bank of Ireland requires that the variables are co-integrated. That is, there exists a linear combination of EX and RN which produces an $I(0)$ error process. Engle and Granger (1987) propose the following procedure to test for co-integration between a pair of time series:

(i) Test that each series is $I(1)$ as against $I(0)$;
(ii) If (i) cannot be rejected, estimate the co-integrating vector by Ordinary Least Squares (OLS). Engle and Granger show that if the series are co-integrated then the co-integrating vector will be unique and will be found by an OLS regression of EX on RN or RN on EX.

(iii) Test that the residuals from (ii) are an I(1) process as against I(0).

Note that the null hypothesis in (i) and (iii) is that the series in question is I(1) or non-stationary, so that the standard statistical tests are inappropriate. However, Dickey and Fuller (1981) have proposed a test that a series is I(1), based on the Augmented Dickey-Fuller (AD-F) regression:

\[
(4) \quad dX = a + bT + cX_{-1} + g_i dX_{-1} + e
\]

where \(i\) is large enough to ensure that the residuals are white noise.

Quarterly data were used first, for the period 1793:1 to 1822:4. Hall (1949: 392-3) reports the Bank of Ireland note-issue, Morgan (1939) the Bank of England's. Fetter (1955: 20) graphs, but does not report, movements in the exchange. However, Fitzpatrick (1973: 380-1) reports month by month the exchange in London on 21-day sight bills drawn on Dublin; the rates for March, June, September and December are used here. Since the the relevant critical values exceeded those obtained (and reported in Table 1), the unit root hypothesis (or non-stationarity)
cannot be rejected in either case.

Table 1: Dickey-Fuller Statistics:
IRISH DATA, 1793:1 - 1822:4

<table>
<thead>
<tr>
<th></th>
<th>@2</th>
<th>@3</th>
</tr>
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<tbody>
<tr>
<td>EX</td>
<td>2.56</td>
<td>3.84</td>
</tr>
<tr>
<td>RN</td>
<td>2.82</td>
<td>1.59</td>
</tr>
</tbody>
</table>

Note: @2 is the D-F (1981) statistic for H(0): a = b = c = 0. Critical values are 6.5 (1%), 4.88 (5%), and 4.16 (10%).
@3 is the D-F statistic for H0: b = c = 0. Critical values are 8.73 (1%), 7.44 (5%), and 5.47 (10%).

Table 2: DW and AD-F Tests on Co-integrating Regressions
Sample Period 1793(1)-1822(4)

<table>
<thead>
<tr>
<th>Cointegrating Regression</th>
<th>DW</th>
<th>AD-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX = 4.67 + 0.013RN</td>
<td>0.331</td>
<td>3.04</td>
</tr>
<tr>
<td>RN = -17.70 + 4.30EX</td>
<td>0.083</td>
<td>1.93</td>
</tr>
</tbody>
</table>

Note: Critical values for DW: 0.511 (1%), 0.386 (5%)
Critical values for AD-F: 3.77 (1%), 3.17 (5%)

Next, following a procedure developed by Engle and Granger (1987) and recently applied by Taylor and McMahon (1988) and Thom (1989) to contexts like that being examined here, I test for co-integration. Cointegration of a pair of variables is at least a necessary condition for them to have a stable long-run (linear) relationship as in (1).
Two tests of co-integration are reported. First, Sargan and Bhargava (1983) have proposed a test using the Durbin-Watson statistic from the co-integrating regressions (as reported in Table 2). The test is whether their computed values are significantly different from zero. The second test, due to Engle and Granger (1987), is an augmented D-F test on an OLS regression like (4), but using the residuals from the co-integrating regressions reported in Table 2 as data. The outcomes of both tests are consistent with the null hypothesis that EX and RN are not co-integrated. Thus the predictions of the Irish Pound Report, even as a long run equilibrium outcome, are not supported by the data.

I also tested RN and EX for unit roots over a shorter period, 1797:4 to 1810:4. The AD-F statistics are reported in Table 3 below. This time, the unit root hypothesis cannot be rejected in the case of EX, but the hypothesis that RN follows a random walk (with or without drift) can. Co-integration of EX and RN is thus ruled out.

<table>
<thead>
<tr>
<th></th>
<th>AD-F Statistics: Ireland, 1797:1 - 1810:4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@2</td>
</tr>
<tr>
<td>EX</td>
<td>1.29</td>
</tr>
<tr>
<td>RN</td>
<td>12.69</td>
</tr>
</tbody>
</table>

A possible drawback of the RN series used above is the exclusion of post-bills. The post-bill was a device to delay payment in the event of loss or theft in transit, operating
rather like a post-dated cheque. Though "to some degree more analogous to bills of exchange than to notes" (Barrow, 1975: 30), post-bills sometimes circulated rather like ordinary bank-notes, and therefore arguably should be added to note-issue. In England post-bills were relatively unimportant, but in Ireland their ratio to note issue was significant but variable. A half-yearly series is available for 1796:2 to 1822:2 (Fetter, 1955: 131); a co-integration test using RN*, where Irish note issue includes post-bills, is reported below. This time the results time were somewhat more consistent with co-integration, but still only weakly so.\(^\text{10}\) The unit root hypothesis could not be rejected in the case of either RN* or EX. The Sargan-Bhargava test provides support for co-integration at the five percent critical value, but the stronger Engle-Granger test is inconclusive (Table 4).

\(^{10}\)Thanks to Gerry Boyle for impressing on me the need to check this. The data used are those in B.P.P. 1823(XVI). They are plotted in Fetter (1955: 35).
Table 4: DW and AD-F Tests on Co-integrating Regressions
RN* and EX, 1796:2 to 1822:2

<table>
<thead>
<tr>
<th>Co-integrating Regression</th>
<th>DW</th>
<th>AD-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX = 4.7055 - 0.00009RN*</td>
<td>0.87</td>
<td>2.69</td>
</tr>
<tr>
<td>RN* = 9.9393 - 0.0301EX</td>
<td>1.26</td>
<td>3.72</td>
</tr>
</tbody>
</table>

Note: The critical levels for the DW statistic for n = 50 are 1.00 (1%) and 0.78 (5%). Those for the AD-F statistic are 4.32 (1%) and 3.67 (5%) (Engle and Yoo, 1987: 157, 158).

3. THE BULLION REPORT OF 1810:

The tests just described suggest a similar analysis of Bank of England 'culpability'. Though slightly more circumspect than the Irish committee of 1804, the Bullion Committee's verdict on the Bank of England in 1810 nonetheless broadly concurred with that of the 1804 committee's on the Bank of Ireland: inflation and the fall in the value of the paper pound were mainly the consequence of an over-issue of banknotes. Historians' verdicts on this finding have been mixed. Viner (1937: chs. 3-4) supported the Report's findings, but E.V. Morgan exonerated the Bank, judging it "only . . a passive agent in the price fluctuations" (Morgan, 1939: 221). Clapham concurred with Morgan in his history of the Bank: the rise in the note issue was justified by the need to replace cash, and "the general price rise of these years cannot be connected at all closely with the mere quantity of notes in circulation" (Clapham, 1944: II, p. 9). Gayer, Rostow and Schwartz (1953:
vol. 1) also absolved the Bank, emphasizing instead the role of
the balance of payments. Graphs 1-3 describe the course of note
issue, 'total advances' (i.e. the Bank's holdings of commercial
discounts plus Treasury Bills) and the price level. All rise up
to the mid-1810s, and then fall (as Viner noted); to this extent
the connection between money supply and price level may seem
obvious. However, a more formal analysis of the connection is
warranted.

The variables used in the analysis are ADV, the natural
logarithm of quarterly advances by the Bank of England, ENG, the
natural logarithm of the Bank's note issue, and PR, the
logarithm of the price level, as represented by the Silberling
quarterly price index (both reported in Morgan, 1939). The tests
refer to the period 1793:1-1822:4.

As above, the three series were first tested for
stationarity; in both cases, the computed Dickey-Fuller
statistics (Table 5) are consistent with the null hypothesis of
non-stationarity. The next step, as before, is to test for co-
integration. The results of the Sargan-Bhargava and Engle-
Granger tests are reported in Table 6; again, in both cases the
outcome is consistent with the null hypothesis of no co-
integration.
Table 5: DICKEY-FULLER STATISTICS
(English Data)

<table>
<thead>
<tr>
<th>Variable</th>
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<th>ulaire(3)</th>
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<tbody>
<tr>
<td>PR</td>
<td>2.73</td>
<td>4.08</td>
</tr>
<tr>
<td>ADV</td>
<td>1.71</td>
<td>2.47</td>
</tr>
<tr>
<td>ENG</td>
<td>1.08</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Table 6: DW and AD-F Tests on Co-integrating Regressions
Sample Period 1793(1)-1822(4)

Co-integrating Regressions

(a) PR and ADV:

\[
PR = 3.64 + 0.24\text{ADV} \\
\text{ADV} = -3.33 + 1.76PR
\]

<table>
<thead>
<tr>
<th></th>
<th>DW</th>
<th>AD-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR</td>
<td>0.12</td>
<td>2.51</td>
</tr>
<tr>
<td>ADV</td>
<td>0.11</td>
<td>1.70</td>
</tr>
</tbody>
</table>

(b) PR and ENG:

\[
PR = 4.02 + 0.18\text{ENG} \\
\text{ENG} = 1.23 + 0.77PR
\]

<table>
<thead>
<tr>
<th></th>
<th>DW</th>
<th>AD-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR</td>
<td>0.07</td>
<td>2.09</td>
</tr>
<tr>
<td>ENG</td>
<td>0.04</td>
<td>1.23</td>
</tr>
</tbody>
</table>

For Morgan "the depreciation of the exchange was the natural consequence and corrective of an adverse balance of payments" (Morgan, 1939: 221) This prompts the need for tests such as those just reported of the relation between the balance of payments on the one hand, and inflation on the other. However, since any estimates of the balance of payments for the period under review must be "almost purely conjectural and subject to a wide and incalculable margin of error" (Imlah, 1955: 43n.),
such tests are not possible at this time.

7. CONCLUSION:

The Irish Pound Report has been deemed a milestone in the history of monetary economics - and rightly so. However, a new look at the contemporary evidence suggests little connexion between, on the one hand, the model articulated in the Report and, on the other, the course in the Irish exchange. The Report's harsh criticism of the Bank of Ireland for over-expanding its note issue is not supported by an analysis of the relevant data. This should not come as such a surprise. The real shocks to the Irish and British economies induced by war and sharp structural change should have been enough to upset the implied purchasing-power-parity reasoning that lay behind the Report. Similarly, a sideways glance at the main finding of the more famous Bullion Report of 1810 - that the depreciation of the English paper pound can be explained entirely in terms of an over-issue of banknotes - fails to find support for it either.

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