How sensitive are Britain's inpayments and outpayments to the value of the British pound

Britain's
inpayments and
outpayments

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Mohsen Bahmani-Oskooee, Claire Economidou and
Gour Gobinda Goswami

*The Center for Research on International Economics and Department of
Economics, The University of Wisconsin-Milwaukee, Milwaukee,
Wisconsin, USA*

Abstract

Purpose – To avoid aggregation bias by using trade data at bilateral level so that we can determine how sensitive are Britain's inpayments and outpayments to the value of the British pound.

Design/methodology/approach – The method is based on the bounds testing approach to cointegration and error-correction modeling.

Findings – The main finding is that while UK inpayments are not sensitive to the exchange rate, her outpayments are.

Research limitations/implications – Future research must concentrate on disaggregating data further, perhaps at commodity level.

Practical implications – The results could be used to identify Britain's trading partners against which Britain can devalue the pound and improve her trade balance.

Originality/value – No study has attempted to test the impact of real depreciation of the pound on Britain's payments and receipts with her major trading partners.

Keywords United Kingdom, Currency accounting, Trade balances, International trade, Financial management

Paper type Research paper

1. Introduction

Standard text book argument pertaining to the relation between a small country's trade balance and her exchange rate is that devaluation will have a favorable impact on the trade balance as long as sum of the import and export demand elasticities add up to more than one. This elasticity condition is tested by estimating import and export demand equations in which trade volumes are regressed on the relative prices and some scale variables. From the estimate of import demand elasticity one concludes whether the product of import volume and import prices (i.e. a country's outpayments) declines due to devaluation. Similarly, from the estimate of export demand elasticity one deducts the direction in which the product of export volume and export prices (i.e. inpayments) will move[1].

One could raise two questions against the studies that have relied upon trade elasticities to infer the effectiveness of devaluation. First, the elasticity approach is an indirect method of assessing the effectiveness of devaluation. Why not rely upon models in which inpayments or outpayments are directly regressed on the exchange rate in addition to other determinants? The second concern relates to the fact that such elasticity estimates suffer from the aggregation bias, for they are obtained by using

aggregate trade data. Bahmani-Oskooee and Goswami (2004) have argued that it is possible that a significant price elasticity with one trading partner could be more than offset by an insignificant elasticity with another partner yielding an insignificant trade elasticity. To remedy these two problems, a new body of the literature has emerged. To avoid aggregation bias, recent studies employ trade data at bilateral level. However, due to lack of import and export prices, they establish a direct link between import or export values and the exchange rate, a rather direct method of assessing the relation between exchange rate and trade. The limited number of studies in this later group have concentrated their efforts on the analysis of bilateral trade between US and her major trading partners. The list includes Summary (1989), Marquez (1990), Eaton (1994), Haynes *et al.* (1996), Sukar and Zoubi (1996), Cushman (1987, 1990), Bahmani-Oskooee and Brooks (1999) and Nadenichek (2000)[2]. The main conclusion in most of these studies is that real exchange rate is a significant determinant of the US bilateral trade flows. Bahmani-Oskooee and Goswami (2004) is a recent addition to the literature who reach similar conclusion by investigating the bilateral trade flows (inpayments and outpayments) between Japan and her nine largest trading partners.

The main purpose of this paper is to extend the literature by considering the experience of United Kingdom. More precisely we estimate the bilateral trade flow equations between UK and her 20 trading partners, i.e. Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Netherlands, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, and the US. Section 2 outlines bilateral trade flow models as well as the methodology. Section 3 presents the empirical results. Unlike the US experience, it appears that the exchange rate does not play any significant role in most cases. Section 4 concludes. Finally, data definition and sources are cited in the appendix.

2. The models

As indicated above, our purpose is to establish a direct link between the UK inpayments and the exchange value of the pound in one relation and between the UK outpayments and the exchange value of the pound in another relation, both at bilateral level. Following Cushman (1987, 1990), Haynes *et al.* (1996) and Bahmani-Oskooee and Goswami (2004), the following models are adopted. These models display the bilateral inpayments and outpayments models between UK and trading partner i .

$$\log VX_{it} = a + b \log Y_{it} + c \log \left(\frac{P_i E_i}{P_{UK}} \right)_t + \varepsilon_t \quad (1)$$

$$\log VM_{it} = d + e \log Y_{UK,t} + f \log \left(\frac{P_i E_i}{P_{UK}} \right)_t + \omega_t \quad (2)$$

In equation (1) UK inpayments by country i is measured by her export value denoted by VX_{it} . It is assumed that VX_{it} is positively related to country i 's income (Y_{it}). Thus, we expect an estimate of b to be positive indicating the fact that as i 's income grows, she imports more from UK. It is also assumed that the real bilateral exchange rate between UK and trading partner i , i.e. $(P_i E_i / P_{UK})$ is another determinant of the UK inpayments.

Note that in this setup E_i is defined as number of pounds per unit of i 's currency, P_i is the price level in i and P_{UK} , the price level in UK. Thus, an increase in real exchange rate reflects a real appreciation of i 's currency or a real depreciation of the pound. If real depreciation of the pound is to increase UK's inpayments, an estimate of c should be positive. Equation (2) outlines the determinants of the UK outpayments to country i . In equation (2), VM_{it} denotes the value of imports by UK from trading partner i . It is assumed that it is positively related to the UK income denoted by Y_{UK} . Finally, if real depreciation of the pound is expected to lower UK outpayments, an estimate of f should be negative.

The two models outlined by equations (1) and (2) are long-run relationships among the trade values and their determinants. With existing literature on time-series modeling, in estimating equations (1) and (2) we must incorporate the short-run dynamics into our estimation procedure. This task is achieved by expressing both models in an error-correction modeling format. Following Engle and Granger (1987), the two error-correction models takes the following form:

$$\begin{aligned} \Delta \log VX_{it} = & a' + \sum_{k=1}^{n1} b'_k \Delta \log VX_{it-k} + \sum_{k=0}^{n2} c'_k \Delta \log Y_{it-k} \\ & + \sum_{k=0}^{n3} d'_k \Delta \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-k} + \ell \varepsilon_{t-1} + \eta_t \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta \log VM_{it} = & e' + \sum_{k=1}^{n1} f'_k \Delta \log VM_{it-k} + \sum_{k=0}^{n2} g'_k \Delta \log Y_{UK,t-k} \\ & + \sum_{k=0}^{n3} h'_k \Delta \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-k} + g \omega_{t-1} + \phi_t \end{aligned} \quad (4)$$

In equations (3) and (4), ε_{t-1} and ω_{t-1} are lagged stationary residuals from equations (1) and (2), respectively. They only enter into error-correction models if variables in each of the models outlined by equations (1) and (2) are integrated of order one, hence I(1) but the residuals, i.e. ε_t and ω_t are I(0). Therefore, Engle-Granger method consists of two steps. In the first step, one has to establish the I(1) property of each variable. In the second step, after applying the OLS on equations (1) and (2), one has to establish the I(0) property of the residuals. Note that cointegration could also be established if the lagged error correction terms, i.e. ε_{t-1} and ω_{t-1} in equations (3) and (4) carry significantly negative coefficients. If cointegration is established, then the error-correction models are estimated. What to do if some variables are I(1) and some I(0)?

Pesaran *et al.* (2001) offer a new method in which there is no need for pre-unit root testing. In equations (3) and (4) they substitute ε_{t-1} and ω_{t-1} by linear combination of the lagged level of variables as in equations (5) and (6) below:

$$\Delta \log VX_{it} = a' + \sum_{k=1}^{n1} b'_k \Delta \log VX_{it-k} + \sum_{k=0}^{n2} c'_k \Delta \log Y_{it-k} + \sum_{k=0}^{n3} d'_k \Delta \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-k} + b \log VX_{it-1} + c \log Y_{it-1} + d \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-1} + \xi_t \quad (5)$$

$$\Delta \log VM_{it} = e' + \sum_{k=1}^{n1} f'_k \Delta \log VM_{it-k} + \sum_{k=0}^{n2} g'_k \Delta \log Y_{UK,t-k} + \sum_{k=0}^{n3} h'_k \Delta \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-k} + f \log VM_{it-1} + g \log Y_{UK,t-1} + h \log \left(\frac{P_i E_i}{P_{UK}} \right)_{t-1} + v_t \quad (6)$$

This new approach known as autoregressive distributed lag (ARDL) approach to cointegration provides a direct method of testing for cointegration. It amounts to testing whether the lagged level of variables (as a proxy for lagged error term) are jointly significant in each model. If they are jointly significant, they are said to be cointegrated. Thus, the null of no cointegration, i.e. $b = c = d = 0$ in equation (5) and $f = g = h = 0$ in equation (6) are tested against the alternative of $b \neq c \neq d \neq 0$ in equation (5) and $f \neq g \neq h \neq 0$ in equation (6) by using the familiar F -test with new critical values. Pesaran *et al.* (2001) tabulate new critical values irrespective of whether variables are integrated of order one or order zero. Note that in this setup, the short-run effects of depreciation is judged by the sign and size of d'_k 's in equation (5) and h'_k 's in equation (6) and the long-run effects by the size and sign of estimates obtained for d and h in equations (5) and (6), respectively (after normalization).

3. Empirical results

In this section, we try to estimate the error-correction models (5) and (6) between the UK and her 20 largest trading partners, i.e. Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Netherlands, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, and the US using quarterly data over 1973I-2002IV period. In estimating any ARDL model, such as equations (5) or (6) Pesaran *et al.* (2001) propose two steps. In the first step, they propose imposing an arbitrary number of lags on the first differenced variables and applying the F -test to determine the cointegrating properties of the variables. Once cointegration (or lack thereof) is established, they suggest using a lag selection criterion to estimate the entire ARDL model. Bahmani-Oskooee and Brooks (1999) and Bahmani-Oskooee and Goswami (2004) have demonstrated that the F -test results in the first step are sensitive to the number of lags imposed on each first differenced variable. To avoid this problem, in this paper, we combine Pesaran *et al.*'s two steps into one. We estimate equations (5) and (6) using Akaike information criterion (AIC) for selecting the optimum number of lags. Once optimum numbers of lags are determined, we carry out the F -test for joint significance of the lagged level variables or for cointegration. Table I reports the results for both models.

Partner country	Outpayments (imports)		Inpayments (exports)	
	Optimum number of lags	Value of F statistics	Optimum number of lags	Value of F statistics
Australia	3,6,8	4.874	1,0,2	8.655
Austria	4,0,0	7.493	2,0,3	5.258
Canada	10,0,3	6.661	4,0,0	7.698
Denmark	7,0,1	2.842	9,0,0	5.966
Finland	2,0,0	4.793	4,0,1	1.324
France	8,0,0	3.818	12,0,0	3.884
Germany	6,4,1	2.022	4,4,10	3.812
Greece	4,0,0	2.758	7,5,0	1.891
India	3,7,0	2.718	3,1,0	3.063
Ireland	8,0,0	3.366	8,5,0	7.496
Italy	8,0,0	5.227	12,0,6	6.395
Japan	4,0,2	2.730	5,3,2	3.917
Netherlands	1,0,0	7.457	5,0,0	2.790
Norway	11,11,10	4.240	1,4,0	3.266
Singapore	2,4,0	2.610	4,0,0	5.365
South Africa	8,11,1	2.734	8,3,2	0.635
Spain	12,4,2	4.236	6,0,0	2.145
Sweden	2,1,0	1.472	7,2,1	2.395
Switzerland	4,7,12	2.785	3,1,1	2.150
US	12,1,4	7.592	9,0,3	4.880

Notes: The first lag is for ΔLVX or ΔLVM , the second is for ΔLYP or ΔLYF , and the last one is for $\Delta LREX$; the critical value of F -statistic for cointegration is 3.80; trade flows are measured in terms of trading partner's currency

Table I.
The F -test for
cointegration (lag length
selected by AIC)

The results in Table I show that in each model the calculated F -statistic is higher than the critical value in almost 50 percent of the cases. It worth noting that most of these significant cases includes countries that are large trading partners of the UK, for example, cointegration is confirmed in both models between UK and the US, Canada, France and Australia. To proceed with the analysis, we will assume cointegration among the variables so that we can retain the lagged level variables. This assumption is mostly based on more powerful results in support of cointegration (via error-correction term) to be presented.

Although the lag lengths in each case are shown in Table I, in order to have a better understanding of the short-run dynamics we need to report the full-information results. However, due to large volume of output and for brevity of presentation we only report the long-run coefficient estimates. For the short-run coefficient estimates, i.e. estimates obtained for the lagged first differenced variables, all we can say is that there was no specific pattern such as J -curve[3]. The long-run coefficient estimates after being normalized by the estimate of b in equation (5) and f in equation (6) are shown in Table II.

Panel A in Table II shows the results for import demand function and Panel B for export demand function. From Panel A, we gather that the real exchange rate carries its expected negative sign and it is significant in 13 out of 20 cases indicating that real depreciation of British pound decreases UK outpayments. However, from Panel B it is clear that real depreciation of the pound has either no significant effect on UK

Partner country	Coefficient estimates of			Diagnostic test results			
	Constant	$\log Y_{UK}$	$\log P_t E_t / P_{UK}$	Adj R^2	LM	RESET	EC_{t-1}
<i>Panel A: import demand equation for the UK</i>							
Australia	-11.98 (5.64)	3.80 (7.19)	-1.36 (3.49)	0.44	1.64	0.69	-0.52 (4.16)
Austria	-10.56 (5.64)	3.48 (8.42)	-1.91 (4.31)	0.35	1.34	8.35	-0.26 (3.58)
Canada	-0.60 (0.50)	1.59 (5.45)	-0.46 (2.04)	0.44	3.19	3.10	-0.45 (4.77)
Denmark	-4.95 (2.31)	1.90 (4.11)	-2.15 (4.35)	0.27	1.72	0.10	-0.20 (3.46)
Finland	-8.90 (4.83)	3.32 (7.95)	-0.94 (3.07)	0.25	3.29	10.41	-0.24 (4.19)
France	-6.79 (2.35)	3.28 (5.09)	-1.21 (2.34)	0.26	2.39	0.16	-0.17 (3.83)
Germany	-4.21 (2.03)	2.73 (5.74)	-2.09 (4.94)	0.25	7.68	0.15	-0.16 (3.56)
Greece	-30.17 (5.67)	7.41 (6.23)	-3.95 (3.41)	0.28	4.69	0.41	-0.16 (3.13)
India	-34.26 (3.78)	8.75 (3.18)	-1.11 (1.10)	0.26	3.27	1.94	-0.13 (3.10)
Ireland	-12.38 (3.60)	4.30 (5.54)	-2.48 (2.19)	0.32	3.47	2.85	-0.13 (2.85)
Italy	-8.38 (2.25)	3.54 (4.33)	-0.64 (0.98)	0.32	2.74	3.12	-0.14 (4.41)
Japan	15.70 (0.91)	-0.55 (0.19)	0.05 (0.05)	0.29	3.52	0.76	-0.07 (1.66)
Netherlands	-1.82 (1.29)	2.07 (6.45)	-1.68 (6.36)	0.20	2.79	0.47	-0.28 (5.11)
Norway	-12.74 (4.17)	2.28 (2.41)	-4.96 (4.34)	0.54	6.25	2.48	-0.29 (3.87)
Singapore	-22.08 (6.67)	6.33 (8.20)	-0.12 (0.16)	0.25	0.19	14.54	-0.24 (3.13)
South Africa	-26.55 (3.56)	6.00 (2.88)	-4.01 (1.27)	0.57	9.77	0.28	-0.12 (1.20)
Spain	-4.07 (0.33)	2.41 (0.89)	-2.82 (1.86)	0.53	6.22	0.21	-0.08 (2.11)
Sweden	-5.88 (1.84)	2.73 (3.22)	-1.06 (1.97)	0.21	3.33	3.82	-0.17 (2.62)
Switzerland	-0.02 (0.01)	1.71 (4.46)	-0.06 (0.11)	0.47	6.16	1.15	-0.39 (2.91)
US	-12.62 (8.46)	4.65 (14.01)	0.15 (0.41)	0.49	3.99	0.31	-0.25 (5.93)
<i>Panel B: export demand equation for the UK</i>							
Australia	-5.71 (9.83)	2.71 (17.91)	-0.25 (1.53)	0.28	8.15	13.28	-0.72 (7.62)
Austria	-3.25 (5.17)	1.99 (13.62)	0.49 (1.79)	0.44	2.63	8.20	-0.34 (5.08)
Canada	-8.26 (5.95)	3.36 (9.73)	-0.11 (0.31)	0.33	4.45	0.34	-0.33 (4.30)
Denmark	0.34 (0.65)	1.10 (10.09)	-1.30 (7.25)	0.30	3.05	3.89	-0.52 (4.80)
Finland	-0.70 (0.29)	1.45 (2.60)	-0.14 (0.15)	0.36	0.31	0.37	-0.13 (1.83)
France	11.47 (1.04)	-0.82 (0.34)	-2.60 (1.98)	0.39	4.62	0.68	-0.09 (3.24)
Germany	-7.36 (1.47)	3.46 (3.14)	-0.35 (0.28)	0.37	1.40	0.60	-0.08 (1.51)
Greece	442.39 (0.32)	-94.88 (0.32)	-39.21 (0.34)	0.27	5.49	2.87	-0.01 (0.38)
India	-1.58 (2.06)	2.04 (5.41)	-0.61 (1.15)	0.35	0.92	11.45	-0.26 (3.08)
Ireland	2.21 (3.95)	0.95 (7.96)	-2.68 (5.42)	0.54	3.76	0.73	-0.23 (5.06)
Italy	6.88 (0.64)	0.37 (0.16)	1.29 (1.11)	0.62	1.35	0.39	-0.10 (2.97)
Japan	6.01 (0.68)	2.14 (2.58)	0.73 (0.59)	0.36	4.49	1.25	-0.08 (1.49)
Netherlands	0.98 (0.43)	1.44 (2.76)	-1.51 (3.29)	0.19	1.43	2.31	-0.20 (3.64)
Norway	0.63 (0.43)	1.27 (4.38)	-0.94 (1.34)	0.19	3.27	3.90	-0.33 (3.87)
Singapore	2.31 (7.28)	0.97 (14.53)	-0.24 (0.90)	0.27	5.68	0.02	-0.31 (3.21)
South Africa	-53.13 (1.06)	13.07 (1.08)	-1.92 (0.51)	0.37	8.44	9.72	-0.03 (0.86)
Spain	-1.69 (0.08)	2.28 (0.51)	1.71 (0.57)	0.37	2.26	0.63	-0.04 (1.43)
Sweden	6.09 (1.41)	-0.34 (0.28)	-1.77 (1.97)	0.46	6.61	4.68	-0.12 (2.49)
Switzerland	-1.77 (0.27)	2.41 (1.37)	1.93 (0.61)	0.28	8.01	2.14	-0.09 (1.26)
US	-1.61 (0.97)	2.28 (6.36)	0.46 (0.74)	0.53	3.40	1.64	-0.16 (4.27)

Table II.
Long-run coefficient
estimates (trade flows
measured in trading
partner's currency)

Notes: Figures in the parentheses represent the absolute values of the (asymptotic) t -ratios; trade flows are measured in terms of trading partner's currency

inpayments or even adverse effect in a few cases. The income variables in both panels carry their expected signs and are highly significant in almost all cases.

Table II also shows some diagnostic statistics. First, using the long-run coefficient estimates we calculate the linear combination of lagged level variables in each model and

denote it by EC_{t-1} . After imposing the optimum number of lags on each first differenced variable, we estimate the models by including EC_{t-1} as lagged error-correction term rather than the linear combination of lagged level variables. A negative and significant coefficient obtained for EC_{t-1} is another and relatively more powerful way of establishing cointegration (Bahmani-Oskooee and Brooks, 1999). As can be seen in both panels and in almost all cases, EC_{t-1} carries a negative and significant coefficient, justifying retention of lagged level variables in specifications (5) and (6). Furthermore, shown in Table II are the Lagrange multiplier (LM) statistic for residual serial correlation and Ramsey's RESET statistic for misspecification. Both statistics are distributed as χ^2 with four and one degrees of freedom, respectively. It is clear that our models pass these tests in majority of the cases. Finally, to ensure that estimated coefficients are stable over time, following Bahmani-Oskooee and Kara (2003), we apply the CUSUM and CUSUMSQ tests to the residuals of error-correction models (5) and (6). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against break points. For stability of all coefficients, the plot of these two statistics must stay within 5 percent significance level (portrayed by two straight lines whose equations are given in Brown *et al.* (1975, Section 2.3)). For demonstrative purpose we show the results for the case of UK vs US in Figure 1.

Since the plot of CUSUM and CUSUMSQ statistics do stay within the critical lines, the estimated coefficients are indeed stable. The results for remaining countries are summarized in Table III.

As can be seen, at least CUSUM test supports stability of estimated coefficients in almost all cases.

So far export and import values were measured in terms of trading partner's (foreign) currency. In order to assess the sensitivity of the results to choice of currency in which import and export values are denominated, we first measure the trade flows in terms of domestic currency (i.e. British Pound) and then in terms of a reserve currency (US Dollar). Once again since there was no specific short-run pattern, we restrict ourselves to reporting the long-run results. Tables IV and V show these results.

From Tables IV and V, we gather that only in the import demand estimates (Panel A of Table IV) number of significant coefficient attached to real exchange rate drops from 13 to 7. The remaining features of both tables are similar to the results shown in Table II. We may then conclude that real depreciation of the British pound lowers UK outpayments and has no significant impact on her inpayments, supporting the notion that currency depreciation will have favorable effect on UK trade balance.

4. Summary and conclusion

Currency depreciation is said to improve a country's trade balance if it lowers her outpayments and increases her inpayments. Most previous studies estimated trade flow equations to determine whether price elasticities in the import and export demand functions add up to more than unity, a condition known as the Marshall-Lerner condition which is said to be an indirect method of analyzing the effectiveness of depreciation. A direct way would be to relate a country's inpayments (export value) and outpayments (import value) to the exchange rate in addition to other determinants.

In this paper, we first outline the long-run relationships between the UK's inpayments and real value of the pound in one relation and between the UK's outpayments and the real value of the pound in another relationship. The models then are expressed in an

Panel A: Out payments (VM)

Panel B: Out payments (VX)

Figure 1.
Stability test results for
the UK *vis-à-vis* US

Partner	Export		Import	
	CUSUM	CUSUMSQ	CUSUM	CUSUMSQ
Australia	Stable	Stable	Stable	Unstable
Austria	Stable	Unstable	Stable	Unstable
Canada	Stable	Unstable	Stable	Unstable
Denmark	Stable	Unstable	Stable	Unstable
Finland	Stable	Stable	Unstable	Stable
France	Stable	Stable	Stable	Unstable
Germany	Stable	Stable	Stable	Stable
Greece	Stable	Stable	Stable	Stable
India	Stable	Unstable	Stable	Unstable
Ireland	Stable	Stable	Stable	Unstable
Italy	Stable	Stable	Stable	Unstable
Japan	Stable	Unstable	Stable	Unstable
Netherlands	Stable	Unstable	Stable	Unstable
Norway	Stable	Unstable	Stable	Stable
Singapore	Stable	Stable	Stable	Unstable
South Africa	Stable	Unstable	Stable	Stable
Spain	Stable	Stable	Stable	Stable
Sweden	Stable	Stable	Unstable	Unstable
Switzerland	Stable	Stable	Stable	Stable
US	Stable	Stable	Stable	Unstable

Table III.
Stability test results for
all trading partners

Partner country	Coefficient estimates of			Diagnostic test results			
	Constant	$\log Y_{UK}$	$\log P_i E_i / P_{UK}$	Adj R^2	LM	RESET	EC _{t-1}
<i>Panel A: import demand equation</i>							
Australia	-11.30 (5.08)	3.64 (6.56)	-0.45 (1.10)	0.44	1.92	1.14	-0.52 (4.28)
Austria	-16.19 (8.99)	4.69 (11.72)	-1.31 (3.16)	0.37	4.39	3.26	-0.26 (3.66)
Canada	-2.24 (1.63)	1.88 (5.72)	0.13 (0.53)	0.44	5.44	1.07	-0.39 (4.89)
Denmark	-6.42 (2.70)	2.33 (4.54)	-0.93 (2.05)	0.24	4.47	0.35	-0.19 (3.17)
Finland	-10.32 (4.89)	3.64 (7.63)	0.00 (0.01)	0.29	5.72	7.39	-0.21 (3.41)
France	-10.27 (4.42)	4.10 (8.03)	0.61 (1.14)	0.33	3.57	1.24	-0.20 (4.08)
Germany	-3.38 (0.77)	2.56 (2.64)	-1.27 (2.12)	0.36	2.50	0.66	-0.11 (3.48)
Greece	-10.12 (3.36)	3.10 (4.61)	-1.52 (2.29)	0.30	5.83	1.33	-0.26 (3.11)
India	-22.94 (3.81)	6.47 (3.51)	0.18 (0.28)	0.30	2.60	1.60	-0.22 (3.23)
Ireland	-14.79 (8.80)	4.81 (12.94)	-0.99 (1.97)	0.42	3.90	7.29	-0.26 (4.37)
Italy	-8.44 (3.32)	3.55 (6.38)	0.79 (1.46)	0.28	3.10	2.90	-0.17 (4.32)
Japan	28.08 (0.99)	-1.95 (0.41)	2.16 (1.38)	0.26	7.81	2.73	-0.05 (1.78)
Netherlands	-8.29 (3.65)	3.46 (6.69)	-1.08 (2.55)	0.13	4.93	3.01	-0.18 (3.86)
Norway	-13.54 (4.19)	2.42 (2.59)	-4.01 (3.68)	0.53	5.34	2.77	-0.28 (3.95)
Singapore	-29.69 (6.92)	7.93 (7.93)	0.55 (0.55)	0.23	0.80	18.61	-0.19 (3.09)
South Africa	18.10 (0.27)	-2.43 (0.18)	1.57 (0.25)	0.32	5.11	4.76	0.04 (0.34)
Spain	-7.63 (1.06)	3.25 (2.11)	-0.10 (0.11)	0.55	6.02	0.08	-0.11 (2.41)
Sweden	-4.89 (1.40)	2.59 (2.96)	0.08 (0.14)	0.24	5.22	4.32	-0.16 (2.18)
Switzerland	-6.45 (2.37)	3.04 (5.56)	0.51 (0.65)	0.49	5.01	1.06	-0.28 (3.26)
US	-12.62 (8.46)	4.65 (14.01)	0.15 (0.41)	0.49	4.00	0.31	-0.25 (5.93)
<i>Panel B: export demand equation</i>							
Australia	-4.74 (7.35)	2.45 (14.67)	0.47 (2.71)	0.18	12.68	21.43	-0.65 (7.17)
Austria	-5.97 (4.99)	2.58 (9.56)	1.21 (3.21)	0.41	4.30	10.74	-0.20 (2.91)
Canada	-10.67 (6.79)	3.91 (9.79)	1.04 (2.63)	0.39	2.59	0.01	-0.30 (4.10)
Denmark	-0.71 (0.66)	1.39 (7.78)	-0.18 (0.57)	0.29	3.33	0.05	-0.33 (3.16)
Finland	-1.68 (0.70)	1.68 (2.99)	1.06 (1.05)	0.36	3.40	0.94	-0.13 (1.93)
France	3.63 (0.38)	1.04 (0.50)	0.51 (0.47)	0.47	3.58	0.13	-0.09 (3.35)
Germany	-12.72 (6.53)	4.63 (10.83)	0.28 (0.86)	0.46	8.37	0.11	-0.20 (5.75)
Greece	58.95 (0.36)	-11.34 (0.32)	1.39 (0.23)	0.32	3.04	0.10	-0.03 (0.62)
India	1.58 (1.48)	1.67 (3.56)	0.77 (1.15)	0.33	2.92	9.47	-0.21 (3.15)
Ireland	1.50 (2.90)	1.10 (10.60)	-1.08 (2.90)	0.54	0.96	0.01	-0.26 (3.98)
Italy	-1.73 (0.32)	2.21 (1.92)	2.56 (2.88)	0.63	1.38	0.40	-0.15 (3.64)
Japan	7.83 (0.67)	2.58 (2.54)	2.43 (1.66)	0.26	1.47	0.02	-0.08 (1.90)
Netherlands	-0.13 (0.02)	1.72 (1.52)	-0.16 (0.16)	0.25	5.31	1.54	-0.10 (2.54)
Norway	0.06 (0.04)	1.29 (4.30)	-0.14 (0.19)	0.18	1.88	2.31	-0.32 (3.81)
Singapore	1.08 (1.26)	1.23 (7.47)	0.62 (1.11)	0.33	8.24	0.98	-0.15 (2.36)
South Africa	-7.80 (1.25)	2.96 (1.80)	-0.09 (0.08)	0.25	6.33	16.16	-0.10 (1.35)
Spain	-11.93 (1.46)	4.51 (2.63)	4.46 (1.92)	0.42	2.21	0.01	-0.07 (2.13)
Sweden	4.49 (1.35)	0.39 (0.47)	-0.08 (0.10)	0.50	3.74	8.61	-0.14 (2.64)
Switzerland	-4.63 (1.77)	2.60 (4.34)	0.81 (0.88)	0.27	5.03	5.90	-0.20 (2.51)
US	-1.61 (0.97)	2.28 (6.36)	0.46 (0.74)	0.53	3.40	1.64	-0.16 (4.27)

Table IV.
Long-run coefficient
estimates (trade flows
measured in pound)

Note: Figures in the parentheses represent the absolute values of the (asymptotic) *t*-ratios

error-correcting modeling format and estimated between UK and her 20 trading partners that include Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Netherlands, Norway, Singapore, South Africa, Spain, Sweden, Switzerland and the US. The empirical results showed that regardless of currency denomination, UK inpayments are not sensitive to real exchange rate changes.

Partner country	Coefficient estimates of			Diagnostic test results			
	Constant	$\log Y_{UK}$	$\log P_t E_t / P_{UK}$	Adj R^2	LM	RESET	EC_{t-1}
<i>Panel A: import demand equation</i>							
Australia	-8.97 (11.29)	3.25 (16.39)	-0.34 (2.34)	0.44	5.96	0.44	-1.03 (7.48)
Austria	-13.33 (9.24)	4.20 (13.03)	-0.52 (1.68)	0.38	3.33	0.18	-0.25 (3.59)
Canada	1.35 (1.05)	1.14 (3.70)	-0.16 (0.68)	0.42	1.27	1.44	-0.42 (4.75)
Denmark	-4.57 (2.17)	2.38 (5.37)	-0.22 (0.46)	0.22	0.43	1.98	-0.20 (3.32)
Finland	-8.61 (5.87)	3.35 (10.00)	0.07 (0.25)	0.35	2.41	7.18	-0.25 (4.35)
France	-6.44 (1.26)	3.35 (2.96)	1.14 (1.13)	0.32	3.11	0.00	-0.16 (3.69)
Germany	7.10 (1.99)	3.50 (4.34)	-0.33 (0.47)	0.21	2.55	1.90	-0.09 (2.67)
Greece	-5.28 (3.29)	2.11 (5.82)	-1.73 (5.45)	0.51	18.19	2.81	-0.51 (4.19)
India	-21.95 (3.23)	6.24 (3.09)	0.02 (0.04)	0.33	2.61	0.96	-0.24 (3.27)
Ireland	-12.58 (7.21)	4.45 (11.26)	-0.06 (0.11)	0.37	0.85	3.32	-0.32 (4.87)
Italy	-3.25 (0.69)	2.47 (2.35)	0.86 (1.07)	0.34	4.89	2.71	-0.16 (4.50)
Japan	21.78 (0.89)	-0.62 (0.15)	2.09 (1.38)	0.31	4.45	1.00	-0.07 (2.45)
Netherlands	-3.87 (1.08)	2.57 (3.08)	-1.03 (1.49)	0.15	3.61	0.16	-0.17 (3.41)
Norway	-11.87 (3.90)	2.39 (2.81)	-3.56 (3.43)	0.55	4.67	2.75	-0.30 (3.74)
Singapore	-26.93 (5.33)	7.22 (6.03)	-0.35 (0.29)	0.23	0.08	13.73	-0.18 (2.63)
South Africa	-166.48 (0.04)	20.51 (0.04)	-48.09 (0.04)	0.42	3.45	4.71	-0.09 (0.85)
Spain	-7.09 (0.98)	3.16 (1.99)	0.38 (0.42)	0.63	8.78	0.43	-0.11 (2.12)
Sweden	-1.50 (2.36)	2.36 (1.68)	0.87 (0.70)	0.29	2.96	3.85	-0.17 (2.35)
Switzerland	-2.69 (0.87)	2.49 (4.11)	1.47 (1.64)	0.49	4.51	2.39	-0.23 (2.63)
US	-10.11 (6.84)	4.07 (11.51)	-1.04 (2.00)	0.45	9.78	0.06	-0.25 (5.54)
<i>Panel B: export demand equation for the UK</i>							
Australia	-2.41 (1.14)	2.08 (3.62)	0.87 (1.02)	0.29	0.76	1.96	-0.41 (3.91)
Austria	-4.47 (5.66)	2.40 (13.37)	2.15 (4.35)	0.49	2.32	8.70	-0.19 (3.23)
Canada	-7.07 (5.25)	3.12 (9.14)	0.51 (1.47)	0.39	3.54	2.34	-0.35 (4.69)
Denmark	4.13 (2.05)	1.24 (6.59)	1.37 (1.59)	0.37	5.29	0.01	-0.20 (2.07)
Finland	-1.88 (0.85)	1.83 (3.37)	2.12 (1.30)	0.41	0.51	1.71	-0.13 (2.16)
France	-3.38 (0.32)	2.90 (1.26)	3.98 (1.70)	0.44	3.31	2.67	-0.06 (2.09)
Germany	-0.08 (0.00)	2.57 (0.60)	8.55 (0.80)	0.49	1.99	0.64	-0.05 (1.36)
Greece	24.57 (0.22)	-3.95 (0.16)	1.29 (0.23)	0.27	1.41	0.87	-0.05 (1.04)
India	1.73 (1.48)	1.21 (2.06)	0.17 (0.20)	0.30	0.62	9.63	-0.18 (2.67)
Ireland	1.58 (2.34)	1.20 (8.86)	-0.60 (0.93)	0.58	1.04	0.28	-0.20 (3.22)
Italy	6.49 (0.23)	0.64 (0.11)	5.25 (1.02)	0.64	0.87	1.40	-0.13 (2.97)
Japan	19.82 (1.21)	1.54 (1.35)	3.75 (1.73)	0.40	8.33	5.87	-0.06 (1.24)
Netherlands	6.82 (0.81)	0.48 (0.27)	3.15 (1.07)	0.36	3.63	8.30	-0.07 (1.56)
Norway	0.62 (0.33)	1.09 (2.98)	-0.47 (0.53)	0.14	2.43	3.49	-0.28 (3.46)
Singapore	1.98 (0.81)	0.81 (1.15)	-0.38 (0.22)	0.19	5.03	0.22	-0.16 (2.30)
South Africa	0.20 (0.04)	0.98 (0.69)	-0.83 (0.74)	0.23	8.36	13.60	-0.18 (2.42)
Spain	-13.04 (1.54)	4.82 (2.67)	4.50 (1.62)	0.49	2.03	0.07	-0.07 (2.04)
Sweden	14.45 (1.28)	0.15 (0.11)	3.38 (0.90)	0.56	4.17	2.55	-0.09 (1.46)
Switzerland	-1.43 (0.20)	2.76 (1.51)	4.59 (0.88)	0.27	6.52	2.02	-0.11 (1.56)
US	-1.44 (1.07)	2.19 (7.19)	0.98 (1.75)	0.44	2.06	0.01	-0.17 (4.09)

Note: Figures in the parentheses represent the absolute values of the (asymptotic) t -ratios

Table V.
Long-run coefficient
estimates (trade flows
measured in us dollar)

However, in many cases when outpayments were measured in terms of foreign currency, real depreciation of the pound was found to lower the outpayments. These findings are similar to those found for Japan by Bahmani-Oskooee and Goswami (2004). The fact that exports are not sensitive to exchange rate changes may reflect actions taken by British exporters to offset effects of exchange rate changes by adjusting their profit margin.

Notes

1. Example of studies that provided estimates of trade elasticities are: Kreinin (1967), Houthakker and Magee (1969), Goldstein and Khan (1976, 1978), Wilson and Takacs (1979), Haynes and Stone (1983a, b), Warner and Kreinin (1983), Bahmani-Oskooee (1986, 1998) and Bahmani-Oskooee and Niroomand (1998).
2. The exception is Summary (1989) who adhered to cross-sectional data from 66 US trading partners. However, she excluded prices and exchange rates from her model due to absence of data and "potential causation problem".
3. The short-run results are available from the authors upon request.

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Appendix. Data definition and sources

Sources of the data

For all countries quarterly data over 1973Q1-2001Q3 period come from the following sources. The data for:

- (1) bilateral trade flow are taken from the direction of trade statistics of the IMF, various issues;
- (2) industrial production index used as a proxy for real GDP, domestic and foreign CPI are taken from the International Financial Statistics of the IMF (CD-ROM); and
- (3) bilateral nominal exchange rates are taken from National Accounts, OECD, CD-ROM, 2002. This data set converts all the previous currencies into their EURO equivalent (where applicable).

Variables

- VX_i UK's export value to trading partner i . The data come from source (1).
- VM_i UK's import value from trading partner i . The data come from source (1).
- Y index of industrial production used as a proxy for real GDP, source (2).
- P price level proxied by the CPI which comes from source (2).
- NEX nominal exchange rate (period average). It is defined as the number of pounds per unit of trading partner's currency. The data come from source (3).