E C O N O M I C S B U L L E T I N

Travel hysteresis in the US current account after the mid−1980s

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Abstract

Following the real appreciation of the US dollar in the first half of the 1980s, travel expenditures in the current account soared. Employing standard regression techniques as well as Markov−switching regime analysis we show that such expenditures did not return to their pre−appreciation levels thereafter. The permanent increase suggests the presence of travel hysteresis in the US current account after the mid−1980s.

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1. Introduction

During the first half of the 1980s the US dollar experienced a real appreciation. This was followed by an increase of US citizens traveling abroad, mostly to Europe and Canada. This paper will show that after the dollar comeback to its pre-appreciation levels, travel expenditures did not return accordingly. The occasional dollar rise left long-lasting effects by possibly changing habits, and thereby generating a travel hysteresis. (Meurer *et al*. 2005 provides a pioneering account of permanent effects of temporary exchange rate changes on traveling abroad.)

Hysteresis has also been studied in the context of permanent effects of temporary exchange rate changes on unemployment rate, exports, overall current account, and currency substitution in the aftermath of hyperinflations. This literature can be categorized into two groups (McCausland 2002). The first one examines the hysteresis resulting from irreversible costs of market entry. A company does not quit the market just because the exchange rate has returned to its previous level (Baldwin 1988, Baldwin and Krugman 1989, Dixit 1989). The second group of literature examines the hysteresis resulting from the exchange rate failure to come back to its original equilibrium following a shock (Roberts and McCausland 1999). Most works show interest in sunk costs, but these are unlikely to play a role in travel hysteresis. Once a journey is over there are no significant, remaining costs. The next trip to anywhere else does not add extra costs (Meurer *et al.* 2005).

The rest of the paper is organized as follows. Section 2 describes data. Section 3 analyzes them. And Section 4 concludes.

2. Data

To gauge the international travel expenditures of American citizens we take the "total travel and passenger fares" item of the current account. Quarterly data for the period 1960:1−2005:2 are taken from the Bureau of Economic Analysis of the US Department of Commerce. Consumer Price Index is used to produce a series in dollars of 2000. The resulting values are then divided by GDP in dollars of 2000. So we get quarterly travel expenditures relative to annual GDP. This gauge corrects for the effects of population and per capita income growth on international travel.

Due to a methodology change in the data source, travel expenditures vary sharply from 1984 on. To take this into account, the 1988 revised value is divided by the difference between revised values of every year and the growth in travel expenditures in 1988. Conversion factor 1.2423 is then multiplied to yearly values, from 1960 to 1983. Doing so works as if the methodology change had been adopted at the beginning of the period.

Travel expenditures are deseasonalized using the ARIMA-X12 program from the US Census Bureau as well as through quarterly dummies. Since deseasonalizing with ARIMA-X12 may render data correlated with previous datapoints, we alternatively consider the dummies. Figure 1 shows the ARIMA-X12 to perform better because the dummies cannot completely remove the seasonal features. So employing the ARIMA-X12 ends up justified.

Because favorite destinations are Europe and Canada, we take a weighting average of the Deutschemark-US dollar and Canadian dollar-US dollar real exchange rates. Nominal rates are deflated using the countries' CPIs and then taken in natural logs. The weights are given by the average share of Europe and Canada in US travel expenditures over the period, which are 0.2536 and 0.1254 respectively.

Figure 2 shows deseasonalized travel expenditures and log of the real exchange rate. Expenditures soar at the naked eye as a result of the strong dollar of the early 1980s. Next section will examine whether the travel expenditures change on a permanent basis, i.e. whether they become less sensitive to the real exchange rate.

3. Analysis

Unit root tests in Table 1 find ARIMA-X12-deseasonalized travel expenditures to be stationary at the significance level of 5 percent (in the presence of a deterministic trend). But the series goes nonstationary as the trend is dropped. The real exchange rate series are in turn stationary at the 5 percent level without trend or constant.

Accordingly cointegration between the variables can be discarded. Whether the trend is considered matters for the unit root tests. Thus we will look for hysteresis with the travel expenditure variable in levels and first differences. Either way hysteresis will mean a changing exchange rate coefficient in a regression of the exchange rate over travel expenditure. Hysteresis is meant lower sensitivity of travel expenditure to the exchange rate. If hysteresis does occur after the mid-1980s the (usually negative) exchange rate coefficient is expected to become less sensitive following dollar changes.

From a general-to-specific approach, we begin with 5 lags in both travel expenditure and exchange rate and gradually drop the less statistically significant ones. The estimate is performed for the period 1973:1–2001:3, from the demise of Bretton Woods to September 11, 2001. Indeed the real exchange rate is less volatile during Bretton Woods (Figure 2), which means it impacts little the decisions of traveling abroad. September 11 also affects travel expenditure regardless of the dollar price (Figure 2). So the upper bound of our data set is at the third quarter of 2001.

We first run a regression for the entire period, 1973:1–2001:3 (Table 2), and then for subsets of data, namely 1973:1–1986:3 and 1986:4–2001:3. Our aim is to observe and compare the exchange rate coefficients of the two subsets. The above choice of regime break is rigorously justified by a Markov-switching regime approach (to be presented below). Yet visual inspection of real exchange rate behavior (Figure 2) suggests the subsets 1973:1–1984:4 and 1985:1–2001:3. We have repeated analysis using these subsets too (not shown) only to realize that results are the same. Delays of perception might be involved in the exact date of the break, whether 1984:4 or 1986:3.

Figure 3 shows the exchange rate parameter to be unstable. This is not so surprising because one expects travel expenditure to have its sensitivity to the exchange rate altered. Figure 3 displays reduction of the coefficient as time goes by. In particular, there is a blip in the sensitivity of travel expenditure to one-quarter lagged exchange rate by 1985.

Table 3 presents regression results for the first subset (1973:1–1986:3). The coefficient estimate, –0.095, is smaller than that for the entire period (–0.036). And a rising t statistics in Figure 4 shows the coefficient to be stable in the strong-dollar early 1980s.

Table 4 shows a small and positive coefficient estimated for the one-lagged exchange rate for the second subset (1986:4–2001:3). Figure 5 shows this striking change in the influence of the real exchange rate on travel expenditure. The coefficient is mostly negative but approaching zero, thereby indicating reduction of the sensitivity of travel expenditure to the exchange rate. Table 5 shows the difference between the coefficient estimates of the two regressions to be significantly different from zero. Thus there is evidence of travel hysteresis. (There is also no indication of parameter instability.)

This finding is robust in that it holds true even if first differences of travel expenditure are taken as the dependent variable. Indeed Table 6 shows results (and in particular coefficient size) to be almost the same.

Travel hysteresis is also present even if estimates are obtained using dummy-deseasonalized travel expenditure (not shown). The only difference is the statistically relevant lag for the exchange rate to be the third. Yet parameter signs and magnitude are similar.

Our choice of regime break can be justified employing a Markov-switching model. In this class of models we set the number of regimes, but not the date of break. The date is estimated iteratively using the EM algorithm (Dempster *et al*. 1977). Testing for the number of regimes in Markov-switching models presents some problems (Krolzig 1997), but fortunately these do not plague our sample. The number of regimes unambiguously equals two, one before and one after 1986:4.

We set a VAR using deseasonalized travel expenditure and real exchange rate. To select the truncation lag of the model we employ Akaike, Hannah-Quinn, and Schwarz information criteria. Results are in Table 11. Akaike and Hannah-Quinn criteria select a lag length of five. Thus we estimate an MSIA−VAR(5) model that allows for changes in both intercept and autoregressive coefficients. Results are in Tables 7−10.

In particular, Table 9 presents the coefficient estimates of the two regimes. The one in the first regime reveals a negative response of travel expenditure to changes in real exchange rate. The coefficient in the second regime does not significantly depart from zero. This means the dollar depreciation of the second half of the 1980s did not affect travel expenditure. Such results are in line with the hysteresis hypothesis.

Actually Table 10 and Figure 6 show the model to select two break points, one at 1975:4 and one at 1986:4. Yet the first break can be explained by the fact that people did not promptly realize the effects of the newly floating exchange rate on their travel expenditures.

4. Conclusion

This paper tests for the occurrence of hysteresis in international travel expenditures of American citizens after the period of strong dollar in the first half of the 1980s. We find expenditures to become less sensitive to the real exchange rate. This is shown by the behavior of the sensitivity coefficient of travel expenditure to real exchange rate in recursive estimation. Coefficient estimates are compared across the two periods, namely before and after 1986:3. This date of regime breaking is justified by a Markov-switching analysis.

Americans seem to get used to traveling abroad during the strong dollar period and this habit of consumption remained during the dollar fall. This suggests the presence of some kind of hysteresis in travel expenditures after the mid-1980s.

Variable	Critical τ at 5%	Critical τ at 1%	*t* ADF	Probability ADF	
Deseasonalized Travel Expenditures	−2.877363	−3.466580	−2.331434	0.1633	Constant
Deseasonalized Travel Expenditures	−3.434844	−4.009558	−3.656559	0.0279	Constant plus Trend
Deseasonalized Travel Expenditures (First Differences)	−2.877453	−3.466786	−16.98986	0.0000	Constant
Real Exchange Rate	−1.942624	−2.578018	−2.624414	0.0088	

Table 1. ADF tests for unit roots

Variable	Coefficient	Std Error	*t* Value	*t* Prob	Part R Squared
Deseasonalized Travel Expenditures (One Lag)	0.496782	0.09104	5.46	0.000	0.2115
Deseasonalized Travel Expenditures (Two Lags)	0.242236	0.09626	2.52	0.013	0.0540
Deseasonalized Travel Expenditures (Five Lags)	0.260592	0.07509	3.47	0.001	0.0979
Real Exchange Rate (One Lag)	−0.036146	0.02563	−1.41	0.161	0.0176

Table 2. Regression results for dependent variable deseasonalized travel expenditure, 1973:1–2001:3

Note

RSS 0.140449087, DW 1.93

Variable	Coefficient	Std Error	*t* Value	*t* Prob	Part R Squared
Deseasonalized Travel Expenditures (One Lag)	0.271297	0.1334	2.03	0.047	0.0750
Deseasonalized Travel Expenditures (Two Lags)	0.299907	0.1472	2.04	0.047	0.0753
Deseasonalized Travel Expenditures (Five Lags)	0.428078	0.1394	3.07	0.003	0.1561
Real Exchange Rate (One Lag)	−0.095162	0.03964	−2.40	0.020	0.1015

Table 3. Regression results for dependent variable deseasonalized travel expenditure, 1973:1–1986:3

Note

RSS 0.0389498 , DW 2.01

Variable	Coefficient	Std Error	*t* Value	*t* Prob	Part R Squared
Deseasonalized Travel Expenditures (One Lag)	0.753467	0.1197	6.30	0.000	0.4144
Deseasonalized Travel Expenditures (Two Lags)	0.0374370	0.1228	0.305	0.762	0.0017
Deseasonalized Travel Expenditures (Five Lags)	0.208907	0.08165	2.56	0.013	0.1047
Real Exchange Rate (One Lag)	0.0234768	0.03431	0.684	0.497	0.0083

Table 4. Regression results for dependent variable deseasonalized travel expenditure, 1986:4–2001:3

Note

RSS 0.0502011679, DW 1.93

Dependent Variable	1973:1–1986:3	1986:4–2001:3	t Value
Deseasonalized Travel Expenditures	0.095 (0.0396)	0.023 (0.03431)	−2.2697
Deseasonalized Travel Expenditures (First Differences)	−0.039 (0.0354)	0.019 (0.0357)	−1.154

Table 5. Test of difference between means of coefficients estimated for one-lagged real exchange rate

Dependent Variable	1973:1–2001:3	1973:1–1986:3	1986:4–2001:3
Deseasonalized Travel Expenditures	−0.036 (0.0256)	−0.095 (0.0396)	0.023 (0.03431)
Deseasonalized Travel Expenditures (First Differences)	−0.031 (0.0249)	−0.039 (0.0354)	0.019 (0.03574)

Table 6. Coefficients estimated for one-lagged real exchange rate

	Regime 1	Regime 2
Regime 1	0.9716	0.0284
Regime 2	0.0160	0.9840

Table 7. Matrix of transition probabilities

	Number of Observations	Probability	Duration
Regime 1	42.5	0.3607	35.26
Regime 2	69.5	0.6393	62.48

Table 8. Regime properties

	Regime 1			Regime 2		
Variable	Coef	Std Error	t Value	Coef	Std Error	t Value
Constant	−2.1879	0.7313	2.9921	−2.2254	1.0061	−2.2120
Deseasonalized Travel Expenditures (One Lag)	0.0315	0.1394	0.2260	0.5716	0.1436	3.9813
Deseasonalized Travel Expenditures (Two Lags)	0.2274	0.1507	1.5099	0.0820	0.1366	0.6003
Deseasonalized Travel Expenditures (Three Lags)	−0.0240	0.1487	−0.1615	−0.0162	0.1355	−0.1198
Deseasonalized Travel Expenditures (Four Lags)	0.1327	0.1543	0.8607	−0.2015	0.1294	−1.5576
Deseasonalized Travel Expenditures (Five Lags)	0.2840	0.1527	1.8606	0.2032	0.1185	1.7148
Real Exchange Rate (One Lag)	−0.1493	0.0405	−3.6853	−0.0811	0.0519	−1.5634
	Standard Error 0.031257			Standard Error 0.031257		

Table 9. Coefficients of the deseasonalized travel expenditure equation

Regime 1	Regime 2
1976:1–1986:3	1973:4–1975:4 1986:4–2001:3

Table 10. Regime classification

	AIC	HQ	SC
VAR(6)	−7.6500	−7.2857	−6.7520
VAR(5)	−7.6856	−7.3823	−6.8846
VAR(4)	−7.6679	−7.3606	−6.9640

Table 11. Information criteria for the MS–VAR model

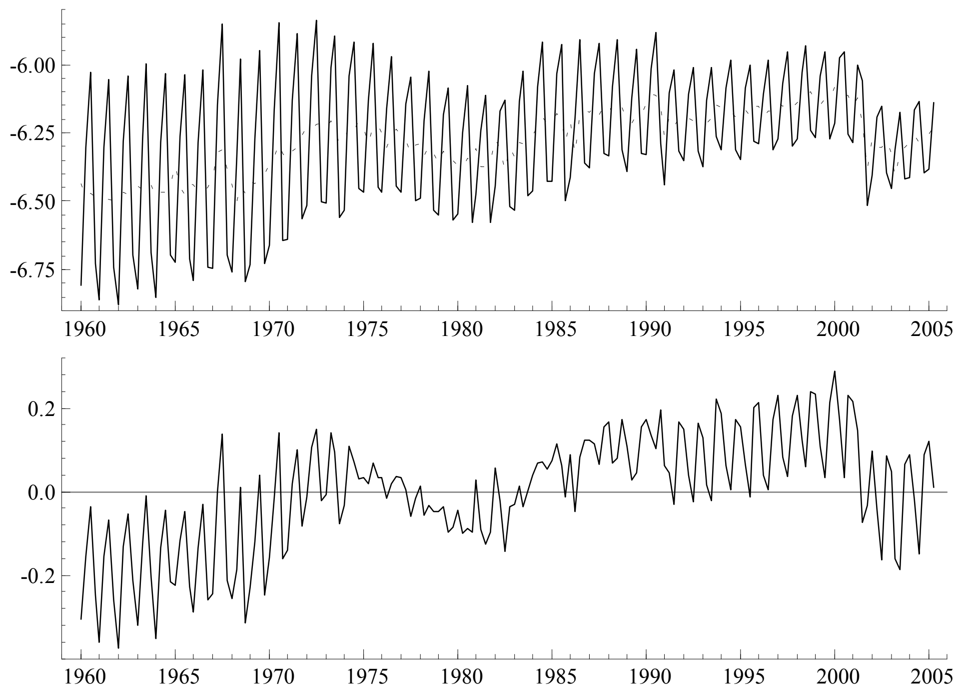

Figure 1. Natural logs of raw and deseasonalized travel expenditures using the ARIMA-X12 program (top) together with deseasonalized travel expenditures using quarterly dummies (bottom)

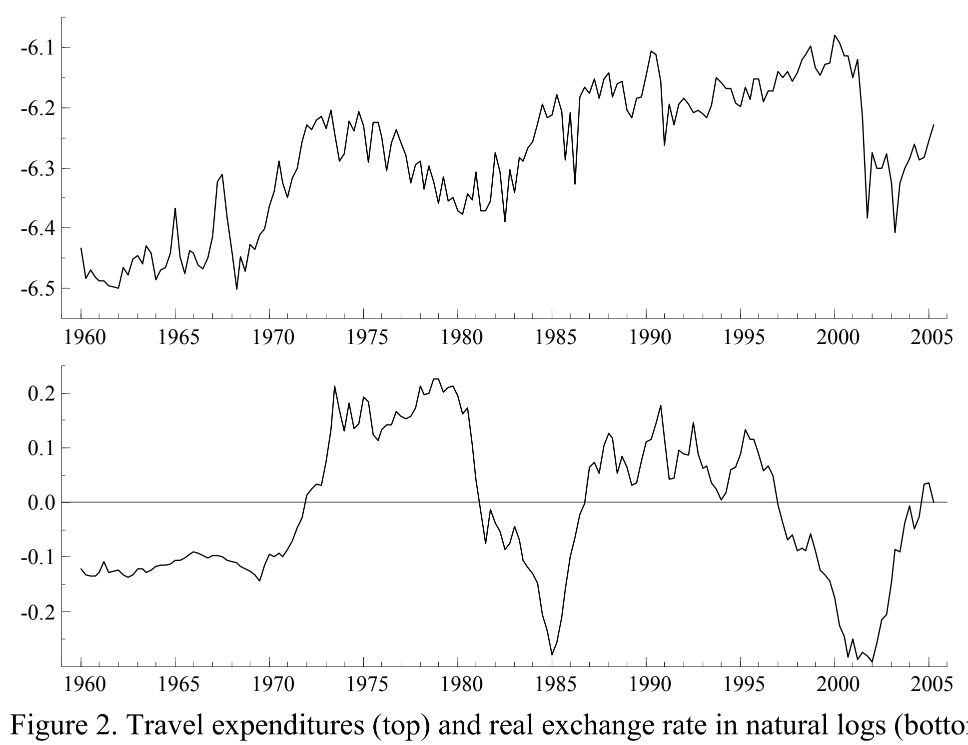

Figure 2. Travel expenditures (top) and real exchange rate in natural logs (bottom)

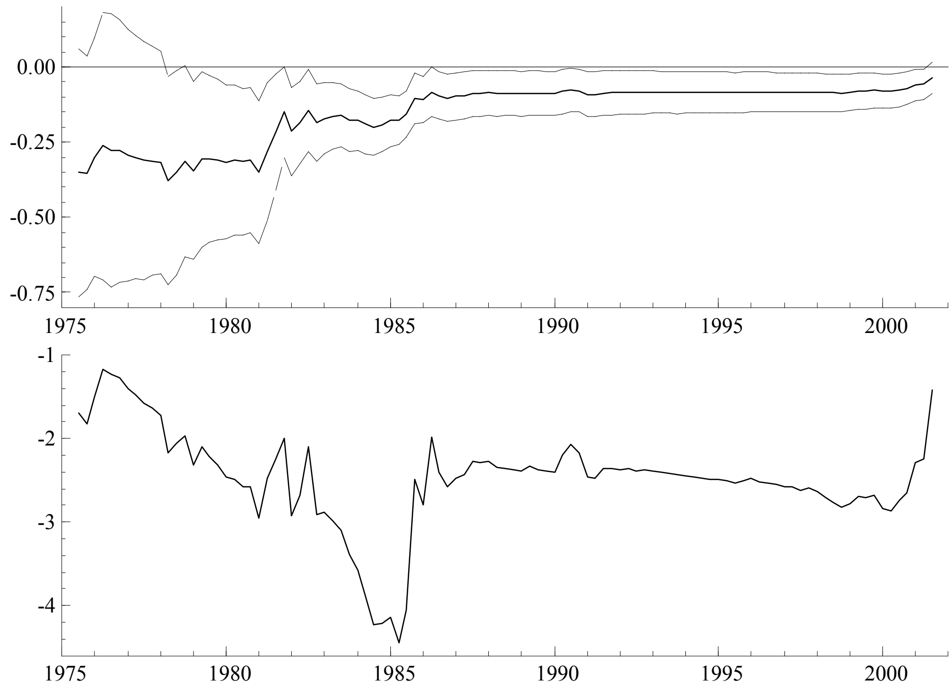

Figure 3. Coefficient estimated recursively for one-lagged real exchange rate. Confidence interval of 95 percent (top) and corresponding *t* statistics (bottom), 1973:1−2001:3

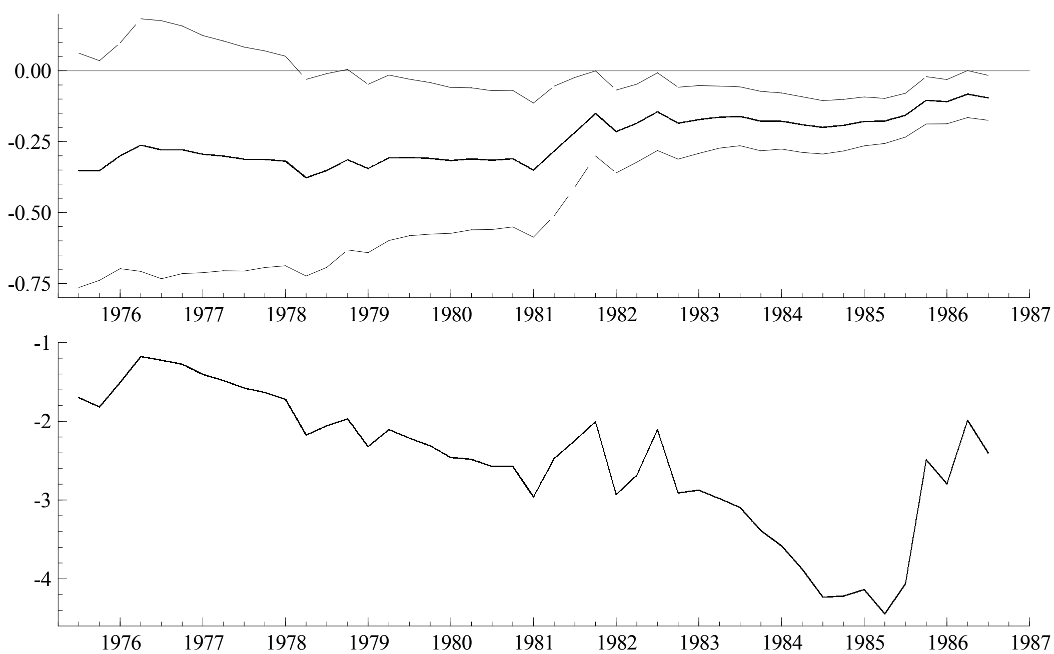

Figure 4. One-lagged real exchange rate estimated recursively. Confidence interval of 95 percent (top) and corresponding *t* statistics (bottom), 1973:1−1986:3

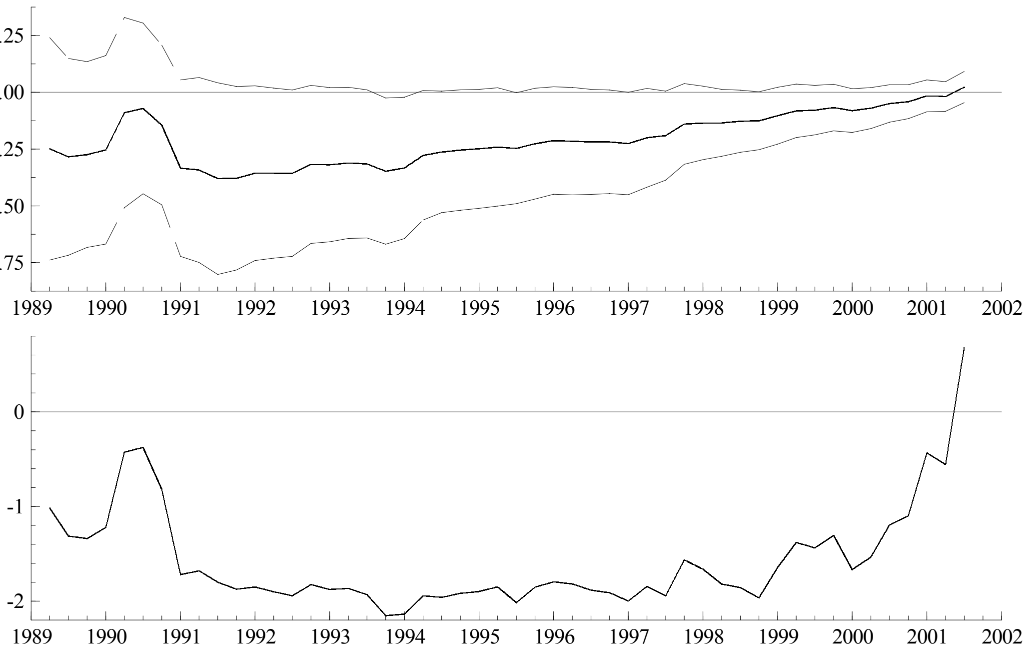

Figure 5. Coefficient estimated recursively for one-lagged real exchange rate. Confidence interval of 95 percent (top) and corresponding *t* statistics (bottom), 1986:4–2001:3

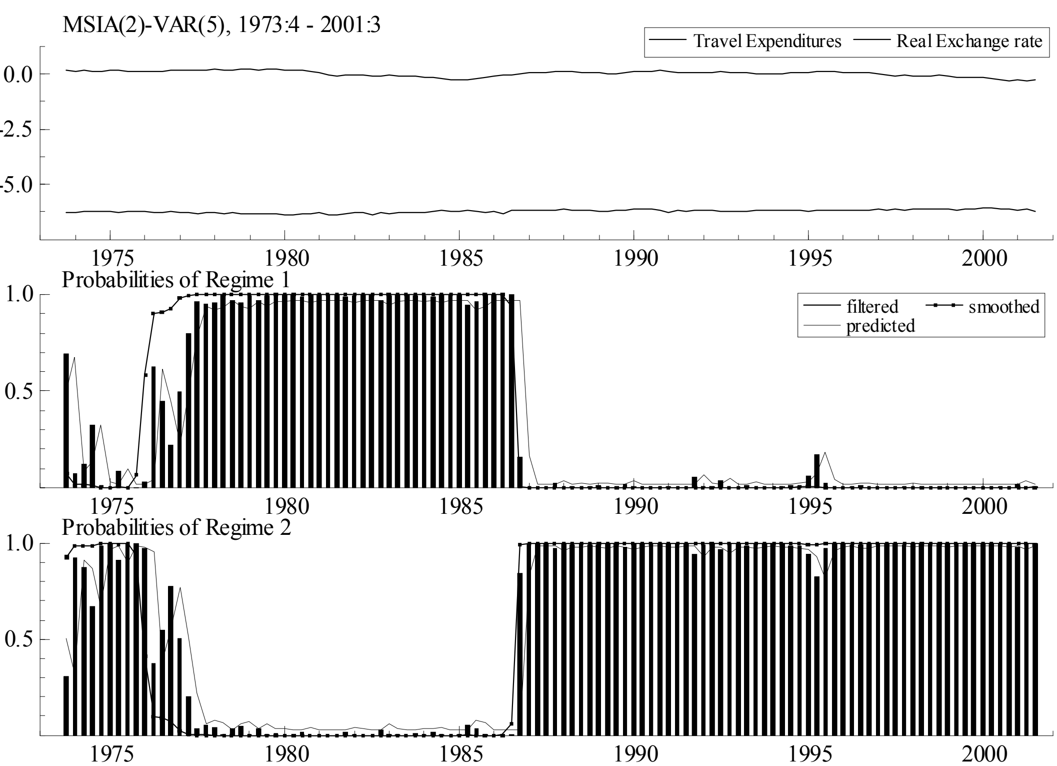

Figure 6. Filtered, predicted and smoothed probabilities for the regimes estimated using an MSIA(2)–VAR(5)

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