Travel Hysteresis in the Brazilian Current Account

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Abstract

The strong Brazilian currency between 1994 and 1998 led Brazilians to an unprecedented increase in their travels abroad. Even after the 1999 currency crisis, travel patterns did not recover to their pre-exchange rate devaluation levels. The occasional exchange rate valuation has left long-lasting effects by changing habits, and thereby generating a travel hysteresis in the Brazilian current account.

Keywords: travel hysteresis, exchange rate, Brazilian economy

JEL classification: F31, F32

1. Introduction

Historically, Brazilian currencies have been kept weak thanks to deliberate exchange rate policy. Yet between the end of 1994 and the end of 1998 the currency was held overvalued toward the US dollar. This was part of the exchange-rate-anchor policy to fight inflation. The policy succeeded due in part to abundant foreign capital. The exchange rate peg eventually collapsed on 13 January 1999 and thereafter the *real*-dollar rate was let to float.

The strong currency led Brazilians to an unprecedented increase in their travels abroad. Travel expenditures in dollar terms tripled, and the number of Brazilian vacationing abroad more than trebled by the end of 1998. These have eased off after the currency crisis, but we will show that travel patterns did not recover to their pre-exchange rate devaluation levels. The occasional exchange rate valuation has left long-lasting effects by possibly changing habits, and thereby generating a travel hysteresis.

Hysteresis has been studied in the context of permanent effects of temporary exchange rate changes on unemployment rate, exports, current account, and currency substitution in the aftermath of hyperinflations. But to our knowledge there is no previous reference to permanent effects of temporary exchange rate changes on traveling abroad.

The exchange rate hysteresis literature can be usefully classified into two branches (McCausland 2002). The first one focuses on the hysteresis resulting from irreversible costs of market entry. These make it impossible for a company to leave the market when the exchange rate returns to its previous level (Baldwin 1988, Baldwin and Krugman 1989, Dixit 1989). The second group of literature emphasizes the exchange rate hysteresis resulting from its fail to return to the original equilibrium following a shock (Roberts and McCausland 1999).

Although most literature shows interest in sunk costs, these play no 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. Also, the reverse effect of travel hysteresis on the exchange rate can be neglected. This is because the item "travel" accounts for less than 20 percent of the Brazilian current account's services.

The rest of the paper is organized as follows. Section 2 presents data, Section 3 shows results, and Section 4 concludes.

2. Data

We take monthly data for travel expenditure from the Brazilian central bank. The data set spans from July 1992 to June 2004 (144 data points). Real travel expenditures in dollar terms are obtained as follows. First, we deflate monthly figures using the US Consumer Price Index. Secondly, since travelers might increase in number due to population growth, and their expenditure may increase with per capita income growth, we take these into account. We thus build a GDP index as follows. Using monthly data from July of a year to next year's June, we carry out a linear interpolation to get a monthly change approaching the annual growth rate. Then the real travel expenditures are divided by the GDP index. The resulting values are deseasonalized using the X-12-ARIMA program from the US Census Bureau. Since this procedure may render data correlated with a month's observation, we alternatively delete monthly averages using dummies, only to realize that deseasonalizing using X-12-ARIMA can be justified. Figure 1 shows travel expenditure in natural logs.

To calculate real exchange rate we take the monthly nominal rate (available from the Brazilian central bank), multiply it by the US CPI, and then divide by the Brazilian consumer price index (IPCA). Figure 2 shows the real exchange rate in natural logs together with deseasonalized travel expenditures.

Purchases of dollar in official markets were limited during part of the period being studied. One Brazilian planning to travel abroad had then to go to the greenback's black market. Thus we also consider the black market dollar spread, i.e. the percentage difference between the dollar price in the black market (reckoned from a series available at Ipeadata) and the official dollar price. A larger dollar spread in the black market is expected to increase travel costs. Figure 3 shows the black market dollar spread together with real travel expenditure and real exchange rate.

We insert a dummy for July 1994, which is the launching date of the *Real* Plan. Unlike previous stabilization plans, there was then widespread information about the measures to be adopted. Yet the plan's success still remained uncertain as well as its effects on the exchange rate. The latter came from the fact that the central bank was committed to an upper band for the exchange rate, without caring about the lower band. Such an uncertainty might have influenced travel behavior.

We insert another dummy for March 1995. In the aftermath of the Mexican crisis, by the end of February and beginning of March the Brazilian economy was overheated. A novel exchange rate regime of explicit bands and informal mini-bands was also adopted. And the exchange rate depreciated relative to previous months. All these may have influenced traveling.

We also consider a dummy for the semi-fixed exchange rate regime from October 1994 to December 1998. This can be justified on the basis that a fixed regime might boost forecastability and lead to better travel planning.

We also insert one more dummy for January 1999. This date saw the semi-fixed regime abandoned and the risk of exhaustion in reserves. The regime switch was painful with strong depreciation of the *real*.

3. Results

The series of travel expenditure and real exchange rate are stationary in first differences, and the dollar-spread series is stationary in levels. Table 1 shows these with the help of the Augmented Dickey-Fuller (ADF) test to check for unit roots. Lags are selected using Schwarz criterion.

Once travel expenditure and real exchange rate are integrated of same order, they may be cointegrated. But Johansen test cannot reject the hypothesis of absence of cointegration, indicating lack of long-run linear relationship between the variables. This result does matter as long as hysteresis is present. Indeed cointegration would mean no change in the relationship between the variables over time.

To check for hysteresis, we then take travel expenditure and real exchange rate in first differences, and the black market dollar spread in levels. From a general-to-specific approach, we start with six lags of the dependent variables together with the lagged independent variable (apart from the dummies). Table 2 shows the best model according to Schwarz criterion for variables that are significant at the 5 percent level. Table 2 displays results of the regression for the dependent variable, i.e. the natural log of the first differences of deseasonalized travel expenditure.

Residuals are well behaved as confirmed by tests of autocorrelation and heteroskedasticity. This is reinforced by a normality test as well as a RESET test of mispecification. And Chow test rejects parameter instability. Lagged travel expenditures impact current expenditure negatively. This is shown in the lags from –1 to –4. The effect lasts for four months. Thus large (small) values of travel expenditure lead to small (large) values in subsequent months. As for the black market dollar spread, though it significantly influences foreign travels, the magnitude of the effect is negligible. The effect of the

contemporaneous spread is positive, but the first and fifth lagged spreads are negative. Then the net effect is almost nil. Though this can be interpreted as an economic uncertainty about travels, short duration may mean simply that journeys are delayed.

Apart from the dummy for the semi-fixed exchange rate regime, the others present the expected signs, realistic magnitudes, and are statistically significant.

As for the real exchange-rate influence over travel expenditure, there is no contemporaneous influence, which is consistent with the need of previous journey planning. However, lags −1 and −3 show strong influence. That travel expenditures are elastic to real exchange-rate changes is confirmed by the statistical significance of the fifth lag.

To check for hysteresis following the overvalued currency period, we estimate two regressions. One aims to track the sensitivity of travel expenditure to the real exchange rate from January 1992 to December 1998, when the Brazilian currency was kept overvalued. We then repeat the procedure for the post-devaluation period. Here we assess whether the coefficients of the real exchange rate as well as the lags decrease. Changing elasticities will mean changing habits. Small estimated parameters will mean hysteresis. Tables 4 and 5 show results for the two periods. There is indeed reduction of the sensitivity of travel expenditure to the real exchange rate. Thus hysteresis is present. We repeat the procedure above with travel expenditures deseasonalized by monthly dummies. Results are in Tables 6–8 and Figure 5. As can be seen, results do not change a great deal.

Figures 4 and 5 display estimated coefficients and their corresponding *t* statistics. Here hysteresis means that the sensitivity of travel expenditure abates following the devaluation. There is a tiny reduction of the sensitivity after the beginning of 1999 (lag –1). Yet there is a larger reduction at lag –3. For the five-month lag, reduction is negligible. Throughout the standard error of the estimate relative to the exchange-rate-regime shift decreases unambiguously. This reinforces our finding of the effect of the real exchange rate on travel expenditure.

ADF tests (Table 3) show that the coefficients of lags 1 and 5 of the real exchange rate are stationary. For lag 3, ADF and Philips-Perron (PP) tests exhibit ambiguous results if only one constant is inserted. Yet considering constant plus trend renders the coefficient stationary. Since the coefficient trend is positive, the sensitivity of travel expenditure to the real exchange rate abates as time goes by.

4. Conclusion

We find evidence of hysteresis in Brazilian travel expenditures following the (1994-1998) overvalued currency period. The occasional, overvalued currency has altered the behavior of vacationing abroad on a permanent basis, i.e. travel expenditures have become less sensitive to real exchange-rate changes.

The hysteresis is detected with the help of two regressions. One tracks the sensitivity of travel expenditure to the real exchange rate from January 1992 to December 1998, and the other repeats the procedure for the post-devaluation period. We assess whether the coefficients for the real exchange rate together with the lags decrease. Changing elasticities show changing habits. Results for two alternative ways of deseasonalizing data show reduction of the sensitivity of travel expenditure to the real exchange rate. We thus conclude that travel hysteresis is present.

Table 1. ADF Tests for the Null Hypothesis of Unit Roots

Variable	ADF	Probability	Lags	Constant	Trend	Critical τ at 1%	Critical τ at 5%
Real Exchange Rate	0.562827	0.8367	2	No	No	–2.580788	–1.943012
Deseasonalized Travel Expenditures	0.130579	0.7223	2	No	No	–2.580788	–1.943012
Dollar Spread	–1.769386	0.0730	2	No	No	–2.580788	–1.943012
Real Exchange Rate (First Differences)	–8.500281	0.0000	1	No	No	–2.580788	–1.943012
Deseasonalized Travel Expenditures (First Differences)	–11.87038	0.0000	1	No	No	–2.580788	–1.943012

Table 2. Regression Results, July 1992–June 2004

Variable	Coefficient	Standard Error	t Value	t Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, One Lag)	–0.479381	0.07093	–6.76	0.000	0.2585
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.392302	0.07864	–4.99	0.000	0.1597
Deseasonalized Travel Expenditures (First Differences, Three Lags)	–0.180039	0.07580	–2.38	0.019	0.0413
Deseasonalized Travel Expenditures (First Differences, Four Lags)	–0.220867	0.06729	–3.28	0.001	0.0760
Real Exchange Rate (First Differences, One Lag)	–1.01823	0.2293	–4.44	0.000	0.1308
Real Exchange Rate (First Differences, Three Lags)	–1.10834	0.2421	–4.58	0.000	0.1379
Real Exchange Rate (First Differences, Five Lags)	–0.642622	0.2076	–3.10	0.002	0.0682
Dollar Spread	0.0265641	0.003788	7.01	0.000	0.2730
Dollar Spread (One Lag)	–0.0177274	0.004432	–4.00	0.000	0.1088
Dollar Spread (Five Lags)	–0.00650069	0.002700	–2.41	0.017	0.0424
Dummy July 1994	–0.521939	0.09719	–5.37	0.000	0.1804
Dummy March 1995	0.269982	0.09582	2.82	0.006	0.0571
Dummy January 1999	–0.266230	0.1002	–2.66	0.009	0.0511

Table 3. Recursive Coefficients of Real Exchange Rate's First Differences: Stationarity Tests for the Null Hypothesis of Unit Roots

Coefficient	Test	Constant	Trend	*t* Value	*t* Probability	Critical τ at 5%
One Lag	ADF	No	No	–1.604470	0.1021	–1.943637
One Lag	ADF	Yes	No	–4.078942	0.0015	–2.886732
One Lag	ADF	Yes	Yes	–4.059320	0.0094	–3.449365
One Lag	PP	No	No	–1.425273	0.1430	–1.943637
One Lag	PP	Yes	No	–1.943637	0.0036	–2.886732
One Lag	PP	Yes	Yes	–3.802267	0.0198	–3.449365
Three Lags	ADF	No	No	–1.915416	0.0533	–1.943741
Three Lags	ADF	Yes	No	–0.785375	0.8190	–2.887665
Three Lags	ADF	Yes	Yes	–9.818415	0.0000	–3.449365
Three Lags	PP	Yes	No	–1.182387	0.2156	–1.943637
Three Lags	PP	Yes	No	–3.502853	0.0096	–2.886732
Three Lags	PP	Yes	Yes	–10.42563	0.0000	–3.449365
Five Lags	ADF	No	No	–2.478666	0.0134	–1.943637
Five Lags	ADF	Yes	No	–8.171536	0.0000	–2.886732
Five Lags	ADF	Yes	Yes	–7.864339	0.0000	–3.449365
Five Lags	PP	No	No	–2.597581	0.0097	–1.943637
Five Lags	PP	Yes	No	–8.171536	0.0000	–2.886732
Five Lags	PP	Yes	Yes	–8.179111	0.0000	–3.449365

Table 4. Regression Results, July 1992–December 1998

Variable	Coefficient	Standard Error	*t* Value	*t* Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.401158	0.1082	–3.71	0.000	0.1724
Deseasonalized Travel Expenditures (First Differences, Three Lags)	–0.210870	0.1043	–2.02	0.047	0.0584
Deseasonalized Travel Expenditures (First Differences, Four Lags)	–0.260798	0.08897	–2.93	0.005	0.1152
Real Exchange Rate (First Differences, One Lag)	–1.41187	0.7215	–1.96	0.055	0.0548
Real Exchange Rate (First Differences, Three Lags)	–2.20618	0.7192	–3.07	0.003	0.1248
Real Exchange Rate (First Differences, Five Lags)	–0.665937	0.7093	–0.939	0.351	0.0132
Dollar Spread	0.0288761	0.005168	5.59	0.000	0.3211
Dollar Spread (One Lag)	–0.0206298	0.006093	–3.39	0.001	0.1480
Dollar Spread (Five Lags)	–0.00364334	0.003092	–1.18	0.243	0.0206
Dummy July 1994	–0.507168	0.09837	–5.16	0.000	0.2871
Dummy March 1995	0.250331	0.1014	2.47	0.016	0.0845

Table 5. Regression Results, January 1999–June 2004

Variable	Coefficient	Standard Error	*t* Value	*t* Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, One Lag)	–0.517789	0.1206	–4.30	0.000	0.2512
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.452315	0.1302	–3.47	0.001	0.1799
Deseasonalized Travel Expenditures (First Differences, Three Lags)	–0.242697	0.1292	–1.88	0.066	0.0603
Deseasonalized Travel Expenditures (First Differences, Four Lags)	–0.239075	0.1138	–2.10	0.040	0.0743
Real Exchange Rate (First Differences, One Lag)	–0.730260	0.3302	–2.21	0.031	0.0817
Real Exchange Rate (First Differences, Three Lags)	–0.906786	0.3046	–2.98	0.004	0.1388
Real Exchange Rate (First Differences, Five Lags)	–0.796250	0.2599	–3.06	0.003	0.1458
Dollar Spread	0.0259863	0.006340	4.10	0.000	0.2340
Dollar Spread (One Lag)	–0.0114080	0.007110	–1.60	0.114	0.0447
Dollar Spread (Five Lags)	–0.0156984	0.006234	–2.52	0.015	0.1034
Dummy January 1999	–0.273421	0.1124	–2.43	0.018	0.0972

Table 6. Regression Results for Deseasonalized Variables by Monthly Dummies, July 1992–June 2004

Variable	Coefficient	Standard Error	*t* Value	*t* Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, One Lag)	–0.421858	0.06868	–6.14	0.000	0.2197
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.322706	0.07182	–4.49	0.000	0.1309
Real Exchange Rate (First Differences)	–0.820101	0.2698	–3.04	0.003	0.0645
Real Exchange Rate (First Differences, One Lag)	–0.768297	0.2803	–2.74	0.007	0.0531
Real Exchange Rate (First Differences, Two Lags)	–0.782686	0.2775	–2.82	0.006	0.0560
Real Exchange Rate (First Differences, Three Lags)	–0.670930	0.2448	–2.74	0.007	0.0531
Dollar Spread	0.0222636	0.004736	4.70	0.000	0.1416
Dollar Spread (One Lag)	–0.0185516	0.004854	–3.82	0.000	0.0983
Dummy July 1994	–0.445058	0.1114	–4.00	0.000	0.1065
Dummy March 1995	0.245343	0.1103	2.22	0.028	0.0356

Table 7. Regression Results for Deseasonalized Variables by Monthly Dummies, July 1992–December 1998

Variable	Coefficient	Standard Error	*t* Value	*t* Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, One Lag)	–0.474890	0.08626	–5.51	0.000	0.3083
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.363778	0.09615	–3.78	0.000	0.1739
Real Exchange Rate (First Differences)	–1.67213	0.9144	–1.83	0.072	0.0469
Real Exchange Rate (First Differences, One Lag)	–1.59901	0.8602	–1.86	0.067	0.0484
Real Exchange Rate (First Differences, Two Lags)	–1.11803	0.7845	–1.43	0.159	0.0290
Real Exchange Rate (First Differences, Three Lags)	–0.965267	0.7580	–1.27	0.207	0.0233
Dollar Spread	0.0253355	0.005848	4.33	0.000	0.2163
Dollar Spread (One Lag)	–0.0204571	0.006019	–3.40	0.001	0.1452
Dummy July 1994	–0.398991	0.1189	–3.36	0.001	0.1421
Dummy March 1995	0.263911	0.1181	2.24	0.029	0.0684

Table 8. Regression Results for Deseasonalized Variables by Monthly Dummies, January 1999–June 2004

Variable	Coefficient	Standard Error	*t* Value	*t* Probability	Partial R Squared
Deseasonalized Travel Expenditures (First Differences, One Lag)	–0.372822	0.1228	–3.04	0.004	0.1372
Deseasonalized Travel Expenditures (First Differences, Two Lags)	–0.241504	0.1198	–2.02	0.048	0.0655
Real Exchange Rate (First Differences)	–0.835330	0.3454	–2.42	0.019	0.0916
Real Exchange Rate (First Differences, One Lag)	–0.673680	0.3231	–2.09	0.041	0.0697
Real Exchange Rate (First Differences, Two Lags)	–0.663985	0.3239	–2.05	0.045	0.0676
Real Exchange Rate (First Differences, Three Lags)	–0.547756	0.2771	–1.98	0.053	0.0631
Dollar Spread	0.0165697	0.009039	1.83	0.072	0.0548
Dollar Spread (One Lag)	–0.0141210	0.009244	–1.53	0.132	0.0387

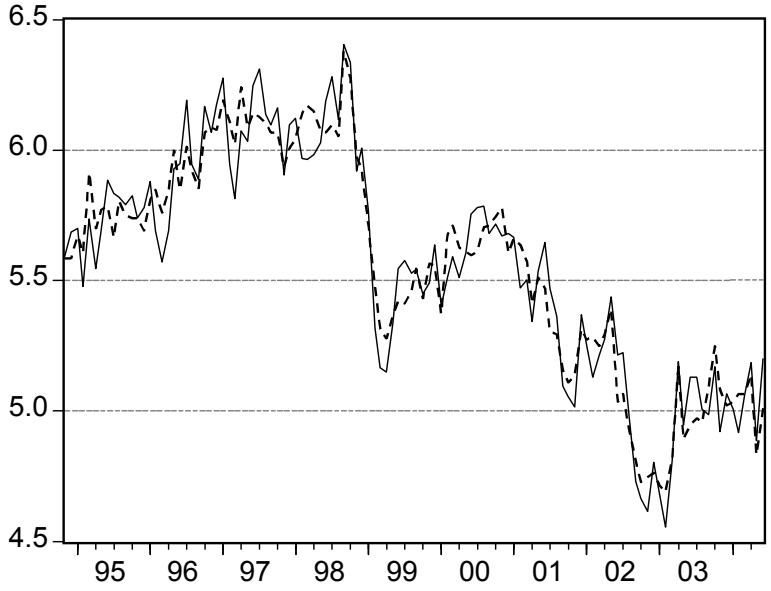

Figure 1. Real travel expenditures from Brazilians in dollars (natural logs): raw (continuous line) and deseasonalized (dashed line) data

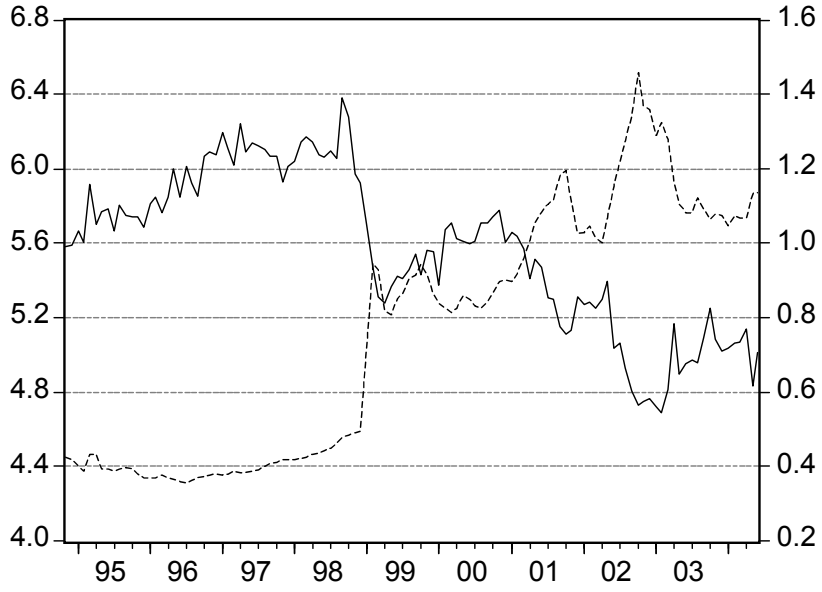

Figure 2. Real exchange rate in natural logs (dashed line) together with deseasonalized real travel expenditures (continuous line and left hand side axis)

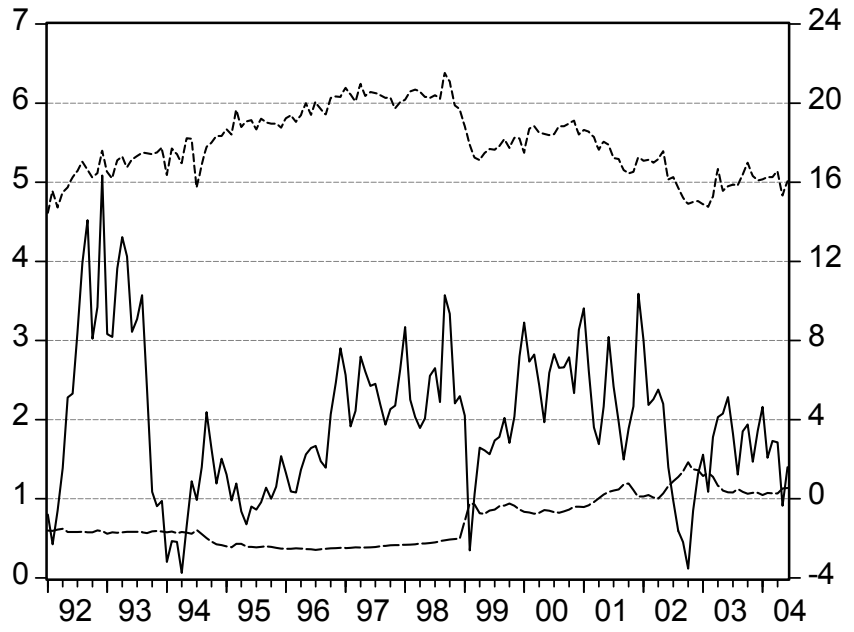

Figure 3. Black market dollar spread in percentage terms (continuous line and right hand side axis) together with travel expenditure and real exchange rate (left-hand-axis, dashed line at the bottom and left hand side axis)

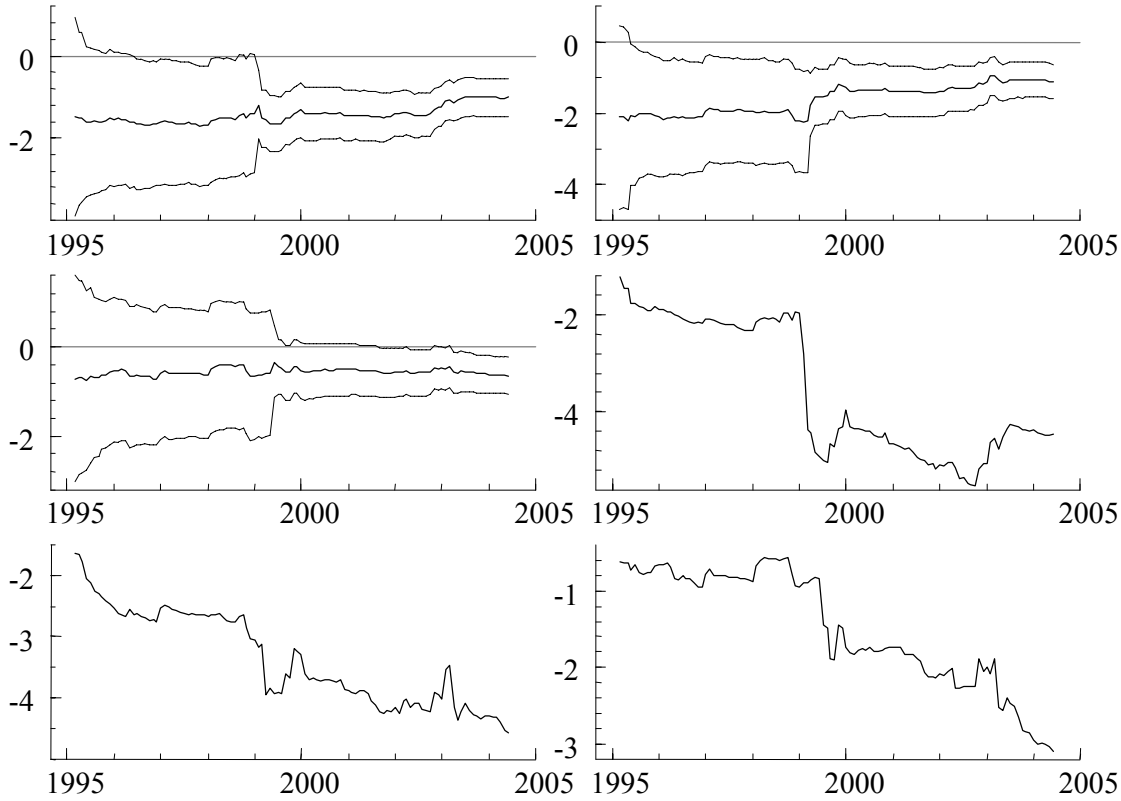

Figure 4. Real Exchange Rate's Recursive Regression Coefficients, 1-, 3-, and 5-Period Lags, and Correspondent *t* Statistics (Left to Right)

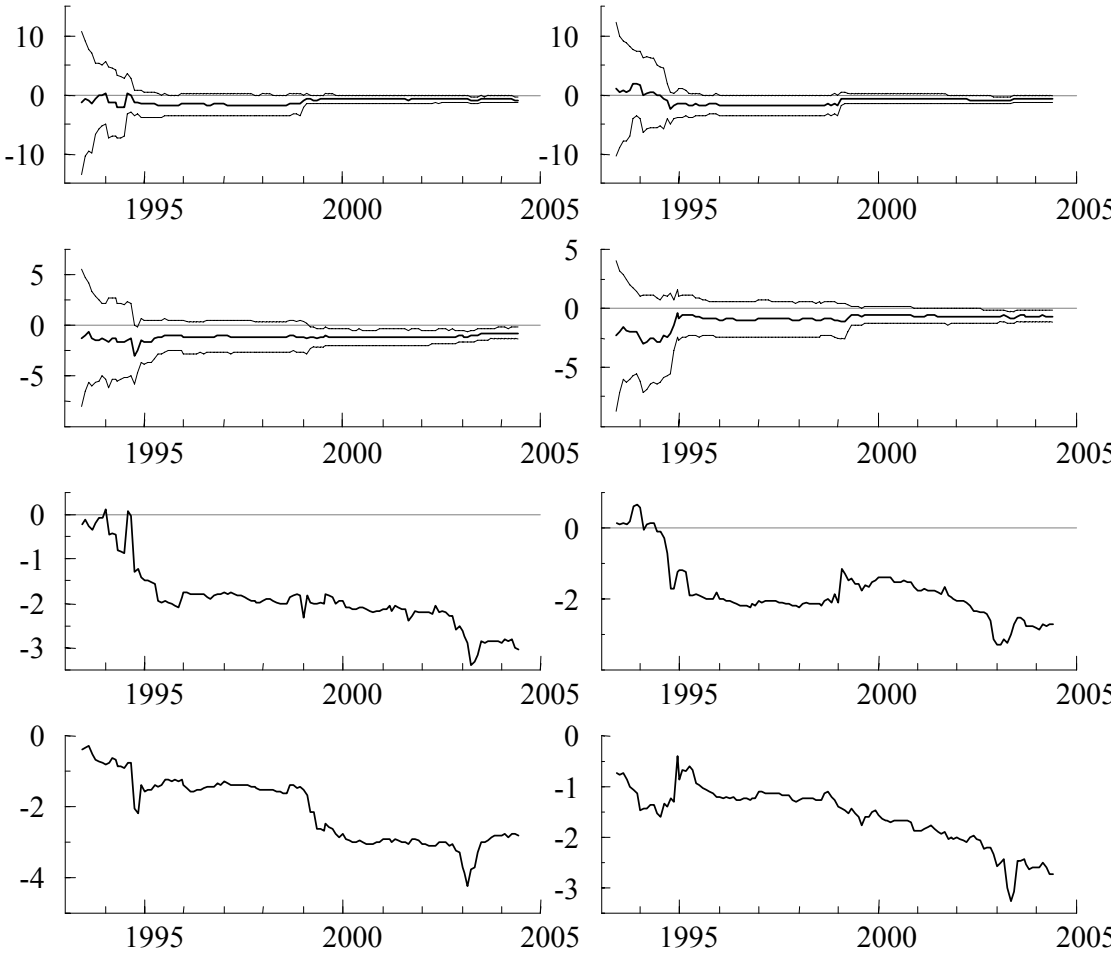

Figure 5. Real Exchange Rate's Recursive Regression Coefficients, 1-, 2-, and 3-Period Lags, and Correspondent *t* Statistics (Left to Right)

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