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What Does the Bootstrap Test Show Us?

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Summary: We use a residual-based bootstrap method to re-examine the finding of the Granger causality relationship from exchange rates to fundamentals in Engel and West (Exchange rate and fundamentals, *Journal of Political Economy* 2005, **113** (3), 485–517), in which the evidence for the relation is taken as evidence for the present-value model for exchange rates. The test results are against the previous findings. The Monte Carlo experiment results suggest that the causality test implemented in the previous study tends to spuriously reject null hypotheses. Thus, the existing evidence for the present value model for exchange rates is not robust.

Keywords: Bootstrap, Granger causality, exchange rates, fundamentals

JEL classification: F30; F31; C32

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1. Introduction

In a recent paper, Engel and West (2005) explain the exchange rate behavior from a new aspect. They argue that the exchange rate behavior is near random in the preset-value model as the discount factor is close to one and at least one of the economic fundamentals of exchange rate is $I(1)$, and validate this argument by empirically uncovering the Granger causality relation from exchange rates to fundamentals implied by the present-value model. In this study, we employ Kilian's (1999) residual-based bootstrapping method to reassess Engel and West's (2005) result. We find that the results from the two test methods become more distinct when the sample size used in the test is smaller. We additionally implement the Monte Carlo experiment to examine the robustness of the two test methods and to investigate whether the bootstrap test performs better than the asymptotic test in this particular application. Results show that the size of the asymptotic Granger causality test is overall larger than that of the bootstrap test and the size-corrected power of the asymptotic test is generally less than that of the bootstrap test. Therefore, the large size and smaller size-corrected power of the asymptotic test indicates that the size distortion affects the asymptotic test and implies that the non-causality null hypothesis are spuriously rejected in Engel and West's(2005) article.

2. Bootstrap algorithms

Since Engel and West's data for the exchange rate and each of the fundamental measures are shown to have unit root processes but not have cointegration relationship, we take the first difference for the variable and do not include a vector correction term in the bivariate vector autoregressive (VAR) model. We follow Engel and West choosing four lags for the VAR model. The model for testing the Granger causality relationship between the exchange rate (s_t) and the fundamental (f_t) takes the form:

$$\begin{pmatrix} \Delta s_t \\ \Delta f_t \end{pmatrix} = \begin{pmatrix} c_s \\ c_f \end{pmatrix} + \sum_{i=1}^{4} \begin{pmatrix} \phi_i^{11} & \phi_i^{12} \\ \phi_i^{21} & \phi_i^{22} \end{pmatrix} \begin{pmatrix} \Delta s_{t-i} \\ \Delta f_{t-i} \end{pmatrix} + \begin{pmatrix} u_{s,t} \\ u_{f,t} \end{pmatrix} \quad (1)$$

We use Kilian's (1999) residual-based bootstrap method to perform the causality test. Since the Jarque-Bera test rejects the null hypothesis of the Gaussian innovation for most of the data, all bootstrap test inferences are drawn from the test with nonparametric re-sampling method. The bootstrap algorithm for the Granger causality test consists of following four steps:

Step 1. Given the original observation, estimate coefficients by the estimated generalized least square (EGLS) method for VAR Model (5) under the null and the alternative, respectively, and obtain the likelihood ratio (LR) test statistic ($\hat{\lambda}$).

Step 2. Apply the estimates of $\hat{\phi}_i$'s estimated under the null hypothesis in Step 1 to generate the pseudo-data $\{s_t^*,\ f_t^*\}$ with the same length as the original data. Then, generate the data under the null hypothesis that Δs_t does not Granger cause Δf_t. To initialize this process, specify $(\Delta s^*_{t-j}, \Delta f^*_{t-j})' = (0, 0)'$ for $j = 1, \ldots, 4$ and discard the first 500 created data. The pseudo innovation term $u^*_t = (u^*_{s,t}, u^*_{f,t})'$ is random and drawn with replacement from the set of observed residuals $\hat{u}_t = (\hat{u}_{s,t}, \hat{u}_{f,t})'$ obtained from Step 1. Repeat this step 2000 times, and obtain 2000-bootstrapped samples.[1]

Step 3. For each bootstrapped sample, re-estimate the coefficients in the VAR Model (5), and construct the corresponding test statistic $\hat{\lambda}^*$ as in Step 1.

Step 4. Use the 2000 test statistics $\hat{\lambda}^*$ obtained from the bootstrapped replications in Step 3 to construct the empirical distribution and determine the *p*-value for the LR statistic $\hat{\lambda}$ of Step 1.

3. Empirical results

We follow Engel and West (2005) dividing the full sample into two sub-samples in 1990:Q3 due to major economic and noneconomic developments during this period. Table 1 summarizes the Granger causality test results from different test methods on each sample period.[2]

Panel (a) of Table 1 shows that, at the 10% significance level, ten out of thirty null hypotheses that Δs_t fails to Granger cause Δf_t based on the asymptotic distribution

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[1] We bootstraps 2000 replications because the bootstrapping *p*-value of the test statistic $\hat{\lambda}$ constructed from 2000 replications only marginally differed from those constructed from 2500 and 5000 replications.
[2] The asymptotic test in this study is replication results of Engel and West's Granger causality test. The *p*-value is available upon request.

are rejected, but the evidence of the causality running from exchange rates to fundamentals is slightly weaker than that in the section of the result from the asymptotic test. Only eight rejections to the non-causality null hypothesis are found at the 10% significance level. Panel (b) of Table 1 summarizes the test results for the early part of the sample. In this panel we see that, the null that Δs_t fails to Granger cause Δf_t is rejected in ten cases at the 5% significance level, but only three cases of the non-Granger causality null hypotheses are rejected at the 5% significance level. Last, Panel (c) of Table 1 reports the test results for the later part of the full sample. In this panel the evidence that the exchange rate Granger causes the fundamental from different test methods is very distinct as well. The null hypotheses of non-Granger causality from exchange rates to fundamentals are rejected in nine cases at the 5% significance level, but by using the bootstrapped empirical distribution, the null hypothesis is rejected in only two cases at the 5% significance level.

4. Size and Power of the Tests

In the previous section, we find that results of the Granger causality test from exchange rates to fundamentals based on two different test approaches are distinct when using small samples. Although it is well-known that the asymptotic test statistics constructed from the small sample data suffer from the size distortion, it is not sufficient to draw the conclusion that the evidence from the bootstrap test is more convincing than the asymptotic test.

We implement the Monte Carlo experiment test the robustness of the two test procedures and to examine whether the bootstrap test performs better than the asymptotic test in this particular application. Similarly, we use the bivariate VAR model with four lags to generate the pseudo data. The coefficients used in the size and the power test are estimated from the real data under the null hypothesis that exchange rates do not Granger cause fundamentals and under the alternative hypothesis of the non-causality test, respectively.[3] Both of the size and power test is determined by the nominal 10% test with 1000 trials of the Monte Carlo experiment. For the bootstrap test, the algorithm is identical to that illustrated in Section 2.

The size of the 10% test is tabulated in Figures 1. The numeric number of 1 to 6 represents Canada, France, Germany, Italy, Japan, and the United Kingdom, respectively. We see that the size of the asymptotic test increases by a large percentage as the sample size declines. For the later part of the sample, the size of the asymptotic test rises in all fundamental measures and in all sample countries by a large percentage. Moreover,

[3] See the Appendix for the estimated coefficients used for the null and alternative hypotheses for each exchange rate.

some magnitudes of the size of the asymptotic tests rise to almost 40%.[4] By contrast, the size of the bootstrap test remains near the nominal 10% significance level. In addition, the size of the bootstrap test is lower than that of the asymptotic test in all samples. The power of the test is tabulated in Figures 2. We see that both of the test methods have similar power, but the size-corrected power of the asymptotic test is generally smaller than that of the bootstrap test.

5. Conclusion

This paper employs the bootstrap method to re-evaluate the evidence of the causality relationship between exchange rates and fundamentals. The bootstrap test results show that the evidence of Granger causality from exchange rates to fundamentals is not as significant as the existing evidence based on the asymptotic distribution in all sample periods. Additionally, Monte Carlo experiment results demonstrate that the bootstrap test is more robust than the asymptotic test. The large size in the asymptotic test implies that Engel and West's results were greatly distorted by the small-sample problem. Therefore, the existing Granger causality evidence is not strong enough to support the present-value model for exchange rate under Engel and West's explanation.

References

[4] Considering the serial correlation and heteroskedasticity in the error term, we also employ the Newey-West HAC estimator to compute the size of the asymptotic test. We find that the size of the asymptotic test based on the HAC estimator is overall higher what we obtained from the EGLS method.

Engel C, West KD. 2005. Exchange rate and fundamentals. *Journal of Political Economy* **113** (3), 485–517.

Kilian L. 1999. Exchange rates and monetary fundamentals: what do we learn from long-horizon regressions? *Journal of Applied Econometrics* **14** (5), 491–510.

Table 1. Results from bivariate Granger non-causality tests from Δs_t to Δf_t

(a) Full sample: 1974:1–2001:3

	Asymptotic test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$		*		*	**	
2.$\Delta(p_t - p_t^*)$			***	***	***	
3.$\Delta(i_t - i_t^*)$		**			***	
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$		*		*		
5.$\Delta(y_t - y_t^*)$						
	Bootstrap test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$				*	**	
2.$\Delta(p_t - p_t^*)$			**	***	**	
3.$\Delta(i_t - i_t^*)$		**			***	
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$				*		
5.$\Delta(y_t - y_t^*)$						

(b) Early part of the sample: 1974:1–1990:2

	Asymptotic test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$		**		*		
2.$\Delta(p_t - p_t^*)$		*	**	***	**	
3.$\Delta(i_t - i_t^*)$		***			**	**
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$		**		**	*	
5.$\Delta(y_t - y_t^*)$					**	
	Bootstrap test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$		*				
2.$\Delta(p_t - p_t^*)$			**	***	*	
3.$\Delta(i_t - i_t^*)$		**			*	*
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$		*		*		
5.$\Delta(y_t - y_t^*)$					*	

Table 1(continued). Results from bivariate Granger non-causality tests from Δs_t to Δf_t

(c) Later part of the sample: 1990:3–2001:3

	Asymptotic test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$	**	*			**	
2.$\Delta(p_t - p_t^*)$	*	**	***			*
3.$\Delta(i_t - i_t^*)$			**	**	*	
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$	***	**				*
5.$\Delta(y_t - y_t^*)$						**
	Bootstrap test					
	Canada	France	Germany	Italy	Japan	United Kingdom
1.$\Delta(m_t - m_t^*)$	*					
2.$\Delta(p_t - p_t^*)$		*	***			
3.$\Delta(i_t - i_t^*)$						
4.$\Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$	**					
5.$\Delta(y_t - y_t^*)$						*

Notes: ***, ** and * denote significance, respectively at the 1, 5 and 10% significance levels.

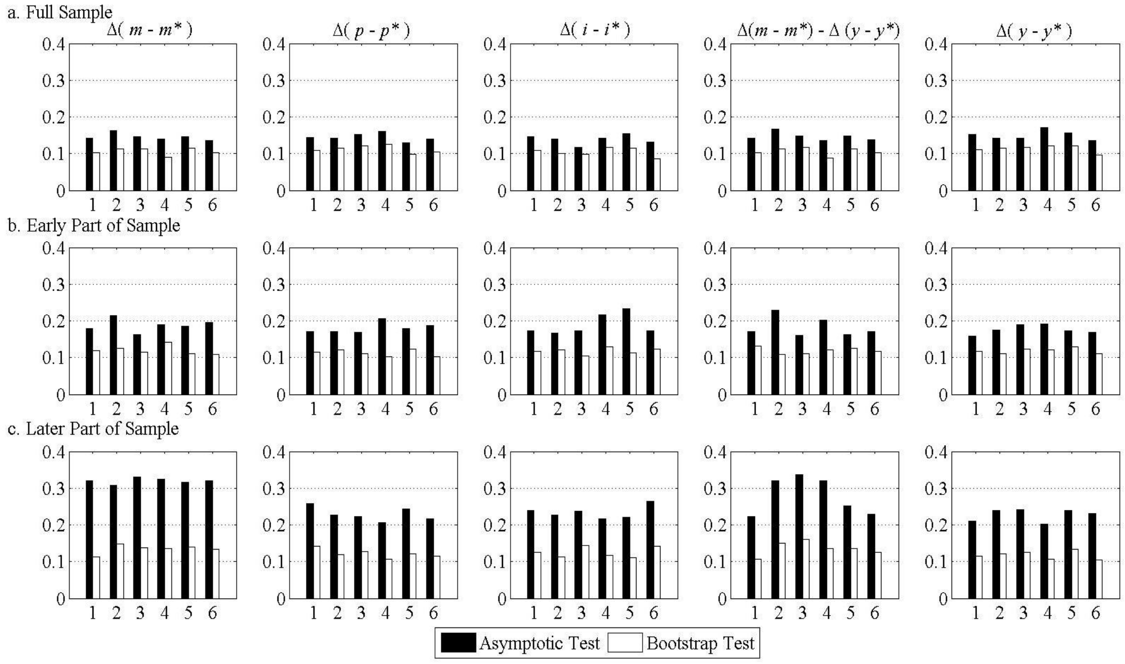

Figure 1. Size of the test. Numeric numbers 1 to 6 represents Canada, France, Germany, Italy, Japan, and the United Kingdom, respectively.

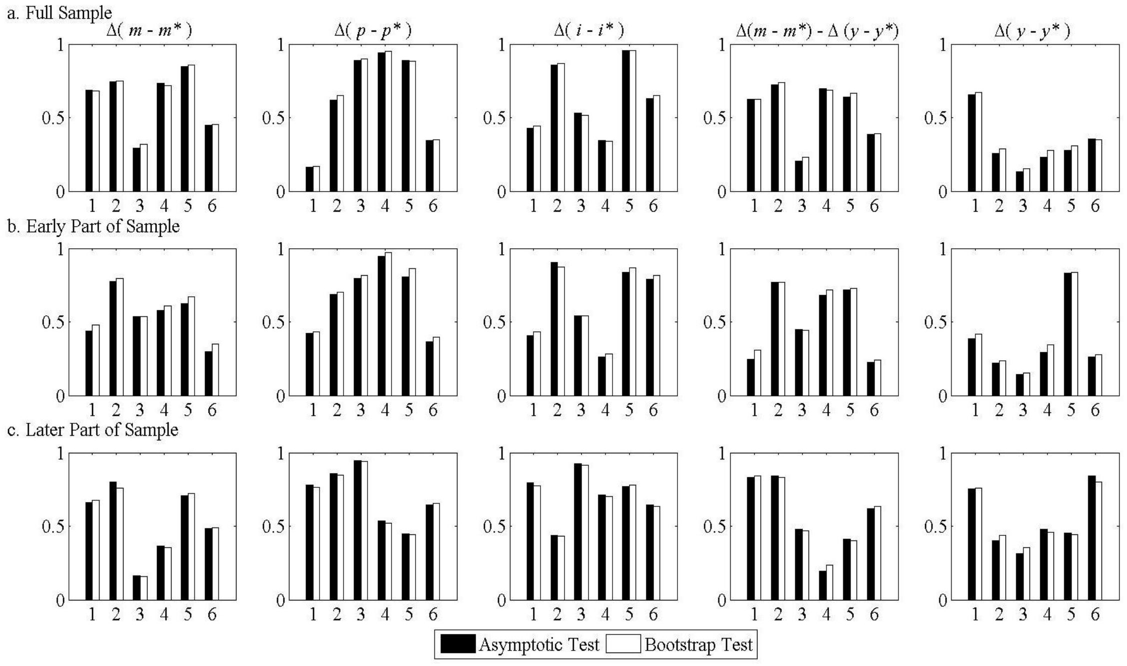

Figure 2. Power of the test. Numeric numbers 1 to 6 represents Canada, France, Germany, Italy, Japan, and the United Kingdom, respectively.

Appendix A1. The coefficients for the DGP in the size test—full sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.35	-0.02	-0.06	0.03	0.00	0.22	0.06	-0.04	-0.02
	Δf_t	-0.19	0.00	0.10	0.00	0.30	0.00	0.20	0.00	-0.07
France	Δs_t	0.20	0.20	-0.64	-0.17	0.05	0.21	0.13	0.14	0.22
	Δf_t	0.10	0.00	0.11	0.00	0.22	0.00	0.04	0.00	0.22
Germany	Δs_t	-0.42	0.14	-0.48	-0.13	-0.80	0.20	1.23	0.18	-0.40
	Δf_t	-0.14	0.00	0.33	0.00	0.23	0.00	0.01	0.00	0.05
Italy	Δs_t	0.36	0.32	-0.46	-0.23	0.55	0.17	0.20	0.16	-0.27
	Δf_t	-0.36	0.00	0.15	0.00	0.15	0.00	0.27	0.00	0.03
Japan	Δs_t	-1.03	0.08	-0.37	-0.14	0.27	0.17	-0.25	0.03	-0.46
	Δf_t	-0.06	0.00	0.35	0.00	0.16	0.00	-0.02	0.00	0.21
United Kingdom	Δs_t	0.31	0.27	-0.24	-0.22	-0.15	0.18	0.30	-0.02	0.05
	Δf_t	-0.40	0.00	0.43	0.00	0.15	0.00	0.11	0.00	-0.03

(b) $\Delta f_t = \Delta(p_t - p_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.33	-0.01	-0.45	0.05	0.95	0.21	0.34	-0.03	-0.75
	Δf_t	-0.02	0.00	0.42	0.00	0.02	0.00	0.17	0.00	-0.04
France	Δs_t	0.45	0.03	-1.18	-0.13	-1.42	0.14	1.10	0.11	1.16
	Δf_t	0.00	0.00	0.34	0.00	0.04	0.00	0.21	0.00	0.25
Germany	Δs_t	-0.61	0.08	-0.79	-0.12	0.69	0.19	0.65	0.15	0.54
	Δf_t	0.10	0.00	0.28	0.00	-0.02	0.00	0.08	0.00	0.39
Italy	Δs_t	0.68	0.13	-0.91	-0.11	0.88	0.08	-0.54	0.09	0.26
	Δf_t	-0.12	0.00	0.40	0.00	-0.03	0.00	0.23	0.00	0.21
Japan	Δs_t	-1.34	0.15	-0.27	-0.13	0.18	0.20	0.37	0.06	1.22
	Δf_t	0.20	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.39
United Kingdom	Δs_t	0.04	0.21	-0.27	-0.21	0.13	0.20	-0.12	-0.05	-0.39
	Δf_t	-0.10	0.00	0.17	0.00	0.14	0.00	-0.07	0.00	0.43

(c) $\Delta f_t = \Delta(i_t - i_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.38	-0.05	0.20	0.03	0.23	0.25	0.05	-0.02	-0.04
	Δf_t	0.05	0.00	-0.47	0.00	-0.10	0.00	0.10	0.00	-0.05
France	Δs_t	0.36	0.14	-0.02	-0.08	0.14	0.24	-0.17	0.11	-0.26
	Δf_t	0.09	0.00	-0.47	0.00	-0.34	0.00	-0.10	0.00	-0.14
Germany	Δs_t	-0.04	0.13	-0.20	-0.14	0.36	0.19	0.05	0.19	-0.41
	Δf_t	-0.04	0.00	-0.38	0.00	-0.27	0.00	0.21	0.00	-0.04

Italy	Δs_t	0.75	0.25	-0.20	-0.20	-0.05	0.23	-0.34	0.09	-0.38
	Δf_t	0.06	0.00	-0.57	0.00	-0.47	0.00	-0.35	0.00	-0.21
Japan	Δs_t	-0.38	0.07	0.61	-0.10	1.07	0.26	0.61	0.24	0.18
	Δf_t	-0.03	0.00	0.04	0.00	-0.35	0.00	0.13	0.00	-0.16
United Kingdom	Δs_t	0.32	0.25	0.05	-0.22	0.47	0.26	-0.02	-0.04	0.22
	Δf_t	0.06	0.00	-0.15	0.00	-0.17	0.00	-0.15	0.00	-0.16

(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.35	-0.02	-0.03	0.02	-0.02	0.22	0.04	-0.03	0.01
	Δf_t	-0.26	0.00	0.11	0.00	0.28	0.00	0.14	0.00	-0.03
France	Δs_t	0.15	0.19	-0.66	-0.17	-0.01	0.21	0.20	0.15	0.20
	Δf_t	-0.02	0.00	0.05	0.00	0.21	0.00	0.07	0.00	0.21
Germany	Δs_t	-0.48	0.13	-0.11	-0.14	-0.55	0.15	0.59	0.18	-0.34
	Δf_t	-0.23	0.00	0.19	0.00	0.05	0.00	0.19	0.00	0.19
Italy	Δs_t	0.29	0.29	-0.49	-0.22	0.33	0.17	0.10	0.17	0.02
	Δf_t	-0.66	0.00	0.17	0.00	0.09	0.00	0.18	0.00	0.04
Japan	Δs_t	-0.96	0.12	-0.18	-0.16	0.04	0.16	-0.10	0.05	-0.39
	Δf_t	-0.12	0.00	0.22	0.00	0.14	0.00	0.19	0.00	0.14
United Kingdom	Δs_t	0.08	0.25	-0.35	-0.22	-0.25	0.21	0.39	-0.01	0.04
	Δf_t	-0.58	0.00	0.37	0.00	0.12	0.00	0.21	0.00	-0.09

(e) $\Delta f_t = \Delta(y_t - y_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.36	-0.04	-0.19	0.03	0.11	0.21	0.04	-0.01	-0.21
	Δf_t	0.08	0.00	-0.16	0.00	-0.10	0.00	0.11	0.00	0.06
France	Δs_t	0.30	0.08	1.01	-0.09	-0.08	0.20	-0.03	0.14	-0.65
	Δf_t	0.16	0.00	0.19	0.00	0.12	0.00	0.08	0.00	-0.09
Germany	Δs_t	-0.14	0.08	0.00	-0.13	0.32	0.18	-0.07	0.16	0.27
	Δf_t	0.11	0.00	0.06	0.00	0.03	0.00	0.09	0.00	0.21
Italy	Δs_t	0.60	0.14	0.78	-0.11	0.14	0.16	0.59	0.12	-0.74
	Δf_t	0.17	0.00	0.14	0.00	0.05	0.00	0.00	0.00	-0.02
Japan	Δs_t	-0.63	0.15	-0.03	-0.14	0.16	0.19	-0.24	0.07	0.33
	Δf_t	0.07	0.00	0.01	0.00	0.04	0.00	0.25	0.00	0.06
United Kingdom	Δs_t	0.05	0.20	0.84	-0.20	0.69	0.24	-0.31	-0.02	0.12
	Δf_t	0.28	0.00	-0.05	0.00	-0.02	0.00	-0.03	0.00	-0.08

Appendix A2. The coefficients for the DGP in the size test—early part of the sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.17	0.06	0.01	-0.06	-0.02	0.22	0.08	-0.02	0.20
	Δf_t	0.23	0.00	0.01	0.00	0.07	0.00	0.17	0.00	-0.21
France	Δs_t	0.22	0.27	-0.87	-0.13	0.42	0.20	0.28	0.14	-0.30
	Δf_t	-0.07	0.00	0.00	0.00	0.14	0.00	-0.08	0.00	0.10
Germany	Δs_t	-0.35	0.19	-0.54	-0.09	-0.13	0.20	0.94	0.14	-0.62
	Δf_t	0.06	0.00	0.21	0.00	0.15	0.00	0.06	0.00	0.07
Italy	Δs_t	-0.19	0.31	-0.78	-0.14	0.86	0.21	0.33	0.22	-0.52
	Δf_t	-0.51	0.00	0.14	0.00	0.26	0.00	0.18	0.00	0.02
Japan	Δs_t	-0.75	0.11	-0.42	0.05	0.44	0.09	-0.12	0.04	-0.58
	Δf_t	0.16	0.00	0.26	0.00	0.12	0.00	-0.23	0.00	0.24
United Kingdom	Δs_t	-0.40	0.34	-0.22	-0.21	-0.36	0.28	0.09	-0.04	0.08
	Δf_t	-0.91	0.00	0.31	0.00	0.09	0.00	0.03	0.00	0.06

(b) $\Delta f_t = \Delta(p_t - p_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.16	0.09	-0.78	0.09	1.40	0.11	0.37	-0.04	-1.11
	Δf_t	-0.08	0.00	0.51	0.00	0.00	0.00	0.28	0.00	-0.21
France	Δs_t	-0.04	0.07	-2.69	-0.02	-1.05	0.06	0.99	0.09	1.56
	Δf_t	-0.04	0.00	0.38	0.00	-0.02	0.00	0.23	0.00	0.23
Germany	Δs_t	-1.61	0.12	-2.08	-0.02	1.22	0.10	1.70	0.06	0.69
	Δf_t	0.15	0.00	0.38	0.00	-0.26	0.00	0.36	0.00	0.28
Italy	Δs_t	-0.17	0.13	-0.93	0.01	0.48	-0.02	-0.48	0.14	0.25
	Δf_t	-0.35	0.00	0.37	0.00	-0.06	0.00	0.21	0.00	0.18
Japan	Δs_t	-1.43	0.13	0.38	0.03	-0.01	0.12	-0.19	0.04	1.24
	Δf_t	0.20	0.00	0.08	0.00	0.29	0.00	-0.06	0.00	0.44
United Kingdom	Δs_t	-0.21	0.30	-0.72	-0.19	0.29	0.27	0.28	-0.07	-0.50
	Δf_t	-0.27	0.00	0.20	0.00	0.12	0.00	-0.06	0.00	0.37

(c) $\Delta f_t = \Delta(i_t - i_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.25	0.06	0.06	-0.03	0.08	0.20	0.12	0.01	0.03
	Δf_t	-0.02	0.00	-0.55	0.00	-0.09	0.00	0.13	0.00	-0.06
France	Δs_t	0.23	0.20	0.11	0.06	0.10	0.20	-0.15	0.15	-0.30
	Δf_t	0.14	0.00	-0.54	0.00	-0.43	0.00	-0.17	0.00	-0.19
Germany	Δs_t	-0.28	0.25	-0.20	-0.10	0.26	0.18	-0.08	0.21	-0.53
	Δf_t	-0.06	0.00	-0.57	0.00	-0.55	0.00	-0.04	0.00	-0.17

Italy	Δs_t	0.23	0.32	-0.15	-0.06	-0.09	0.27	-0.44	0.18	-0.48
	Δf_t	-0.07	0.00	-0.72	0.00	-0.66	0.00	-0.52	0.00	-0.33
Japan	Δs_t	-0.18	0.00	0.92	0.08	0.99	0.25	0.58	0.28	0.07
	Δf_t	-0.14	0.00	-0.02	0.00	-0.42	0.00	0.07	0.00	-0.20
United Kingdom	Δs_t	0.25	0.34	0.19	-0.21	0.60	0.40	0.09	-0.03	0.26
	Δf_t	-0.03	0.00	-0.18	0.00	-0.20	0.00	-0.17	0.00	-0.17
(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.15	0.08	0.10	-0.06	-0.04	0.21	0.11	0.00	0.18
	Δf_t	0.18	0.00	-0.04	0.00	0.02	0.00	0.09	0.00	-0.13
France	Δs_t	0.20	0.28	-0.85	-0.14	0.35	0.23	0.32	0.14	-0.06
	Δf_t	-0.21	0.00	-0.06	0.00	0.07	0.00	-0.05	0.00	0.08
Germany	Δs_t	-0.41	0.18	-0.37	-0.05	-0.04	0.18	0.60	0.13	-0.46
	Δf_t	-0.07	0.00	0.04	0.00	0.01	0.00	0.16	0.00	0.13
Italy	Δs_t	-0.16	0.26	-0.65	-0.12	0.37	0.19	0.37	0.26	-0.16
	Δf_t	-0.84	0.00	0.28	0.00	0.01	0.00	0.11	0.00	0.04
Japan	Δs_t	-0.64	0.14	-0.10	0.08	0.24	0.05	-0.24	0.04	-0.37
	Δf_t	0.35	0.00	0.13	0.00	-0.07	0.00	0.05	0.00	0.02
United Kingdom	Δs_t	-0.83	0.32	-0.44	-0.22	-0.41	0.30	0.38	-0.01	-0.08
	Δf_t	-1.39	0.00	0.20	0.00	0.02	0.00	0.17	0.00	-0.08
(e) $\Delta f_t = \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.17	0.10	-0.44	-0.05	0.21	0.23	-0.27	-0.01	0.01
	Δf_t	0.07	0.00	-0.16	0.00	-0.22	0.00	0.12	0.00	-0.01
France	Δs_t	0.34	0.16	1.05	-0.03	-0.46	0.16	0.06	0.19	-1.15
	Δf_t	0.16	0.00	0.24	0.00	0.05	0.00	0.07	0.00	-0.11
Germany	Δs_t	-0.46	0.16	0.43	-0.07	-0.04	0.17	-0.51	0.14	0.50
	Δf_t	0.26	0.00	-0.23	0.00	-0.18	0.00	0.04	0.00	0.17
Italy	Δs_t	0.50	0.15	0.23	0.06	0.32	0.10	0.01	0.20	-0.87
	Δf_t	0.11	0.00	0.21	0.00	-0.03	0.00	-0.05	0.00	-0.01
Japan	Δs_t	-0.89	0.17	-0.75	0.03	-0.19	0.02	0.25	0.05	-0.01
	Δf_t	-0.17	0.00	0.05	0.00	-0.01	0.00	0.16	0.00	-0.12
United Kingdom	Δs_t	0.04	0.31	0.87	-0.19	0.52	0.35	-0.75	-0.05	0.26
	Δf_t	0.34	0.00	-0.05	0.00	-0.06	0.00	-0.04	0.00	-0.12

Appendix A3. The coefficients for the DGP in the size test—later part of the sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	1.11	-0.19	-0.09	0.07	0.16	0.11	0.21	-0.21	-0.20
	Δf_t	-0.80	0.00	0.11	0.00	0.39	0.00	0.09	0.00	-0.07
France	Δs_t	-0.22	-0.04	0.15	0.02	-0.37	0.25	-0.90	-0.10	1.08
	Δf_t	-0.12	0.00	0.11	0.00	0.11	0.00	0.24	0.00	0.31
Germany	Δs_t	-0.40	0.13	0.50	-0.08	-2.21	0.23	1.84	0.06	-0.44
	Δf_t	-0.41	0.00	0.52	0.00	0.28	0.00	0.04	0.00	-0.15
Italy	Δs_t	1.45	0.33	-0.02	-0.39	0.29	0.19	-0.26	-0.21	0.56
	Δf_t	-0.23	0.00	0.14	0.00	0.05	0.00	0.34	0.00	-0.01
Japan	Δs_t	-1.51	0.04	-0.03	-0.35	-0.30	0.22	-0.46	-0.04	-0.28
	Δf_t	-0.17	0.00	0.36	0.00	0.18	0.00	0.05	0.00	0.23
United Kingdom	Δs_t	1.16	-0.06	0.07	-0.27	-0.10	-0.02	0.31	-0.17	0.26
	Δf_t	-0.17	0.00	0.55	0.00	0.14	0.00	0.25	0.00	-0.22

(b) $\Delta f_t = \Delta(p_t - p_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	1.42	0.06	-2.46	-0.16	0.59	0.18	0.09	0.08	-1.27
	Δf_t	0.26	0.00	0.07	0.00	-0.06	0.00	-0.16	0.00	0.03
France	Δs_t	-4.06	-0.23	7.27	-0.15	4.92	0.18	5.61	0.09	-0.20
	Δf_t	0.29	0.00	-0.15	0.00	0.00	0.00	0.01	0.00	0.07
Germany	Δs_t	0.29	-0.17	2.87	-0.06	1.87	0.18	-2.20	-0.06	2.63
	Δf_t	0.06	0.00	0.20	0.00	0.29	0.00	-0.30	0.00	0.24
Italy	Δs_t	1.95	0.10	-0.86	-0.27	8.95	0.19	-4.76	-0.16	-0.65
	Δf_t	-0.03	0.00	0.42	0.00	0.05	0.00	0.22	0.00	0.02
Japan	Δs_t	-0.74	0.23	-2.67	-0.26	0.59	0.33	1.92	0.00	1.66
	Δf_t	0.32	0.00	-0.18	0.00	0.24	0.00	0.10	0.00	0.31
United Kingdom	Δs_t	0.75	-0.19	1.56	-0.30	-0.20	-0.01	-0.96	-0.19	0.90
	Δf_t	0.02	0.00	-0.03	0.00	0.05	0.00	-0.20	0.00	0.50

(c) $\Delta f_t = \Delta(i_t - i_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.89	-0.23	0.13	0.29	1.00	0.02	-0.41	-0.17	-0.47
	Δf_t	0.05	0.00	-0.16	0.00	-0.20	0.00	0.11	0.00	0.06
France	Δs_t	0.54	0.10	-1.44	-0.17	1.32	0.23	-0.75	0.04	-0.39
	Δf_t	0.05	0.00	0.07	0.00	0.14	0.00	-0.06	0.00	0.08
Germany	Δs_t	0.49	-0.08	-1.35	-0.04	0.14	0.14	2.07	0.06	-1.10
	Δf_t	0.01	0.00	0.44	0.00	0.22	0.00	0.30	0.00	-0.21

Italy	Δs_t	1.68	0.02	-0.25	-0.23	-0.48	0.10	0.16	-0.11	0.21
	Δf_t	0.08	0.00	0.05	0.00	0.06	0.00	0.18	0.00	-0.07
Japan	Δs_t	-0.45	0.14	-5.75	-0.32	4.88	0.24	2.52	0.17	-0.40
	Δf_t	-0.06	0.00	0.32	0.00	0.47	0.00	0.33	0.00	-0.16
United Kingdom	Δs_t	0.81	0.09	-1.45	-0.21	2.34	0.16	-2.61	0.00	-0.74
	Δf_t	0.10	0.00	0.31	0.00	-0.11	0.00	0.03	0.00	-0.26
(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	1.03	-0.19	-0.13	0.09	0.17	0.13	0.19	-0.20	-0.19
	Δf_t	-0.89	0.00	0.13	0.00	0.45	0.00	0.02	0.00	-0.12
France	Δs_t	-0.38	-0.08	0.07	0.01	-0.63	0.18	-0.55	-0.02	0.85
	Δf_t	-0.34	0.00	-0.01	0.00	0.20	0.00	0.17	0.00	0.37
Germany	Δs_t	-1.40	0.05	0.38	-0.19	-1.87	0.07	0.85	0.06	-0.22
	Δf_t	-0.74	0.00	0.27	0.00	0.19	0.00	0.07	0.00	0.18
Italy	Δs_t	1.42	0.35	-0.12	-0.40	0.29	0.25	-0.55	-0.25	0.74
	Δf_t	-0.59	0.00	0.02	0.00	0.14	0.00	0.26	0.00	0.08
Japan	Δs_t	-2.07	0.09	-0.17	-0.36	-0.65	0.19	0.09	-0.02	-0.31
	Δf_t	-0.33	0.00	0.01	0.00	0.31	0.00	0.29	0.00	0.23
United Kingdom	Δs_t	1.16	0.00	-0.32	-0.37	0.54	0.11	-0.39	-0.24	0.62
	Δf_t	-0.17	0.00	0.60	0.00	0.15	0.00	0.19	0.00	-0.21
(e) $\Delta f_t = \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.78	-0.23	0.54	0.02	0.38	0.22	0.67	-0.03	-0.49
	Δf_t	0.05	0.00	-0.12	0.00	0.26	0.00	-0.01	0.00	0.08
France	Δs_t	-1.60	-0.19	2.15	-0.15	2.74	0.25	0.36	0.12	0.33
	Δf_t	0.25	0.00	-0.04	0.00	0.29	0.00	0.14	0.00	-0.10
Germany	Δs_t	-1.78	-0.23	1.24	-0.10	3.38	0.22	0.82	0.11	-0.12
	Δf_t	0.45	0.00	-0.17	0.00	0.17	0.00	-0.04	0.00	0.15
Italy	Δs_t	-0.64	0.02	2.55	-0.33	0.72	0.17	2.53	-0.04	-0.58
	Δf_t	0.36	0.00	-0.06	0.00	0.12	0.00	0.17	0.00	-0.07
Japan	Δs_t	-0.01	0.11	-0.05	-0.19	0.30	0.31	-0.58	0.04	0.04
	Δf_t	0.81	0.00	-0.35	0.00	-0.22	0.00	0.11	0.00	0.12
United Kingdom	Δs_t	-0.34	-0.11	1.06	-0.22	0.75	0.06	2.28	-0.11	0.34
	Δf_t	0.06	0.00	-0.02	0.00	0.29	0.00	0.04	0.00	0.16

Appendix B1. The coefficients for the DGP in the power test—full sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.35	-0.03	-0.06	0.03	0.00	0.22	0.06	-0.05	-0.02
	Δf_t	-0.29	0.14	0.11	0.07	0.33	-0.13	0.16	0.16	-0.08
France	Δs_t	0.22	0.16	-0.63	-0.16	0.03	0.21	0.12	0.14	0.22
	Δf_t	0.14	-0.12	0.15	0.01	0.16	0.00	0.00	-0.01	0.24
Germany	Δs_t	-0.41	0.14	-0.48	-0.13	-0.80	0.20	1.23	0.18	-0.40
	Δf_t	-0.11	0.00	0.33	0.04	0.23	0.00	0.03	0.01	0.07
Italy	Δs_t	0.40	0.26	-0.44	-0.21	0.52	0.18	0.20	0.17	-0.25
	Δf_t	-0.30	-0.10	0.19	0.03	0.10	0.01	0.28	0.02	0.07
Japan	Δs_t	-1.08	0.11	-0.36	-0.18	0.26	0.16	-0.28	0.01	-0.46
	Δf_t	0.04	-0.05	0.33	0.08	0.18	0.02	0.04	0.05	0.22
United Kingdom	Δs_t	0.33	0.23	-0.21	-0.20	-0.17	0.20	0.27	-0.02	0.08
	Δf_t	-0.38	-0.06	0.48	0.03	0.12	0.02	0.07	0.00	0.01
(b) $\Delta f_t = \Delta(p_t - p_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.34	-0.01	-0.45	0.04	0.95	0.21	0.34	-0.03	-0.75
	Δf_t	0.00	-0.01	0.41	-0.01	0.02	-0.01	0.18	-0.01	-0.02
France	Δs_t	0.43	0.05	-1.05	-0.10	-1.38	0.18	1.17	0.12	1.10
	Δf_t	0.01	-0.01	0.29	-0.01	0.03	-0.02	0.18	-0.01	0.27
Germany	Δs_t	-0.61	0.07	-0.81	-0.13	0.69	0.18	0.65	0.14	0.55
	Δf_t	0.12	-0.02	0.22	-0.02	-0.02	-0.02	0.07	-0.01	0.41
Italy	Δs_t	0.66	0.14	-0.88	-0.10	0.89	0.12	-0.50	0.08	0.24
	Δf_t	-0.10	-0.01	0.37	-0.01	-0.04	-0.05	0.19	0.01	0.24
Japan	Δs_t	-1.43	0.15	-0.37	-0.16	0.17	0.17	0.45	0.03	1.30
	Δf_t	0.14	0.00	-0.06	-0.02	0.29	-0.02	0.05	-0.02	0.44
United Kingdom	Δs_t	0.04	0.21	-0.27	-0.21	0.13	0.20	-0.12	-0.05	-0.39
	Δf_t	-0.10	0.00	0.18	-0.01	0.15	-0.02	-0.08	0.02	0.43
(c) $\Delta f_t = \Delta(i_t - i_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.38	-0.05	0.20	0.03	0.23	0.25	0.05	-0.02	-0.04
	Δf_t	0.06	-0.09	-0.46	0.00	-0.06	0.05	0.13	0.02	-0.05
France	Δs_t	0.39	0.08	-0.01	-0.11	0.16	0.21	-0.13	0.15	-0.26
	Δf_t	0.16	-0.11	-0.45	-0.06	-0.30	-0.07	-0.01	0.09	-0.15
Germany	Δs_t	-0.04	0.09	-0.18	-0.15	0.36	0.19	0.06	0.19	-0.41
	Δf_t	-0.04	-0.05	-0.36	-0.02	-0.26	0.01	0.22	0.00	-0.03

Italy	Δs_t	0.76	0.23	-0.20	-0.22	-0.03	0.24	-0.33	0.11	-0.38
	Δf_t	0.09	-0.04	-0.56	-0.06	-0.42	0.04	-0.33	0.04	-0.22
Japan	Δs_t	-0.42	0.05	0.58	-0.13	1.07	0.26	0.60	0.22	0.19
	Δf_t	-0.12	-0.04	-0.04	-0.08	-0.36	0.00	0.10	-0.04	-0.12
United Kingdom	Δs_t	0.33	0.22	0.05	-0.23	0.49	0.26	-0.01	-0.04	0.23
	Δf_t	0.11	-0.08	-0.14	-0.03	-0.14	0.01	-0.13	0.00	-0.15
(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.35	-0.03	-0.03	0.01	-0.02	0.23	0.04	-0.04	0.01
	Δf_t	-0.38	0.06	0.11	0.09	0.29	-0.08	0.12	0.21	-0.02
France	Δs_t	0.16	0.15	-0.65	-0.16	-0.03	0.21	0.19	0.15	0.21
	Δf_t	0.01	-0.12	0.09	0.02	0.14	0.00	0.02	-0.02	0.24
Germany	Δs_t	-0.47	0.13	-0.11	-0.14	-0.55	0.15	0.59	0.18	-0.34
	Δf_t	-0.20	-0.02	0.19	0.05	0.05	0.00	0.19	0.01	0.22
Italy	Δs_t	0.32	0.24	-0.47	-0.20	0.31	0.18	0.10	0.16	0.04
	Δf_t	-0.59	-0.10	0.22	0.05	0.04	0.02	0.16	-0.01	0.08
Japan	Δs_t	-0.98	0.12	-0.18	-0.17	0.04	0.16	-0.10	0.04	-0.39
	Δf_t	-0.03	-0.05	0.22	0.07	0.12	0.00	0.22	0.06	0.16
United Kingdom	Δs_t	0.08	0.24	-0.34	-0.19	-0.27	0.20	0.39	-0.01	0.05
	Δf_t	-0.58	-0.03	0.40	0.07	0.07	-0.02	0.21	0.01	-0.07
(e) $\Delta f_t = \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.36	-0.01	-0.20	0.03	0.12	0.20	0.05	-0.03	-0.21
	Δf_t	0.09	0.07	-0.20	0.00	-0.08	-0.03	0.13	-0.07	0.07
France	Δs_t	0.30	0.08	1.01	-0.09	-0.08	0.20	-0.04	0.14	-0.65
	Δf_t	0.16	-0.01	0.19	-0.02	0.14	0.00	0.09	0.01	-0.09
Germany	Δs_t	-0.15	0.08	0.00	-0.13	0.32	0.18	-0.07	0.15	0.27
	Δf_t	0.11	0.01	0.06	0.01	0.03	0.01	0.08	0.01	0.21
Italy	Δs_t	0.60	0.14	0.78	-0.11	0.14	0.16	0.59	0.13	-0.74
	Δf_t	0.17	0.00	0.14	-0.01	0.06	-0.01	0.01	0.02	-0.02
Japan	Δs_t	-0.63	0.16	-0.03	-0.14	0.15	0.18	-0.24	0.07	0.33
	Δf_t	0.06	-0.02	0.01	0.00	0.05	0.02	0.27	0.00	0.05
United Kingdom	Δs_t	0.05	0.20	0.84	-0.21	0.70	0.25	-0.30	-0.03	0.12
	Δf_t	0.28	0.00	-0.04	-0.03	-0.01	0.01	-0.01	0.00	-0.07

Appendix B2. The coefficients for the DGP in the power test—early part of the sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.17	0.07	0.01	-0.06	-0.02	0.22	0.08	-0.02	0.20
	Δf_t	0.20	0.15	0.03	0.03	0.09	-0.13	0.14	0.08	-0.21
France	Δs_t	0.24	0.24	-0.88	-0.13	0.37	0.17	0.28	0.14	-0.31
	Δf_t	0.03	-0.14	-0.02	0.01	-0.06	-0.11	-0.06	0.02	0.04
Germany	Δs_t	-0.35	0.19	-0.54	-0.09	-0.13	0.20	0.94	0.14	-0.62
	Δf_t	0.10	-0.01	0.23	0.07	0.14	-0.03	0.08	0.01	0.07
Italy	Δs_t	-0.17	0.28	-0.78	-0.12	0.84	0.21	0.34	0.22	-0.50
	Δf_t	-0.44	-0.10	0.16	0.05	0.16	0.01	0.21	0.02	0.10
Japan	Δs_t	-0.82	0.14	-0.42	0.02	0.48	0.08	-0.19	-0.02	-0.59
	Δf_t	0.26	-0.04	0.25	0.05	0.07	0.00	-0.12	0.08	0.26
United Kingdom	Δs_t	-0.41	0.31	-0.20	-0.20	-0.36	0.29	0.07	-0.03	0.08
	Δf_t	-0.93	-0.05	0.33	0.01	0.09	0.02	0.00	0.03	0.06

(b) $\Delta f_t = \Delta(p_t - p_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.15	0.06	-0.81	0.13	1.41	0.12	0.47	-0.04	-1.19
	Δf_t	-0.07	0.03	0.55	-0.05	-0.01	-0.01	0.17	0.00	-0.12
France	Δs_t	0.07	0.07	-2.60	0.03	-0.97	0.08	1.08	0.11	1.63
	Δf_t	-0.09	0.00	0.33	-0.03	-0.07	-0.01	0.18	-0.02	0.18
Germany	Δs_t	-1.63	0.12	-2.05	0.02	1.21	0.11	1.77	0.08	0.68
	Δf_t	0.17	0.01	0.36	-0.03	-0.25	-0.01	0.29	-0.01	0.29
Italy	Δs_t	0.01	0.14	-0.85	0.04	0.50	0.06	-0.37	0.13	0.25
	Δf_t	-0.52	-0.01	0.28	-0.03	-0.08	-0.09	0.11	0.01	0.18
Japan	Δs_t	-1.52	0.14	0.29	0.00	-0.02	0.08	-0.11	0.02	1.29
	Δf_t	0.11	0.00	-0.02	-0.03	0.28	-0.03	0.02	-0.02	0.48
United Kingdom	Δs_t	-0.21	0.30	-0.72	-0.19	0.29	0.27	0.28	-0.07	-0.50
	Δf_t	-0.28	0.00	0.22	-0.02	0.12	-0.03	-0.09	0.03	0.36

(c) $\Delta f_t = \Delta(i_t - i_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.25	0.04	0.07	-0.05	0.11	0.25	0.11	0.01	0.02
	Δf_t	-0.03	-0.06	-0.52	-0.04	-0.01	0.12	0.11	0.01	-0.09
France	Δs_t	0.25	0.12	0.12	0.01	0.14	0.16	-0.07	0.22	-0.28
	Δf_t	0.19	-0.17	-0.54	-0.12	-0.35	-0.10	0.00	0.15	-0.16
Germany	Δs_t	-0.34	0.18	-0.14	-0.14	0.32	0.19	-0.04	0.19	-0.51
	Δf_t	-0.12	-0.07	-0.52	-0.03	-0.48	0.02	0.00	-0.01	-0.14

Italy	Δs_t	0.30	0.27	-0.13	-0.11	-0.04	0.28	-0.40	0.20	-0.47
	Δf_t	0.06	-0.10	-0.68	-0.10	-0.55	0.01	-0.44	0.04	-0.31
Japan	Δs_t	-0.27	-0.03	0.90	0.01	1.01	0.27	0.58	0.25	0.09
	Δf_t	-0.29	-0.06	-0.05	-0.12	-0.38	0.03	0.08	-0.05	-0.16
United Kingdom	Δs_t	0.28	0.28	0.19	-0.22	0.63	0.41	0.11	-0.02	0.26
	Δf_t	0.05	-0.15	-0.18	-0.03	-0.11	0.03	-0.10	0.02	-0.15

(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.15	0.08	0.10	-0.06	-0.04	0.22	0.11	-0.01	0.18
	Δf_t	0.15	0.07	-0.02	0.01	0.02	-0.09	0.07	0.13	-0.12
France	Δs_t	0.22	0.24	-0.84	-0.13	0.30	0.21	0.32	0.15	-0.07
	Δf_t	-0.13	-0.16	-0.05	0.04	-0.16	-0.12	-0.02	0.02	0.04
Germany	Δs_t	-0.42	0.18	-0.37	-0.07	-0.04	0.19	0.59	0.13	-0.46
	Δf_t	0.00	-0.02	0.04	0.10	0.01	-0.02	0.19	0.02	0.13
Italy	Δs_t	-0.11	0.22	-0.63	-0.09	0.34	0.19	0.37	0.26	-0.14
	Δf_t	-0.70	-0.12	0.34	0.09	-0.07	0.00	0.11	-0.02	0.11
Japan	Δs_t	-0.70	0.15	-0.13	0.03	0.28	0.08	-0.27	-0.01	-0.37
	Δf_t	0.46	-0.02	0.20	0.10	-0.13	-0.06	0.10	0.09	0.02
United Kingdom	Δs_t	-0.83	0.31	-0.44	-0.21	-0.42	0.30	0.38	-0.01	-0.07
	Δf_t	-1.38	-0.03	0.21	0.05	-0.01	-0.03	0.18	0.04	-0.05

(e) $\Delta f_t = \Delta(y_t - y_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.17	0.13	-0.46	-0.04	0.21	0.22	-0.26	-0.02	0.01
	Δf_t	0.05	0.07	-0.21	0.05	-0.19	-0.01	0.13	-0.04	0.01
France	Δs_t	0.34	0.16	1.05	-0.03	-0.46	0.16	0.06	0.19	-1.15
	Δf_t	0.16	0.00	0.24	-0.02	0.06	0.00	0.09	0.01	-0.12
Germany	Δs_t	-0.47	0.17	0.43	-0.08	-0.04	0.17	-0.51	0.13	0.50
	Δf_t	0.26	0.02	-0.24	-0.01	-0.18	0.00	0.05	-0.01	0.19
Italy	Δs_t	0.50	0.15	0.23	0.05	0.33	0.10	0.01	0.21	-0.87
	Δf_t	0.10	0.00	0.21	-0.02	-0.01	-0.01	-0.06	0.03	0.00
Japan	Δs_t	-0.90	0.16	-0.75	0.01	-0.18	0.03	0.24	0.06	-0.01
	Δf_t	-0.23	-0.03	0.05	-0.06	0.01	0.04	0.13	0.01	-0.11
United Kingdom	Δs_t	0.04	0.31	0.87	-0.21	0.53	0.36	-0.74	-0.05	0.26
	Δf_t	0.33	0.00	-0.03	-0.04	-0.03	0.03	-0.02	0.00	-0.11

Appendix B3. The coefficients for the DGP in the power test—later part of the sample

(a) $\Delta f_t = \Delta(m_t - m_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	1.05	-0.17	-0.10	0.09	0.16	0.12	0.21	-0.19	-0.20
	Δf_t	-1.72	0.25	0.02	0.28	0.40	0.08	0.06	0.35	-0.10
France	Δs_t	-0.22	-0.02	0.12	0.01	-0.40	0.22	-0.84	-0.08	1.07
	Δf_t	-0.10	-0.14	0.29	0.02	0.29	0.14	-0.12	-0.09	0.32
Germany	Δs_t	-0.41	0.14	0.51	-0.09	-2.20	0.21	1.83	0.05	-0.48
	Δf_t	-0.40	-0.01	0.51	0.02	0.27	0.04	0.04	0.02	-0.08
Italy	Δs_t	1.55	0.22	0.08	-0.38	0.35	0.20	-0.29	-0.19	0.50
	Δf_t	-0.10	-0.15	0.27	0.00	0.13	0.01	0.30	0.03	-0.09
Japan	Δs_t	-1.55	0.05	-0.03	-0.38	-0.34	0.21	-0.44	-0.04	-0.28
	Δf_t	-0.01	-0.03	0.38	0.11	0.33	0.05	-0.03	-0.01	0.25
United Kingdom	Δs_t	1.18	-0.12	0.17	-0.21	-0.20	-0.02	0.29	-0.18	0.30
	Δf_t	-0.13	-0.10	0.72	0.10	-0.03	0.00	0.21	-0.02	-0.15

(b) $\Delta f_t = \Delta(p_t - p_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	1.30	-0.09	-1.68	-0.06	0.43	0.25	-0.02	-0.04	-0.98
	Δf_t	0.22	-0.05	0.33	0.03	-0.11	0.02	-0.19	-0.04	0.12
France	Δs_t	-4.06	-0.23	7.27	-0.15	4.93	0.18	5.60	0.09	-0.20
	Δf_t	0.26	-0.01	0.03	0.02	0.18	-0.01	-0.22	-0.01	0.05
Germany	Δs_t	0.28	-0.15	2.73	-0.07	1.88	0.18	-2.06	-0.04	2.51
	Δf_t	0.08	-0.02	0.40	0.02	0.27	0.00	-0.48	-0.03	0.39
Italy	Δs_t	2.05	0.08	-0.93	-0.28	8.96	0.18	-4.62	-0.17	-0.61
	Δf_t	0.06	-0.02	0.36	-0.01	0.06	-0.01	0.34	-0.01	0.05
Japan	Δs_t	-0.78	0.24	-2.83	-0.33	0.68	0.30	1.91	-0.06	1.72
	Δf_t	0.31	0.00	-0.24	-0.03	0.27	-0.01	0.10	-0.02	0.33
United Kingdom	Δs_t	0.59	-0.08	1.12	-0.18	-0.63	0.03	-1.08	-0.14	0.91
	Δf_t	-0.04	0.04	-0.19	0.04	-0.11	0.01	-0.24	0.02	0.50

(c) $\Delta f_t = \Delta(i_t - i_t^*)$

		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.93	-0.22	0.06	0.29	1.01	0.12	-0.32	-0.33	-0.69
	Δf_t	0.01	-0.02	-0.09	-0.01	-0.21	-0.11	0.02	0.16	0.28
France	Δs_t	0.59	0.20	-1.56	-0.30	1.70	0.24	-1.03	-0.01	-0.24
	Δf_t	0.08	0.06	0.00	-0.07	0.35	0.01	-0.22	-0.03	0.16
Germany	Δs_t	0.55	-0.05	-1.58	-0.09	0.82	0.06	2.12	0.08	-1.65
	Δf_t	0.03	0.01	0.33	-0.03	0.54	-0.04	0.32	0.01	-0.46

Italy	Δs_t	1.60	0.07	-0.23	-0.25	-0.48	0.14	0.15	-0.12	0.22
	Δf_t	-0.06	0.09	0.08	-0.04	0.07	0.07	0.17	-0.02	-0.06
Japan	Δs_t	-0.46	0.19	-5.54	-0.29	4.92	0.26	2.47	0.11	-0.53
	Δf_t	-0.06	-0.02	0.24	-0.01	0.46	-0.01	0.35	0.02	-0.11
United Kingdom	Δs_t	0.85	0.14	-1.55	-0.40	3.64	0.06	-3.09	0.09	-0.91
	Δf_t	0.11	0.02	0.28	-0.06	0.31	-0.03	-0.13	0.03	-0.31
(d) $\Delta f_t = \Delta(m_t - m_t^*) - \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.98	-0.18	-0.14	0.10	0.17	0.13	0.19	-0.18	-0.19
	Δf_t	-2.01	0.26	0.00	0.37	0.45	0.12	0.01	0.42	-0.13
France	Δs_t	-0.38	-0.06	0.04	0.00	-0.67	0.15	-0.48	0.00	0.85
	Δf_t	-0.35	-0.12	0.15	0.07	0.37	0.17	-0.15	-0.09	0.40
Germany	Δs_t	-1.40	0.07	0.38	-0.22	-1.90	0.04	0.90	0.06	-0.26
	Δf_t	-0.72	-0.05	0.28	0.11	0.29	0.09	-0.15	0.03	0.37
Italy	Δs_t	1.40	0.31	-0.08	-0.40	0.32	0.28	-0.59	-0.24	0.71
	Δf_t	-0.62	-0.08	0.07	-0.01	0.20	0.06	0.19	0.01	0.03
Japan	Δs_t	-2.01	0.08	-0.15	-0.35	-0.62	0.21	0.06	-0.01	-0.31
	Δf_t	-0.18	-0.03	0.06	0.02	0.37	0.07	0.22	0.03	0.24
United Kingdom	Δs_t	1.19	-0.06	-0.16	-0.27	0.36	0.09	-0.39	-0.26	0.66
	Δf_t	-0.12	-0.09	0.82	0.13	-0.09	-0.02	0.19	-0.03	-0.15
(e) $\Delta f_t = \Delta(y_t - y_t^*)$										
		c	Δs_{t-1}	Δf_{t-1}	Δs_{t-2}	Δf_{t-2}	Δs_{t-3}	Δf_{t-3}	Δs_{t-4}	Δf_{t-4}
Canada	Δs_t	0.87	-0.22	0.47	-0.02	0.35	0.17	0.73	-0.08	-0.46
	Δf_t	0.18	0.02	-0.24	-0.07	0.20	-0.07	0.08	-0.09	0.11
France	Δs_t	-1.60	-0.19	2.15	-0.15	2.75	0.25	0.37	0.12	0.33
	Δf_t	0.22	-0.03	-0.09	-0.03	0.35	-0.01	0.27	0.00	-0.04
Germany	Δs_t	-1.76	-0.23	1.28	-0.12	3.41	0.19	0.79	0.10	-0.11
	Δf_t	0.48	0.00	-0.13	-0.01	0.20	-0.03	-0.08	-0.01	0.15
Italy	Δs_t	-0.64	0.00	2.53	-0.34	0.77	0.16	2.57	-0.04	-0.52
	Δf_t	0.38	-0.04	-0.11	-0.03	0.25	-0.02	0.27	-0.01	0.07
Japan	Δs_t	0.00	0.16	0.03	-0.26	0.16	0.28	-0.66	0.03	0.12
	Δf_t	0.80	-0.04	-0.40	0.05	-0.12	0.02	0.16	0.01	0.07
United Kingdom	Δs_t	-0.34	-0.11	1.06	-0.22	0.75	0.06	2.28	-0.11	0.34
	Δf_t	0.06	-0.05	-0.13	-0.05	0.37	-0.02	0.16	0.01	0.28