Chapter 14

Net Investment and Business Cycle: Using 'sin' in G and PRI Sectors

Signpost to Chapter 14

This chapter summarizes Author's business cycle. Author's business cycle under the endogenous-equilibrium differs from business cycle in the literature in several points:

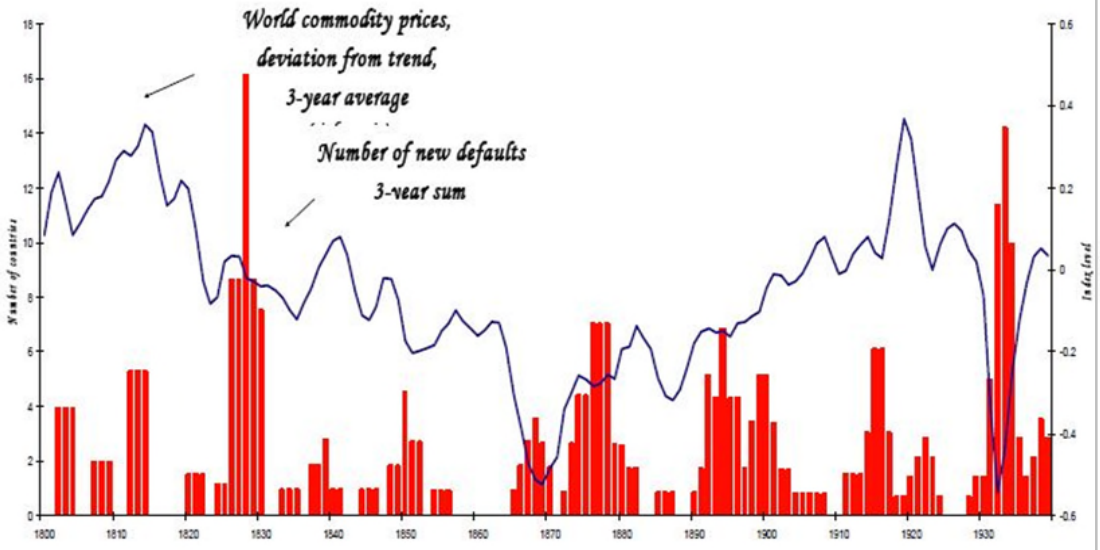
1. The purpose of business cycle is to analyze dynamic policy balances between the private (PRI) sector and government (G) sector. The literature usually investigates private business cycle because final income or *GDP* is distributed to enterprises and households, which follows the SNA (1993). Contrarily the endogenous system approves consumption + saving = returns + wages each at the PRI and G sectors since final disposable income is replaced by that just before the redistribution of endogenous taxes.
2. Endogenous business cycle, beyond space and time, fully reflects the neutrality of the financial/market assets to the real assets (recall Chapter 2). The results of the business cycle based on the real assets are just 'turn over' the business cycle based on the financial/market assets. There is no difference between both results under the neutrality.
3. Business cycle is another integrated expression of the endogenous system, where seven endogenous parameters, hidden in the discrete Cobb-Douglas production function, simultaneously determine all the parameters and variables. This is because endogenous business cycle is shown using net investment and its growth that hold in an open endogenous economy. Minimum net investment produces maximum returns by country, sector, and year and over years. Business cycle totally reflects resultant policies executed economic, real and financial/market, and the central bank. Yet, finally business cycle follows the above neutrality. For example, see Figure 7 of Reinhart and Rogoff (33, 2008) below. The Figure 7 reflects the real assets, although endogenous net investment has not been measured accurately up to date. True causes always come from the real assets.
4. Unsolved serious problem is represented by the rate of unemployment. Leaders and policy-makers are eager to directly erase unemployment even using fiscal policy. Historically the current economic policies have been unsuccessful. Fiscal policy reduces real endogenous growth. Recall that Samuelson (1942, 1975). Zero deficit results in most robust economic activities and, this discovery has been theoretically and empirically proved in Chapters 3, 4, 5, 12, and 13. This chapter first of all clarifies why the rate of involuntary unemployment is always zero at the endogenous system. The rate of change in population and the rate of unemployment is closely related. It is

another discovery that under the decrease in population, the rate of technological progress increases more than that under increasing population (see Chapter 15).

5. Business cycle is indispensable even under no unemployment. Adjustments by net investment guarantee the sustainability of an economy. Business cycle, however, reflects various levels of qualitative shocks. Directly; these shocks are expressed by the speed years for convergence by country and sector. The endogenous system has an optimum range of the speed years and is shown by the speed year hyperbola function each to net investment and population (see Chapters 7, 11, Appendix). Surprisingly, net investment and population growth rate are related numerically. Nature promises us bright future.

Reinhart, C. M., and K. S. Rogoff (page 33, WP 13882, 2008, NBER, Cambridge, MA, 123p.).

Figure 7. Commodity Prices and New External Defaults
1800–1939



(The author got Permissions for the use of Figure 7 from Reinhart and Rogoff, via NBER, Cambridge, MA, on Oct 14, 2012 and accordingly, from Princeton Univ. Press, 2009, for page 781 Figure, the same as the above Figure 7).

Note 1: During the last 21 years, we have had financial crisis called once a hundred years. The author, separately from the *EES*, intends to compare endogenous results with those in 1910-1940 or 1920-1940 statistics or measuring endogenous data that are converted from Maddison's estimated data. Also, the author intends to compare longer unique results estimated by Maddison Angus (1987, 1995, 1996), e.g., in 1820-1992 and also in 1960-2010

(see Chapter 6 for capital stock, 1960-2010). Maddison's methodology really presents an available base not only for PWT and EPWT but also for a few representative databases. The author expresses revere thankfulness for life-work of Reinhart, C. M., and K. S. Rogoff and, Angus Maddison.

Note 2: For methodologies to KEWT data-sets, Chapter 14 is interrelated to Chapter 15. The aspect of Chapter 14 is net investment to output, $i = (I/Y)$ or more accurately, $i^* = (I^*/Y^*)$, while the aspect of Chapter 15 is the rate of change in population, $n = (L_t - L_{t-1})/L_{t-1}$ or more accurately, $n_E = (L_t - L_{t-1})/L_{t-1}$, where $n_E = n$ under full-employment.

14.1 Proof of Full-employment in the KEWT Database 6.12

Before entering Hicks' (1950) sin business cycle, this chapter first proves full-employment theoretically and empirically (see **Tables UN1** and **UN2** for 46 countries). The author defines the rate of unemployment as the difference between the actual growth rate of population, *n*, and the endogenous rate of change in population, n_E.

Theoretically, full-employment exists with no assumption at the endogenous-equilibrium by country (see **BOX 14-1** below). Why full-employment? The intercept of the rate of return function to the rate of change in population, $r(n)$ or $r^*(n)$, where $r = r^* = r_0$, guarantees no unemployment. Because: The intercept by country is always higher than $n_E = n$. The vertical asymptote crosses the intercept, which is composed of two endogenous parameters, the relative share of capital, $\alpha = \Pi/Y$, and the qualitative net investment coefficient, β^*: $Intercept = (\alpha(1-\beta^*)/\beta^*(1-\alpha))$. A country that shows a high actual statistical rate of unemployment is out of a dynamic balance required for α and β^*. This country does not compatibly connect α with β^*. $\alpha = \Omega \cdot r$ controls a core of the real assets and, β^* determines the quality of net investment. As a result, unemployment does not exist endogenously.

A specific warning against a high rate of unemployment is the gradient of $r(n)$. Look at Tables UN1 and UN2. If an actual rate of unemployment rises, the $gradient(i, n, \alpha, \beta^*)$ simultaneously rises up. The gradient crosses the two-dimension origin. The gradient is always positive to the right but, big difference appears between countries. It is essential for policy-makers to lower the actual rate of unemployment; i.e, by reducing $gradient(i, n, \alpha, \beta^*)$.

In short, there exists no unemployment endogenously. Nevertheless we are waked up by perceiving the controllability of seven endogenous parameters. National taste and technology are wholly integrated in any country. A developing country must carefully march on the correct road, watching dynamic balance between its technological progress and taste, culture, and history.

BOX 14-1 Endogenous proof using a reduced linear form of hyperbola (see geographical hyperbola at 2-3 $r^*(n)$ by country in Appendix of the *EES*)

$$r^*(n) = \frac{\{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)\}n+i\cdot\alpha(1-\beta^*)}{i\cdot\beta^*(1-\alpha)}.$$

$$y = \frac{C}{B}x + \frac{D}{B} = \frac{Cx+D}{B}. \quad B = i\cdot\beta^*(1-\alpha). \quad C = i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha).$$

$$D = i\cdot\alpha(1-\beta^*). \quad \frac{C}{B} = \frac{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)}{i\cdot\beta^*(1-\alpha)}. \quad \frac{D}{B} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

$$r^*(n) = \left(\frac{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)}{i\cdot\beta^*(1-\alpha)}\right)n + \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

$$Gradient_{r^*(n)} = \frac{\alpha\{i(1-\beta^*)+(1-\alpha)\}}{i\cdot\beta^*(1-\alpha)}. \quad Intercept_{r^*(n)} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

14.2 Fingleton (2012), Blinder (2012), and Bernanke and Blinder (1992): Related to Unemployment

Why doesn't full-employment exist by country in the actual world? Let the author briefly review *three articles* related to unemployment: i) Fingleton (2012), ii) Blinder (2012), and iii) Bernanke and Blinder (1992).

The first **article**: "The Myth if Japan's Failure" by Fingleton, Eamonn (*New York Times* Sunday Review, Jan 8, 2012) stresses that Japan stands on the opposite side of economic failure as a country, by raising several phenomenal robust facts compared with those of other countries. The author agrees to a rate of unemployment at the lowest level of 4.2% among countries. These facts are true from a phenomenal viewpoint of policies and strategies. But, these facts remain results and a decisive fact is hidden. These facts only appear at the sacrifice of unbelievable deficits and debts.

For the above Myth, the author states two real stories. The first story (i): The rate of unemployment in statistics shows how far the marginal productivity of labor, *MPL*, is from the actual wage rate. Unfortunately Japan has realized a sort of flexibility of the actual wage rate to labor productivity, as an excuse of globalization, and by introducing western drama into Japan's traditional labor system. It implies that Japan has approached an endogenous condition compulsively and resultantly. It does not mean that Japan's economic policies have been appropriate, from the viewpoint of traditional human life and, as warned by the will of Peter, F. Drucker early in the 2000s. The author adds a word to this fact: if workers are each aware of what is happiness then there exists no problem.

The second story (ii): Robust economy is most guaranteed by zero deficit by year, as the author has proved theoretically and empirically in Chapters 12 and 13, based on Samuelson's (1942, 1975) great discovery at the real assets.

Table UN1 Actual unemployment rate and full-employment guaranteed in KEWT database 6.12

	Unem.rate	n_E=n	Gradient	Intercept	Unem.rate	n_E=n	Gradient	Intercept
	Actual				*Actual*			
	1. the US				**3. Finland**			
2005	(0.051)	0.0097	3.196	0.060	(0.0860)	0.0019	2.257	0.095
2006	(0.046)	0.0098	2.123	0.056	(0.0790)	0.0038	2.374	0.090
2007	(0.046)	0.0097	1.560	0.048	(0.0690)	0.0038	2.287	0.128
2008	(0.058)	0.0097	2.141	0.050	(0.0640)	0.0038	1.992	0.090
2009	(0.093)	0.0096	27.344	(0.150)	(0.0820)	0.0057	2.755	0.052
2010	(0.096)	0.0095	9.187	0.017	(0.0840)	0.0038	2.136	0.060
	2. Canada				**4. France**			
2005	(0.068)	0.0103	1.368	0.034	(0.0930)	0.0063	2.655	0.063
2006	(0.063)	0.0099	1.246	0.037	(0.0920)	0.0059	2.159	0.059
2007	(0.060)	0.0098	1.155	0.038	(0.0840)	0.0055	1.624	0.056
2008	(0.061)	0.0094	1.146	0.038	(0.0780)	0.0053	1.701	0.056
2009	(0.083)	0.0093	2.064	0.042	(0.0950)	0.0048	3.029	0.061
2010	(0.080)	0.0095	1.790	0.042	(0.0980)	0.0048	2.875	0.063
	3. Australia				**5. Germany**			
2005	(0.505)	0.0159	0.953	0.042	(0.1170)	0.0004	7.644	0.053
2006	(0.479)	0.0000	1.060	0.056	(0.1080)	(0.0002)	7.778	0.058
2007	(0.044)	0.0107	0.870	0.044	(0.0900)	(0.0006)	7.469	0.064
2008	(0.043)	0.0106	0.800	0.044	(0.0780)	(0.0010)	4.919	0.065
2009	(0.056)	0.0104	0.985	0.039	(0.0810)	(0.0011)	6.887	0.065
2010	(0.052)	0.0103	0.925	0.038	(0.0770)	(0.0013)	4.550	0.063
	5. Mexico				**6. Greece**			
2005	(0.036)	0.0104	1.181	0.095	(0.0986)	0.0018	6.044	0.184
2006	(0.036)	0.0103	1.299	0.112	(0.0888)	0.0027	2.716	0.142
2007	(0.037)	0.0101	1.267	0.106	(0.0830)	0.0018	2.619	0.153
2008	(0.040)	0.0100	1.225	0.100	(0.0770)	0.0027	3.285	0.172
2009	(0.055)	0.0097	1.103	0.074	(0.0950)	0.0018	5.165	0.177
2010	(0.054)	0.0095	1.231	0.089	(0.1250)	0.0018	6.024	0.157
	7. China				**7. Ireland**			
2005	(0.042)	0.0066	1.468	0.156	(0.0430)	0.0220	1.870	0.180
2006	(0.041)	0.0064	1.545	0.162	(0.0440)	0.0191	1.803	0.169
2007	(0.040)	0.0064	1.338	0.171	(0.0460)	0.0211	1.573	0.131
2008	(0.042)	0.0062	1.325	0.164	(0.0600)	0.0183	1.172	0.067
2009	(0.043)	0.0063	1.320	0.163	(0.1190)	0.0180	1.140	0.043
2010	0.000	0.0062	1.319	0.163	(0.1370)	0.0155	1.545	0.037
	9. Indonesia				**8. Italy**			
2005	(0.112)	0.0128	1.574	0.133	(0.0680)	0.0062	2.614	0.075
2006	(0.103)	0.0125	1.911	0.164	(0.0610)	0.0056	2.249	0.074
2007	(0.091)	0.0123	1.757	0.156	(0.0610)	0.0056	2.095	0.070
2008	(0.081)	0.0119	1.859	0.213	(0.0670)	0.0049	2.202	0.075
2009	(0.074)	0.0115	1.992	0.211	(0.0780)	0.0045	3.830	0.083
2010	(0.071)	0.0111	2.068	0.238	(0.0840)	0.0038	3.218	0.086
	10. Japan				**10. Netherlands**			
2005	(0.044)	0.0005	6.164	0.027	(0.0650)	0.0049	3.855	0.082
2006	(0.041)	0.0000	7.541	0.030	(0.0550)	0.0043	4.272	0.111
2007	(0.039)	(0.0004)	8.205	0.032	(0.0450)	0.0043	3.779	0.128
2008	(0.040)	(0.0009)	4.987	0.035	(0.0390)	0.0043	2.495	0.131
2009	(0.050)	(0.0010)	4.063	0.034	(0.0490)	0.0036	1.902	0.087
2010	(0.050)	(0.0013)	2.614	0.029	(0.0550)	0.0036	2.884	0.088
	11. Korea				**11. Portugal**			
2005	(0.037)	0.0042	1.730	0.097	(0.0760)	0.0057	1.525	0.077
2006	(0.035)	0.0042	1.505	0.081	(0.0770)	0.0047	2.109	0.091
2007	(0.033)	0.0040	1.697	0.104	(0.0800)	0.0038	2.083	0.087
2008	(0.032)	0.0040	1.412	0.090	(0.0770)	0.0038	2.352	0.099
2009	(0.036)	0.0037	1.816	0.085	(0.0960)	0.0047	3.391	0.092
2010	(0.037)	0.0035	1.865	0.111	(0.1100)	(0.0019)	4.338	0.120
	12. Malaysia				**14. Spain**			
2005	(0.036)	0.0183	2.162	0.095	(0.0920)	0.0134	1.405	0.066
2006	(0.033)	0.0179	2.284	0.100	(0.0850)	0.0121	1.061	0.061
2007	(0.032)	0.0176	2.151	0.110	(0.0830)	0.0108	1.015	0.059
2008	(0.033)	0.0166	2.407	0.111	(0.1130)	0.0100	1.532	0.066
2009	(0.036)	0.0170	2.560	0.064	(0.1800)	0.0092	2.183	0.055
2010	(0.033)	0.0160	1.930	0.087	(0.2010)	0.0094	3.188	0.056
	13. Philippines				**15. Sri Lanka**			
2005	(0.114)	0.0189	2.297	0.195	(0.077)	0.0088	0.853	0.067
2006	(0.079)	0.0187	2.552	0.171	(0.065)	0.0087	0.852	0.072
2007	(0.073)	0.0186	2.738	0.180	(0.060)	0.0091	0.836	0.069
2008	(0.074)	0.0184	2.860	0.186	(0.052)	0.0091	1.116	0.100
2009	(0.075)	0.0180	3.638	0.149	(0.057)	0.0090	0.963	0.065
2010	(0.074)	0.0178	6.526	(0.011)	0.000	0.0084	0.776	0.063
	14. Singapore				**16. Thailand**			
2005	0.000	0.0167	2.257	0.091	(0.019)	0.0103	1.035	0.080
2006	(0.045)	0.0211	2.436	0.102	(0.016)	0.0085	1.147	0.083
2007	(0.040)	0.0298	2.596	0.101	(0.014)	0.0071	1.363	0.085
2008	(0.032)	0.0290	1.716	0.088	(0.014)	0.0061	1.111	0.077
2009	(0.043)	0.0260	2.003	0.071	(0.015)	0.0055	1.466	0.067
2010	(0.031)	0.0211	2.277	0.093	(0.010)	0.0056	1.269	0.075

Note: Compare a high rate of unemployment at *IFSY*, IMF, with KEWT 6.12 database, where the intercept is higher than the rate of change in population, n_E=n, and this guarantees full-employment at the endogenous system.

Table UN2 Actual unemployment rate and full-employment guaranteed in KEWT database 6.12

	Unem.rate	n_E=n	Gradient	Intercept	Unem.rate	n_E=n	Gradient	Intercept
	Actual				*Actual*			
	1. Denmark				**1. Argentina**			
2005	(0.0560)	0.0037	2.915	0.131	(0.1160)	0.0094	2.106	0.175
2006	(0.0410)	0.0018	2.529	0.160	(0.1020)	0.0098	2.306	0.211
2007	(0.0290)	0.0037	2.476	0.233	(0.0850)	0.0097	2.263	0.219
2008	(0.0180)	0.0018	2.324	0.169	(0.0790)	0.0099	2.384	0.240
2009	(0.0330)	0.0018	2.142	0.098	(0.0870)	0.0100	2.873	0.186
2010	(0.0590)	0.0018	2.533	0.106	(0.0780)	0.0097	2.318	0.226
	2. Iceland				**3. Brazil**			
2005	(0.0210)	0.0135	1.290	0.108	(0.0940)	0.0121	1.357	0.079
2006	(0.0130)	0.0126	0.572	0.069	(0.0840)	0.0112	1.346	0.080
2007	(0.0100)	0.0125	0.837	0.070	(0.0930)	0.0104	1.364	0.092
2008	(0.0160)	0.0104	0.796	0.083	(0.0790)	0.0097	1.380	0.110
2009	(0.0810)	0.0103	0.642	0.043	(0.0810)	0.0092	1.048	0.062
2010	(0.0790)	0.0476	0.576	0.018	(0.0670)	0.0087	1.123	0.078
	3. Norway				**4. Chile**			
2005	(0.0450)	0.0087	5.235	0.197	(0.0800)	0.0112	3.751	0.236
2006	(0.0340)	0.0086	5.011	0.222	(0.0770)	0.0104	8.801	0.250
2007	(0.0250)	0.0085	3.367	0.229	(0.0710)	0.0103	6.761	0.294
2008	(0.0250)	0.0106	3.688	0.246	(0.0780)	0.0096	2.539	0.179
2009	(0.0310)	0.0084	3.121	0.154	(0.0980)	0.0101	3.080	0.114
2010	(0.0350)	0.0104	3.044	0.151	(0.0830)	0.0100	3.441	0.179
	4. Sweden				**5. Colombia**			
2005	(0.0780)	0.0055	4.392	0.061	(0.1180)	0.0153	1.625	0.089
2006	(0.0710)	0.0044	3.710	0.105	(0.1210)	0.0151	1.703	0.117
2007	(0.0610)	0.0055	3.689	0.121	(0.1110)	0.0151	1.664	0.121
2008	(0.0620)	0.0055	4.092	0.102	(0.1130)	0.0147	1.754	0.126
2009	(0.0830)	0.0043	4.480	0.057	(0.1200)	0.0144	1.616	0.104
2010	(0.0840)	0.0043	3.122	0.074	(0.1170)	0.0140	1.667	0.114
	5. Switzerland				**7. Peru**			
2005	(0.0380)	0.0068	2.146	0.077	(0.0950)	0.0127	2.107	0.083
2006	(0.0330)	0.0054	2.562	0.103	(0.0850)	0.0122	3.107	0.182
2007	(0.0280)	0.0040	3.191	0.129	(0.0840)	0.0117	2.749	0.212
2008	(0.0260)	0.0040	3.508	0.130	(0.0840)	0.0116	1.878	0.174
2009	(0.0370)	0.0040	3.311	0.099	(0.0830)	0.0114	1.839	0.116
2010	(0.0390)	0.0040	3.709	0.099	(0.0790)	0.0113	2.108	0.175
	6. the UK				**9. Kazakhstan**			
2005	(0.0480)	0.0050	3.820	0.084	(0.0810)	0.0066	2.701	0.321
2006	(0.0540)	0.0053	3.942	0.090	(0.0780)	0.0066	2.621	0.369
2007	(0.0540)	0.0053	4.136	0.086	(0.0740)	0.0065	2.064	0.331
2008	(0.0570)	0.0054	6.040	0.082	(0.0660)	0.0071	3.407	0.382
2009	(0.0470)	0.0056	8.530	0.074	(0.0580)	0.0077	2.096	0.217
2010	(0.0790)	0.0054	7.210	0.084	(0.0660)	0.0070	2.176	0.330
	1. Bulgaria				**11. Pakistan**			
2005	(0.1010)	(0.0064)	2.047	0.222	(0.0770)	0.0222	1.434	0.080
2006	(0.0900)	(0.0065)	1.517	0.193	(0.0620)	0.0220	1.187	0.085
2007	(0.0690)	(0.0065)	1.776	0.211	(0.0530)	0.0219	1.122	0.077
2008	(0.0560)	(0.0065)	0.746	0.106	(0.0520)	0.0218	2.076	0.121
2009	(0.0690)	(0.0053)	0.711	0.067		0.0218	2.199	0.104
2010	(0.1030)	(0.0066)	0.961	0.072		0.0218	3.506	0.100
	2. Czech Republic				**14. Egypt**			
2005	(0.0890)	0.0019	1.494	0.113	(0.1100)	0.0189	2.164	0.078
2006	(0.0810)	0.0029	1.536	0.119	(0.1070)	0.0188	1.432	0.072
2007	(0.0660)	0.0039	1.538	0.121	(0.0900)	0.0186	1.653	0.088
2008	(0.0540)	0.0049	1.465	0.089	(0.0870)	0.0184	1.094	0.082
2009	(0.0810)	0.0048	1.190	0.058	(0.0940)	0.0180	1.878	0.107
2010	(0.0900)	0.0039	1.093	0.056	(0.0900)	0.0177	1.402	0.080
	3. Hungary				**16. Morocco**			
2005	(0.0720)	(0.0020)	3.695	0.159	(0.1130)	0.0116	2.085	0.095
2006	(0.0750)	(0.0030)	1.550	0.121	(0.0960)	0.0115	2.088	0.097
2007	(0.0740)	(0.0020)	1.756	0.109	(0.0950)	0.0120	1.714	0.094
2008	(0.0780)	(0.0020)	1.617	0.099	(0.0960)	0.0125	1.223	0.098
2009	(0.1000)	(0.0020)	2.570	0.095	(0.0910)	0.0120	1.067	0.091
2010	(0.1110)	(0.0020)	3.344	0.104	(0.0910)	0.0122	0.873	0.068
	5. Poland				18. South Africa			
2005	(0.1820)	(0.0010)	4.150	0.164	(0.2390)	0.0124	1.164	0.080
2006	(0.1390)	(0.0010)	2.922	0.146	(0.2260)	0.0119	1.034	0.076
2007	(0.1270)	(0.0008)	1.377	0.116	(0.2230)	0.0109	0.939	0.080
2008	(0.0990)	(0.0008)	1.249	0.100	(0.2290)	0.0102	0.958	0.084
2009	(0.1100)	(0.0008)	1.675	0.094	(0.2390)	0.0089	1.063	0.058
2010	(0.1210)	(0.0008)	1.554	0.087	(0.2490)	0.0076	1.070	0.062
	6. Romania				**8. Turkey**			
2005	(0.0580)	(0.0041)	2.023	0.188	(0.1020)	0.0131	3.665	0.257
2006	(0.0550)	(0.0046)	1.444	0.161	(0.0990)	0.0129	2.604	0.210
2007	(0.0430)	(0.0042)	1.084	0.138	(0.1020)	0.0126	2.872	0.203
2008	(0.0400)	(0.0042)	1.026	0.126	(0.1100)	0.0125	1.935	0.148
2009	(0.0630)	(0.0037)	1.244	0.105	(0.1400)	0.0123	4.051	0.147
2010	(0.0760)	(0.0042)	0.995	0.084	(0.1190)	0.0119	2.168	0.147
	7. Russia				**9. Ukraine**			
2005	(0.0760)	(0.0048)	4.718	0.406	(0.0720)	(0.0074)	1.492	0.110
2006	(0.0720)	(0.0045)	4.113	0.385	(0.0680)	(0.0072)	1.129	0.098
2007	(0.0610)	(0.0041)	3.072	0.315	(0.0670)	(0.0067)	1.067	0.106
2008	(0.0620)	(0.0039)	2.975	0.312	(0.0640)	(0.0065)	0.965	0.098
2009	(0.0840)	(0.0037)	3.269	0.183	(0.0880)	(0.0061)	2.322	0.119
2010	(0.0750)	(0.0035)	3.986	0.328	(0.0810)	(0.0061)	1.846	0.111

The second **article**: "A Contribution to *Nikkei* Newspaper at Economic School dated on Oct 4, 2012," by Blinder, Alan, S. was understandably edited by Nikkei but the spirit is the same. Blinder analyzes that the current crisis is not 'a Keynesian recession' but 'a Reinhart-Rogoff-Minsky (RRM) recession.' Blinder says "choose to deleverage," but sometimes the accumulation of too much sovereign debt leaves little choice—they are forced to cut spending and raise taxes in a recession. Blinder concludes that for RRM recession non-traditional policy may not work well. The author of *EES* got a reply from Blinder by email dated on Oct 9: Blinder's intension is that traditional policies may not be enough—not that they don't work.

The author respects his theoretical and empirical experiences and supports his penetrating conclusion. The author stresses one word. The central bank should be neutral from political powers since no effect is expected at all. Leaders use some policies as if it is attractive, even if leaders know the real fact. What we need universally is that each person is aware of the true meaning of democracy: When each person has to plan, do, and see everything by herself or himself, assuming that there is no person besides the person in a country, then, an economy will become steadily recover. Convey true stories to people, without escaping from true stories. Give and given is true. Prefer great cooperation to little differences is true.

For the above two articles, the author sums up why net investment is a base of economic activities. Both actual and endogenous economic activities are simultaneously destined to stay within a moderate range of the endogenous-equilibrium. When an economy becomes out of endogenous equilibrium, a final solution is expressed by net investment in an open economy. A shock is indispensable and it results in business cycle. This fact is not a parable but a real story. A unique adjustor is the net investment to output, $i = I/Y$, $i_{PRI/Y} = I_{PRI}/Y$, and $i_{G/Y} = I_G/Y$, by sector. A healthy road is arranged. Empirically we are now ready to step into business cycle discussions.

The third **article:** "The federal Funds rate and the Channels of Monetary Transmission," by Bernanke, Ben, S., and Blinder, Alan, S. (901-921, 1992). This is related to the author's neutrality of the financial/market assets to the real assets. Bernanke and Blinder (1992) shows the first half of one cycle on the following Figure 4, where financial/market assets, securities, deposits, and loans, are compared with the un-employment rate as the real assets. Figure 4 starts with the shock and this shock comes at the end of the second half hidden here. The unemployment rate hits its peak at the end of the first half. These results are clearly explained as the author cites on the same page 918 (now under getting permissions from American Economic Association):

> As is apparent, the effects of unemployment are essentially zero during the first two or three quarters after the shock to the funds rate; but at about the nine-month point,

unemployment begins to rise, building gradually to a peak after about two years, before declining back to zero (the decline is not shown in the graph).

At first, the author intuitively looked at this Figure 4. Fureka!, this proves the existence of the author's neutrality of the financial/market assets to the real assets (see Chapter 2). The character of their 'shock' is similar to the author's, described at the above second article. Our economies run well with the shock. The shock is a given carrier of an economy, although it is actually controlled by policy-makers. In other words, business cycle is a good thermometer of an economy.

Bernanke, Ben, S., and Blinder, Alan, S. (Figure 4, page 918,
AER 82 (Sep, 4): 901-921, 1992)

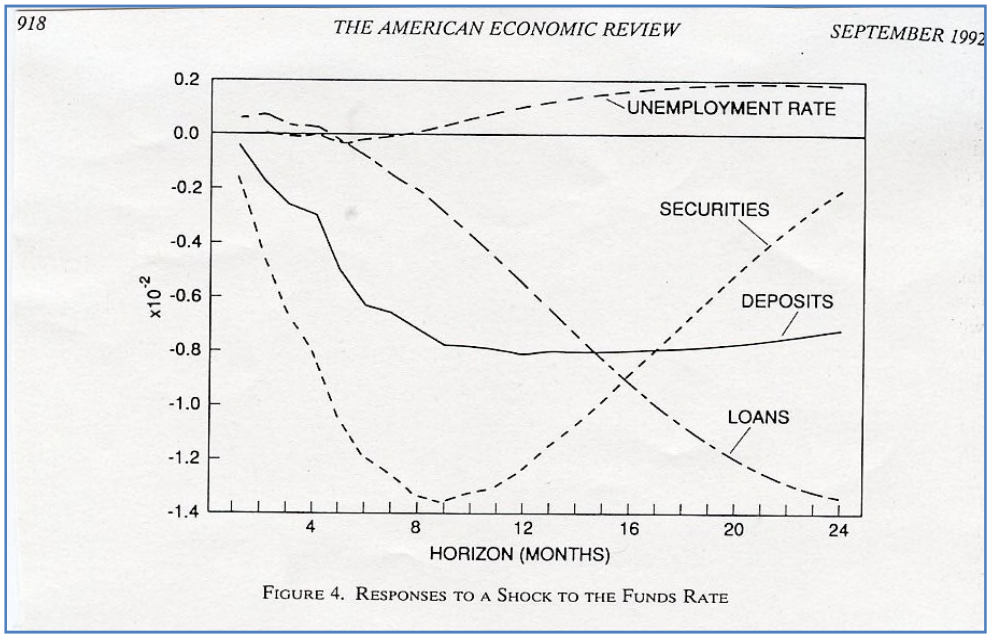


FIGURE 4. RESPONSES TO A SHOCK TO THE FUNDS RATE

(With Permissions to cite Figure 4 from Subscription Department,
American Economic Association)

14.3 Standpoint of Real Business Cycle to Obey Samuelson (1998)

This section outlines the essence of business cycle. The concept of business cycle is divided into two sorts: (1) Real business cycle in the literature, where the price-equilibrium is indispensable. (2) Endogenous real business cycle under the neutrality of the financial/market assets to the real assets at the endogenous-equilibrium, where results of both assets are the same in cooperation with the price-equilibrium. Endogenous business cycle holds only when a system is wholly integrated. Here partial/specified endogenous and partial/specified system does not produce real business cycle. This chapter connects real business cycle with endogenous business cycle. Note that endogenous business cycle never excludes real business cycle in the literature. First, the

author sums up the outline of Kydland, Finn, E., and Prescott, Edward, C. (1977), Kydland, Finn, E., and Prescott, Edward, C. (1982), and Backus, David, K., Kehoe, Patrick, J., and Kydland, Finn, E. (1992). These articles have taught us essential problems lying between the financial/market assets and the real assets. Their aspect is natural since the relationship between the financial/market assets and the real assets is in vague and the real assets must be a base for business cycle.

First, Kydland and Prescott (1977) is policy-oriented, which is consistent with the endogenous-system. This paper (479, ibid.) shows Figure 1 using topology and compares consistent equilibrium with optimal equilibrium. The optimal equilibrium locates at the origin of the two dimensions; the x axis shows the difference between unemployment and full-employment, and the y axis shows the forecasted or expected inflation rate. The optimal equilibrium holds with no inflation. The endogenous system holds under no unemployment but with a low rate of endogenous inflation rate. This is the endogenous NAIRU (see, Chapters 7 and 11). Two sorts of business cycle are close each other. An answer is given by the endogenous system, where endogenous business cycle and the neutrality of the financial/market assets to the real assets are proved empirically using 81 countries.

Second, Kydland and Prescott (1982) is model calibration-oriented. This paper (1363, ibid.) shows Table 1 using the small number of free parameters, preference and technology, with shock variance. At the endogenous system, the free parameters in the above Table are, contrarily, replaced by 'seven' endogenous measured parameters. The same resultant shocks exist between shocks of Kydland and Prescott (1982) and the author's shocks (see Signpost above). The estimated shocks in the literature need the auto-covariance of output (VARs) (see Chapter 12). The endogenous system measures preferences and technology wholly in its system.

Third, Backus, Patrick, and Kydland (1992) present results of empirical researches internationally. The author pays attention to Figures 1, 2, and 3 each on pages 749, 764, and 770. This is because data are based on Citibank's Citibase, *International Financial Statistics*, IMF, and Hodrick-Prescott (1980) filtered data. We use the same data of *IFS*, IMF. The only difference is statistics or purely endogenous data.

Following the stream of business cycle, the author leads real business cycle to endogenous business cycle more concretely hereunder; i) starting with Kalecky, ii) touching the essence of real assets penetrated by Samuelson, and iii) leading individual utility to a macro utility and sums up the essence of business cycle in the KEWT database. Business cycle is broadly explained using real assets, financial/market assets, and totally of real and financial assets, under the price-equilibrium. The author does not deny this fact but favorably accept all of these phenomena, under the author's neutrality of financial/market assets to real assets (see Chapter 2).

Net Investment and Business Cycle: Using 'sin' in G and PRI Sectors

A real-assets oriented business cycle was earlier set by Kalecky, Michael (88, 91-92, 1937), ever under the price-equilibrium. The idea is unique in that Kalecky illustrated several diagrams based on 45^0 diagonal. The author was, in a moment, excited with his imaginable discovery of the diagonal. His hyperbolic curves are shown by 'D' on the y axis and D may or may not cross the diagonal, taking total investment 'I' on the x axis. D is an increasing function of the difference between the prospective rate of profit and the rate of interest to net investment. His first one-half process is shown by $\mathrm{I}_1 < \mathrm{D}_1 < \mathrm{I}_2 < \mathrm{D}_2 < \mathrm{I}_3 < \mathrm{D}_3 < \mathrm{I}_4 < \mathrm{D}_4 < \mathrm{I}_5 = \mathrm{D}_5 = \mathrm{I}_6 = \mathrm{D}_6$ so that $\mathrm{I}_1 < \mathrm{I}_2 < \mathrm{I}_3 < \mathrm{I}_4$ corresponds with $\mathrm{Y}_1 < \mathrm{Y}_2 < \mathrm{Y}_3 < \mathrm{Y}_4$, where $\mathrm{d}Y/\mathrm{d}I = f'(I)$ prevails. His second half process is just reversed and, a business cycle is formed. His business cycle seems to come up with the scheme of changes in prices (i.e., rates of profit and interest) yet, essentially real-assets oriented. Kalecky does not contradict with Samuelson (33-36, 1998).

Business cycle typically belongs to macroeconomics. The author realized two great discoveries of Samuelson (155-161, 1937; use of a fixed discount rate, connected with Fisher, I.) and Samuelson (1942; 1975, revisiting with Salant, W. S.). These two discoveries were based on the real assets under the price-equilibrium. Nevertheless, these two discoveries, to the author's understanding, properly connect the micro level with the macro level by his own way and, resultantly delete the difference between the price-equilibrium and the endogenous-equilibrium. Author's KEWT 6.12 database exactly proves Samuelson's theoretical framework. And, the author's business cycle is a typical case of the two discoveries or another expression of Samuelson's theoretical framework.

The bridge between Samuelson's and Author's frameworks is summarized as follows: A moment was the use of a fixed exponential discount rate to individual utility. This discovery simply made it possible for anyone to connect the rate of return for some periods with a fixed discount rate in an infinite time: $\sum_{n=1}^{\infty}(\frac{1}{1+r})^n = \frac{1}{r}$. The endogenous system, suggested by Samuelson's (155-161, ibid.--1937) utility idea, measures a rate of return endogenously and, instead of an external rate of interest, it is now possible for anyone to measure the relative discount rate of consumer goods to capital goods, *rho/r*, as a function of the propensity to consume, $c = C/Y$: $(rho/r)(c)$ and $(rho/r) = 13.301c^2 - 22.608c + 10.566$. This function is common to 81 countries and each country expresses national taste/preferences, culture, and history, by country. Several saving-oriented countries are exceptional among 81 countries: $(rho/r) = 1.8638c^2 - 2.4547c + 1.758$. This is because $(rho/r)(c)$ is determined simultaneously with endogenous equations such as $\alpha = \Pi/Y$: $(1-\alpha) = c/(rho/r)$ and, $\frac{K}{L} = \frac{(\alpha/(1-\alpha)}{(r/w)}$ or $k = \frac{w \cdot \Omega}{1 - r \cdot \Omega}$ (for endogenous equations, see 'Notations' at the beginning of the *EES*). The above process, regardless of the character of equilibrium, turns the individual utility at the

micro utility to the macro utility at the macro level. As a result, the first discovery by Samuelson (1937) could be proved empirically by the endogenous system and the KEWT database.

Secondly, two fiscal multipliers discovered by Samuelson (1942) guarantee the growth rate of per capita output within a moderate range of the endogenous-equilibrium. This was already discussed at Chapter 13, to answer the unsolved problems raised by Krugman (July 1st, 2012).

Let the author repeat the dictum of Samuelson (1998). Historically, micro market efficiency has prevailed for many decades in the literature. Meantime, Samuelson has exceptionally raised hands to macro market efficiency based on the real assets. Samuelson (1939) had clarified the acceleration principle and the multiplier, which is the inverse of corresponding endogenous ratios, as discussed in Chapter 12. Samuelson (1946) was against Keynesians' reliance of financial assets. These facts show the essence of Samuelson's view. The essence is reinforced by the empirical proof of the neutrality of financial/market assets to real assets (see Chapters 2 to 5).

Real business cycle is now reliable because the neutrality of financial/market assets to real assets has been endogenously proved every year, since KEWT 1.07, 1960-2005, established in 2007. This is endogenous real business cycle. Some countries suddenly fell into disequilibrium or close-to-disequilibrium, during 1990-2010. Suddenly fallen is a shock. The neutrality is required for recovering equilibrium at the real assets. Then, shocks in business cycle reflect some features behind the endogenous-equilibrium. Typical features are the speed years and the valuation ratio, by sector (see related Chapters, 2, 6, 7, 8, 12, and 13).

Among others, business cycle has been most diversified in macroeconomics topics: financial/market assets to real assets and, synthesized contents. Kuznets, S. S. (1941, 1952, 1966, 1971) has devoted his life-work to the study of business cycle (for his philosophy, see Chapter 15). Numerous investigations by Kuznets are beyond description. This is because, the real assets, the financial assets, and market indicators, all of these are historically interrelated. Among others, endogenous real business cycle is most essential, as Samuelson proved theoretically when statistics data were not yet reliable by country. This chapter does not repeat Samuelson's performances but Ramsey and J & G (see Chapter 6 or section 14.4 soon below). The character of business cycle will be more understandable.

14.4 Revisit: Ramsey (1928), Jorgenson (1963), and Jorgenson and Griliches (1967)

The author revisits the stream of Ramsey, F. P. (1928), Jorgenson (1963), and Jorgenson and Griliches (1967) (recall Chapter 6). Economics and Financing have

recently been behavior-oriented, as shown by Shiller, R. J. (2003). Behavioral science needs its robust reciprocal and leadership of philosophy. Social science and economics aim at finding scientific discoveries, as the author stressed in Chapter 1. It is important to distinguish scientific discovery under a fixed level of spirituality with various levels of spirituality spread over social science. Business cycle deepens the essence of reciprocal at real assets staying a fixed level of spirituality. In this viewpoint, the author does not step into the current behavioral economics.

Ramsey (1928) and Jorgenson (1963) respectively hold under the price-equilibrium. These two papers are individual-utility oriented, commonly to Neo-classical school. Ramsey (1928) uses saving behavior and sets the saving rate as a variable in a process from close-to-disequilibrium to equilibrium/the steady state. Jorgenson (1963) uses investment behavior and sets vintage embodied to cope with heterogeneous capital.

Author of *EES* never blames Neo-classical school since the author has been brought up by converting Solow's (1956) exogenous framework to endogenous one. The author always broadly looks for a lighthouse from the Sea of Samuelson's numerous specified researches in his lifetime. Two articles, Ramsey (1928) and Jorgenson (1963), clarify why Neo-classical articles hit a wall and cannot get rid of this wall. The difference between two articles and the endogenous system reveals what we need for economic policies and leads to how to answer unsolved problems at the current literature.

First Ramsey, F. P. (1928) historically and mathematically left an indispensable fact. In a word, Ramsey challenged for a model including processes to attain equilibrium from statistics data under the price-equilibrium. Ramsey's challenge remained theoretical, since statistics became reliable after the SNA (1993). Maddison's long estimation for population and *GDP*, 1820-1992, has been exceptionally accepted. The methodology was explained at Maddison (Growth and Slowdown; 649-698, 1987) and accepted by representative database, starting with capital stock rather than the capital-labor ratio.

For mathematical integration of disequilibrium and equilibrium relying on the price levels at macroeconomics, Ramsey uses quadratic equations. Quadratic equations are composed of parabola, hyperbola, and oval or ellipse. It is impossible for researchers to set up an expression of the third order. Researchers naturally use various quadratic equations and with various assumptions to justify scientific. Hyperbola belongs to quadratic expression and is relative. The Excel does not treat hyperbolas. A quadratic expression needs parameters, but unknown unless whole values exist consistently within a system and over years. For parameters, values of elasticity w. r. t. so and so are given with assumptions. A problem is that assumptions are indifferent of reality or empirical results, although assumptions are convenient to researchers.

Barro, R. J., and Sala-i-Martin (59-90, 1995) develops Ramsey's behavior of the saving rate. At their Appendix (ibid., 462-528; in particularly, 474-483 and 493- 497),

'mathematical methods' are shown with first-order ordinary differential equations and also with phase diagrams related to rotations. If these diagrams are empirically proved, hyperbolic may appear although no word of hyperbola was found in a few suggestive diagrams. The serious problem is traced back to a fact that the speed years for convergence are estimated not endogenously but exogenously. An optimum point at the above diagrams remains a version. At the endogenous system, an optimum range of a maximum rate of return to a minimum net investment is measured accurately by country and by sector, using 36 country hyperbolas, as shown in Appendix.

Jorgenson, D. W. (1963) presents capital theory and investment behavior, with regression coefficients using unrestricted versus restricted. Jorgenson, D. W. (247, ibid.) connects investment behavior with Irving Fisher's (87-116, 1907) interest rate and, tries to open a door to bury the difference between econometric practice and neoclassical theory. The difference is whether the price-equilibrium is indispensable or not; the price-equilibrium is 'entirely absent from the econometric literature on investment,' according to Jorgenson. Investment behavior is more decision-making oriented, as generally expressed in behavioral economics. Jorgenson, D. W. (ibid., 248) states: 'Demand for capital stock is determined to maximize net worth' by using a fixed rate of interest or a constant exponential rate. This leads to embodied investment. As a result, Jorgenson, D. W. (1966) raises his embodiment hypothesis, after referring to the first appearance of 'embodied' in Solow (312-13, 1957). Embodiment is a means to avoid heterogeneous capital and, vintage is a means to satisfy heterogeneous capital. Denison Edward, F. (90-93, 1964) states 'Unimportance of the Embodied Question,' partly due to empirical changes in the rate of return over years.

Conclusively, we need both embodied and disembodied in capital stock or we must accept a constant exponential rate since real assets remain the same, as first discovered by Samuelson (1937, 1942). The KEWT database 6.12 represents one case of disembodied.

The endogenous system measures capital stock simultaneously with the rate of return. Capital stock is a mixture of quantity and quality which cannot be divided by year. Net investment is purely qualitative and absorbs qualitative net investment entirely by year. Then, what is the relationship between capital stock and net investment? The growth rate of capital stock is expressed as total factor productivity (*TFP*); $g^*_{A(STOCK)} = g^*_{TFP}$. The growth rate of capital flow or net investment is expressed as the rate of technological progress; $g^*_{A(FLOW)} = i(1-\beta^*)$. Schumpeter's (1939) idea is realized endogenously. One discovery: $g^*_{A=TFP(STOCK)} = g^*_{A(FLOW)}$ holds at convergence (see BOX 14-2).

BOX 14-2 Proof of growth rates of technology, STOCK=FLOW, $g^*_{A=TFP(STOCK)} = g^*_{A(FLOW)}$

5. Proof of productivity growth, at convergence in the transitional path, using FLOW and STOCK:
$g_{A(FLOW)}(t^*) = g_{TFP(STOCK)}(t^*)$, where A=total factor productivity (TFP) as STOCK.
$g_{A(FLOW)}(t^*) = i(t^*) \cdot (1 - \beta(t^*))$. $A_{TFP(STOCK)}(t^*) = A_0(1 + g_{A(FLOW)}(t^*))^{1/\lambda^*}$.

6. Proof at KEWT database, differently from the above $g_{TFP(STOCK)}(t^*) = g_{A(FLOW)}(t^*)$:
Starting with endogenous Conservation Laws, $\Omega = \Omega^* = \Omega_0$ and $r = r^* = r_0$,
under $\alpha = const.$: $\alpha = r^* \cdot \Omega^*$,
1). $A^* = A_0(1 + g^*_A)^{1/\lambda^*} = k^{*1-\alpha}/\Omega^*$. $k^* = (A^* \cdot \Omega^*)^{1/1-\alpha}$. $y^* = A^* k^{*\alpha}$.
2). $L^* = L_0(1 + n)^{1/\lambda^*}$. $K^* = k^* L^*$. $Y^* = A^* K^{*\alpha} L^{*(1-\alpha)}$. Or, $Y^* = y^* L^*$.
3). Equations prevailing commonly to KEWT and its recursive programming,
$A(t) = \frac{k(t)^{1-\alpha}}{\Omega(t)}$. (See Note 11 on page25, PhD thesis, 2003/Nov). $1/\lambda^* = 1/\left((1-\alpha)n + (1-\delta_0)g^*_A\right)$.

Source: Reproduced from B. Equations in Notes, at the beginning of the *EES*.

The author confirms that results of growth accounting and continuous differential are finally within a certain range of those of the endogenous system. The elasticity of substitution, $\sigma = \eta(k/r/w)$, is accurately 1.000 in the transitional path by time/year when data are based on KEWT series; e.g., as shown in *PRSCE* 52 (Sep, 1): 67-111, 2011. It is suggestive for researchers to make use of econometric methods for the differences of data and results between the literature and the endogenous system. Because the endogenous system is an immovable base, as long as 'purely endogenous with no assumption' is guaranteed at the endogenous system. A typical case is the business cycle. The author reconfirms that a base data for 'sin' must be 'purely endogenous with no assumption'. Otherwise, results of 'sin' business cycle change every time when a researcher works on 'sin' business cycle.

14.5 Hicks 'sin' Business Cycle in G and PRI Sectors with Empirical Results

This section empirically presents J. Hicks' (65-82, 170-181; 1950) sin business cycle. The author (PRSCE, 48 (Sep), 49 (Feb); and JES 11 (Sep)) presented the same empirical results with KEWT 1.07, 1960-2005. The previous work only used the total economy while this section compares 'sin' business cycle at the government (G) sector with that at the private (PRI) sector. A fruitful finding of this section is that the sin adjustment process by 'an arbitrary parameter' used for sin cycles corresponds with the adjustment process by 'the speed years' used for realizing the endogenous-equilibrium.

For example: (i) If the endogenous-equilibrium is moderate and smooth, the adjustment process is easily finished. (ii) If the endogenous-equilibrium is close to

disequilibrium, it takes time to finish adjusting. In the case of (i), the wave of sin business cycle smoothly overlaps the wave of $i_{PRI/Y} = I_{PRI}/Y$ or $i_{G/Y} = I_G/Y$. Contrarily in the case of (ii), the wave of sin business cycle does not overlap the wave of $i_{PRI/Y} = I_{PRI}/Y$ or $i_{G/Y} = I_G/Y$, where the difference between these two waves is not buried easily. This implies that the situation is complicated.

14.5.1 Structure of sin curve

Hicks, John R. (1950), for the first time, formulated 'sin' type of business cycle. No one has proved his 'sin' empirically and endogenously up to date.

What are a ratio and/or ratios most fitted for determining (endogenous) real business cycle? The author has compared various combinations, similarly to Kuznets. As a preparation of this determination, the author needs to clarify the relationship between capital flow/net investment and capital stock, together with the relationship between the government and private sector. The author cites a paragraph in an earlier paper[1] (page 37, *PRSCE* 48 (Sep, 1): 29-63, 2007), which tested Hicks' 'sin' using KEWT 1.07 data-sets:

> Hicks J. (1950, 65-82, 170-181) formulated equations, paying attention to the multipliers and accelerators, separating the trend of consumption from the trend of investment, and introducing no consumption multiplier. Hicks (ibid., p.176, p.179 in Mathematical Appendix) shows 'cos' and 'sin' equations, referring to Moivre's theorem. The author does not review his equations in detail in this section. The author, however, found that Hicks's 'sin' measurement to business cycle is the best among others after testing various measurements, although Hicks did not show empirical results probably due to the lack of pertinent data at those times, similarly to Tinbergen Jan (1956).

In detail, let the author show how to formulate business cycle using Hicks' sin equations. Basically we need eleven elements to draw sin curve at two dimensions. The sin curve is composed of amplitude, *Am*; period, *Pe*; radians *x*, *Rad*; topological, *Top*; and business cycle, *Bc* or $B_{c(START)}$. Eleven elements are used for sin curve as expressed by parameters, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *j*, *l*, and *START*. Three year averages of $i_{PRI} = I_{PRI}/Y_{PRI}$ and $i_G = I_G/Y_G$ are each designed for smoothness.[2] For example, the same

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[1] For example, see the following equations to the multiplier theory and the accelerator theory, $I_n = A\sin(nh + k)$ to investment, or the combinations of cos and sin, $a = \rho\cos\vartheta$, $b = \rho\sin\vartheta$, $\rho = \sqrt{a^2 + b^2}$, where $\tan\theta = b/a$, $u_1 = \rho(\cos\vartheta + i\sin\vartheta)$, and $A_1 = k(\cos\varepsilon + i\sin\varepsilon)$.

[2] The author got Hidetsugu Nagai's software newly this time. Nagai's software is similar to K. Tomoda's software to hyperbola drawing (see Appendix at the end of the *EES*)

Chari, V. V., Kehoe, Patrick J., McGrattan, Ellen, R. (781-836, 801-809, 815-818, 2007) shows five year average although the background is similar to neo classical. We think that three is better to five in the case of sin curve.

value of $i_{PRI} = I_{PRI}/Y_{PRI}$ at 1990 is arbitrarily added to that at 1989. Similarly, the same value of $i_{PRI} = I_{PRI}/Y_{PRI}$ at 2010 is arbitrarily added to that at 2011.

Am shows a hyperbolic curve of $Am = (1/(t-a)) + b$. *Pe* shows a non-linear curve of $Pe = c - (t/d)^3$. *Rad* shows an exponent curve of $Rad = RADIANS(t-e)$. *Top* shows a linear equation of $Top = f \cdot Rad + g$. Finally, business cycle, *Bc*, shows a sin curve of $Bc = Am \cdot SIN(Pe \cdot Rad) + Top$. If a resultant pattern of business cycle seems to be unnatural, *Bc* is replaced by $B_{c(START)}$, where the starting point of height is adjusted: $Bc = Am \cdot SIN(Pe \cdot Rad) + Top$, or $B_{c(START)} = Am \cdot SIN(Pe \cdot Rad + _{START}) + Top$.

As a criterion to determine each value of the above eleven parameters introduced into the sin equation, the author uses the trend of the growth rate of net investment by sector. This trend is expressed by a quadratic curve of $trend_{gI(PRI)} = h \cdot t^2 + j \cdot t + l$ or $trend_{gI(G)} = h \cdot t^2 + j \cdot t + l$.

14.5.2 Adjustment process of sin curve: five steps

Adjustment process for sin cycles is composed of five steps based on $y = a(\sin x) + b$:

1. Topology *b*; $b_{PRI} = f_{PRI}x + g_{PRI}$ and $b_G = f_G x + g_G$.
2. Starting point for the first cycle
3. Start angle, change so as to match, where $90^0 = \frac{\pi}{2} rad$.
4. Matching the number of peaks; *x* or period.
5. An arbitrary parameter for adjustment by year; amplitude *a* is adjusted as a result.

The above adjustment differs by the level of the endogenous-equilibrium, as explained at first. It implies that business cycle wholly reflects the quality of the endogenous-equilibrium. Behind the curtain, huge deficit and debts are hidden. Therefore, business cycle has been discussed in so many ways—using the real assets, financial and market assets, or both combinations, partially and wholly, in the literature.

14.5.3 Empirical adjustment process of sin curve

Table T1 shows topology equations at G and PRI. Needless to say, a positive gradient is preferred to negative gradient. Contrarily the intercept has its meaning: If it is too high, the country may aims at higher growth, apart from maximum return minimum net investment. A true leader does not aim at mere expansion.

Table T1 shows 36 countries, 2005-2010, developed versus developing; small populated versus six countries suffering from the current financial crisis; and Asian steady countries versus unique countries. Business cycle shows a result of real-assets economic

policies. Each country enjoys higher growth more money and suffers from bubbles and resultant financial crisis. Each country is able to stop the occurrence of bubbles by using an endogenous valuation ratio, as the author repeatedly indicated hitherto. Moderate growth is controllable and business cycle becomes moderate and sustainable. **Figures BC-1** to **BC-6** and **BCL** follow Table T1.

The author added long results of business cycle, 1960-2010, at PRI and G sectors. The results suggest that we need moderate equilibrium. Otherwise, growth power is weakened and bubbles are repeated wastefully. In this sense, topology, $b_{PRI} = f_{PRI}x + g_{PRI}$ and $b_G = f_G x + g_G$, are good indicators. Most important is dynamic balance between PRI and G sectors. Some countries serve PRI sector while other countries serve G sector. The PRI sector is the first priority, as the golden saying of the people, for the people, and to the people. This level depends on people's consciousness and no others. We march step by step towards cooperative real world by integrating national taste with technology.

Full employment is guaranteed at any level of the endogenous-equilibrium. Behind the curtain, another relationship is hidden. This is the relationship between the rate of change in population and the ratio of net investment to disposable income, $i_{PRI} = I_{PRI}/Y_{PRI}$ and $i_G = I_G/Y_G$. This relationship is expressed by another hyperbola, $i(n)$ or $i(n)$ (see Appendix Hyperbolas at the end of the *EES*). The next chapter sums up the rate of technological progress and different levels of net investment which differ from an endogenous net investment. A true discovery is found only when the rate of change in population changes along with various levels of net investment.

For readers' convenience: contents of figures hereunder

Notes for Figures IS1, IS2, and IS3:

Figure IS1 compares 6 developed countries with BRICs countries: the US, Japan, Australia, France, Germany, and the UK; China, India, Brazil, Russia, and South Africa, and Mexico. **Figure IS2** compares EU countries with non-EU Europe countries: Denmark, Finland, Netherlands, Norway, Sweden, and Canada; Greece, Iceland, Ireland, Italy, Portugal, and Spain. **Figure IS3** compares Asia countries with Rest countries: Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand; Bangladesh, Pakistan, Saudi Arabia, Sri Lanka, Czech Rep, and Poland.

The author does not comment the contents by country, for simplicity here but summarizes suggestions expressed by Figures IS1, IS2, and IS3. The following summary is worthy of a preparatory step to interpret business cycle observed at the PRI and G sectors.

1. Changes in net investment level, 1990-2010, express the loci of policy-makers by country.
2. Each country has its own characteristics in whole economic policies to real, financial, market, and central bank. Readers may confirm the differences between economic policies over years.
3. Policy-makers' efforts are surprising by year, coping with national taste, preferences, culture, and even civilization. The author feels their sincere efforts over years, beyond description. Results reflect philosophy of leaders and policy-makers.
4. A simple litmus paper to their efforts and prompt execution of policies is the balances between the government and private sectors and those between actual/statistics data and endogenous data.
5. The above balances must be moderate or within a controllability of leaders and policy-makers.
6. Democracy is not the best but the second political system. Democracy needs immediate openness and publication, as advocated by Kant. People must be interested in country's future and responsible for next generations, each by each and; towards cooperative global economies in reality by country.

Here is a story of wash hand basin/wash tab, filled with water and on a flat floor.

1) *First give* person wants water to give water for an opposite person but, water soon returns back to *first give* person.
2) *First take* person wants water to take water near to the *first take* person but, water soon runs opposite side of the *first take* person.
3) The flat surface of water is moderate and most composed. Democracy requires ever-lasting moderation in practice and decision-making.

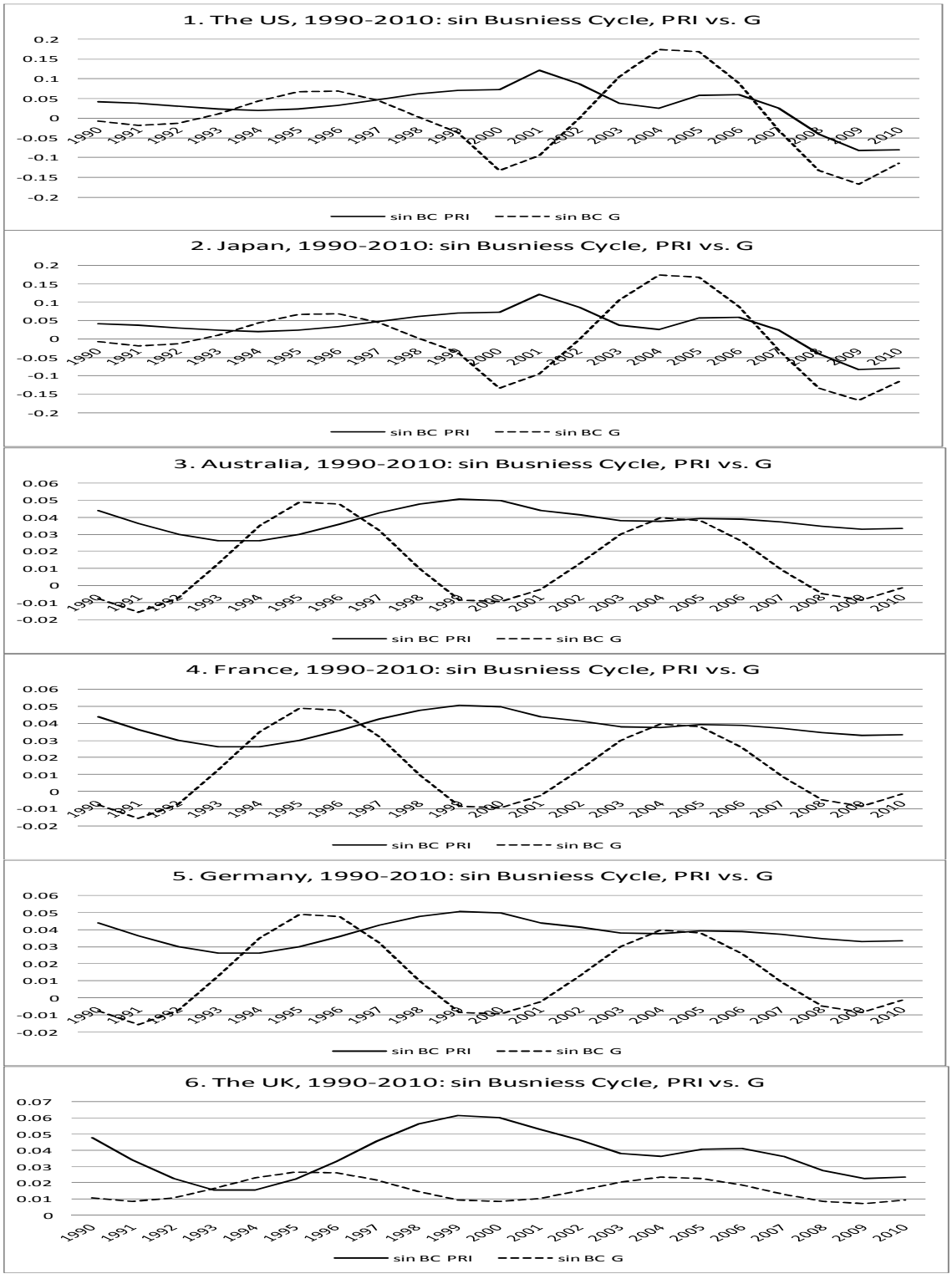
Chapter 14

Table T1 Topology of sin in $y = a(\sin x) + b$, by sector, 1990-2010

1. the US	bPRI=-0.0035x+0.0784	bG=0.004x-0.0129
2. Japan	bPRI=0.0005x+0.0071	bG=0.004x-0.0129
3. Australia	bPRI=0.0041x+0.0522	bG=0.0015x-0.0041
4. France	bPRI=0.0002x+0.04	bG=0.0015x-0.0041
5. Germany	bPRI=-0.0038x+0.0858	bG=0.0015x-0.0041
6. the UK	bPRI=-0.00009x+0.0395	bG=-0.0002x+0.0187
7. China	bPRI=0.0073x+0.2764	bG=0.00005x+0.0448
8. India	bPRI=.0022x+0.0398	bG=0.004x+0.0711
9. Brazil	bPRI=-0.0052x+0.2063	bG=0.0002x+0.0096
10. Mexico	bPRI=-0.0004x+0.1539	bG=-0.0005x+0.0823
11. Russia	bPRI=0.0049x+0.0133	bG=-0.0005x+0.0823
12. Sourth Africa	bPRI=0.0044x+0.0672	bG=0.0004x+0.033
1. Denmark	bPRI=0.0019x+0.0156	bG=0.0039x-0.0153
2. Finland	bPRI=0.004x-0.0129	bG=-0.0035x+0.0784
3. Netherlands	bPRI=-0.0027x+0.0908	bG=0.0001x+0.0263
4. Norway	bPRI=0.0014x+0.0616	bG=0.0008x+0.0009
5. Sweden	bPRI=0.0005x+0.0422	bG=-0.001x+0.0227
6. Canada	bPRI=-0.002x+0.1108	bG=0.0002x+0.0096
7. Greece	bPRI=0.0026x+0.0877	bG=0.0005x+0.0116
8. Iceland	bPRI=0.0084x+0.0026	bG=0.0032x+0.0012
9. Ireland	bPRI=-0.0004x+0.2123	bG=0.0051x-0.0134
10. Italy	bPRI=-0.0028x+0.0999	bG=0.0005x+0.013
11. Portugal	bPRI=-0.0058x+0.1817	bG=0.0007x+0.0299
12. Spain	bPRI=-0.0009x+0.119	bG=-0.0012x+0.021
1. Indonesia	bPRI=-0.0035x+0.2331	bG=-0.0016x+0.0582
2. Korea	bPRI=-0.0082x+0.3071	bG=-0.0013x+0.04
3. Malaysia	bPRI=-0.0138x+0.3819	bG=0.002x+0.0409
4. Philippine	bPRI=0.0021x+0.0621	bG=-0.0005x+0.0823
5. Singapore	bPRI=-0.0037x+0.2706	bG=0.0004x+0.033
6. Thailand	bPRI=-0.0066x+0.3077	bG=0.0015x+0.0428
7. Bangladesh	bPRI=0.0017x+0.0314	bG=-0.0002x+0.0517
8. Pakistan	bPRI=0.0011x+0.0525	bG=0.0001x+0.0416
9. Sadi Arabia	bPRI=-0.0013x+0.0912	bG=0.0009x+0.0294
10. Sri Lanka	bPRI=0.0006x+0.1289	bG=-0.0003x+0.0634
11. Czech Rep	bPRI=0.0055x+0.1006	bG=0.0028x+0.0136
12. Poland	bPRI=-0.0006x+0.092	bG=0.0013x+0.0027
1. Japan, 1960-2010	bPRI=-0.0045x+0.2336	bG=-0.0011x+0.0781
2. the US, 1960-2010	bPRI=-0.002x+0.1254	bG=-0.0011x+0.0781

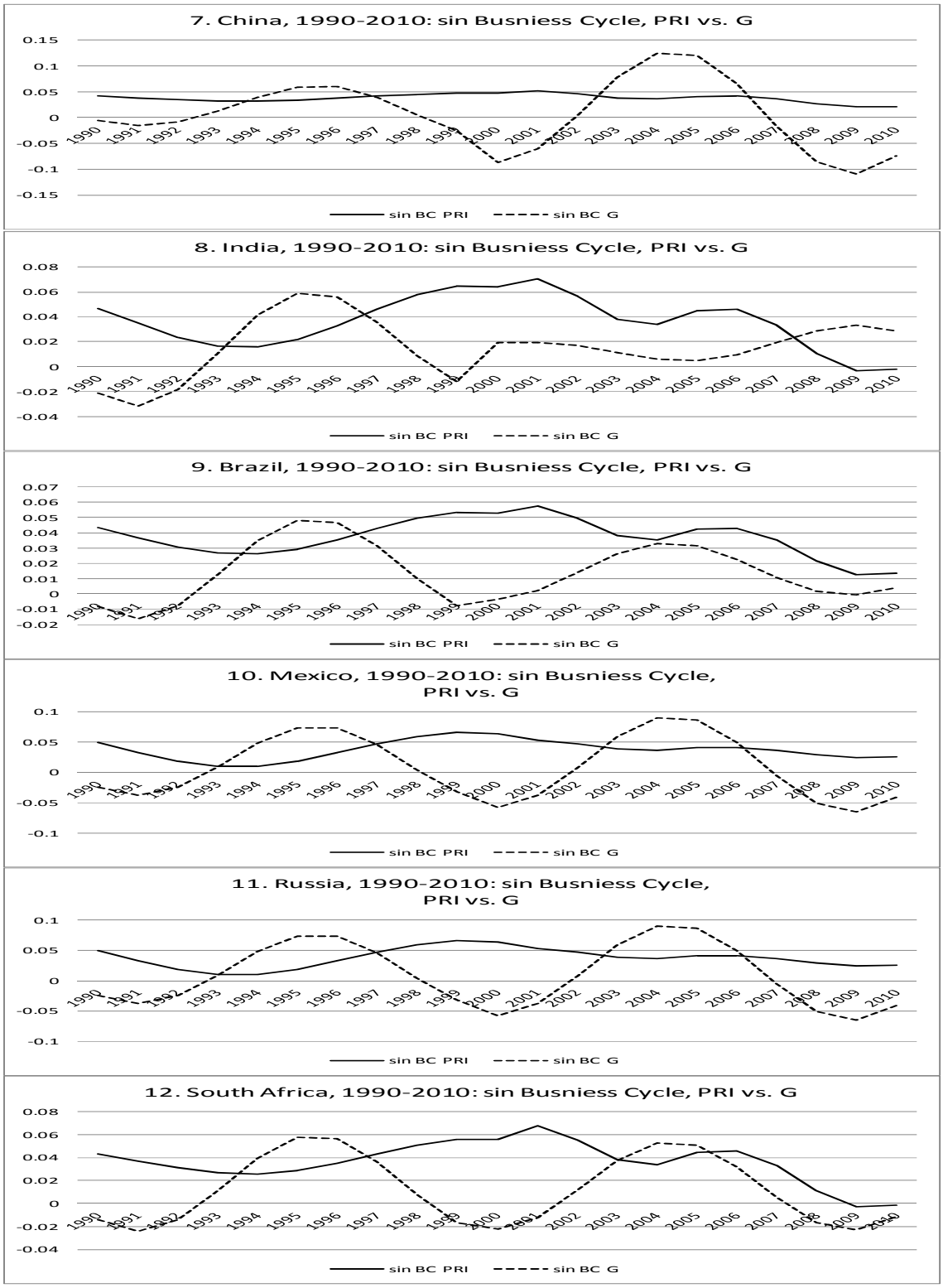
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Note: $y = ax + b$ is divided into two parts: $b_{PRI} = ax + c$ and $b_G = dx + e$, as shown in this table.



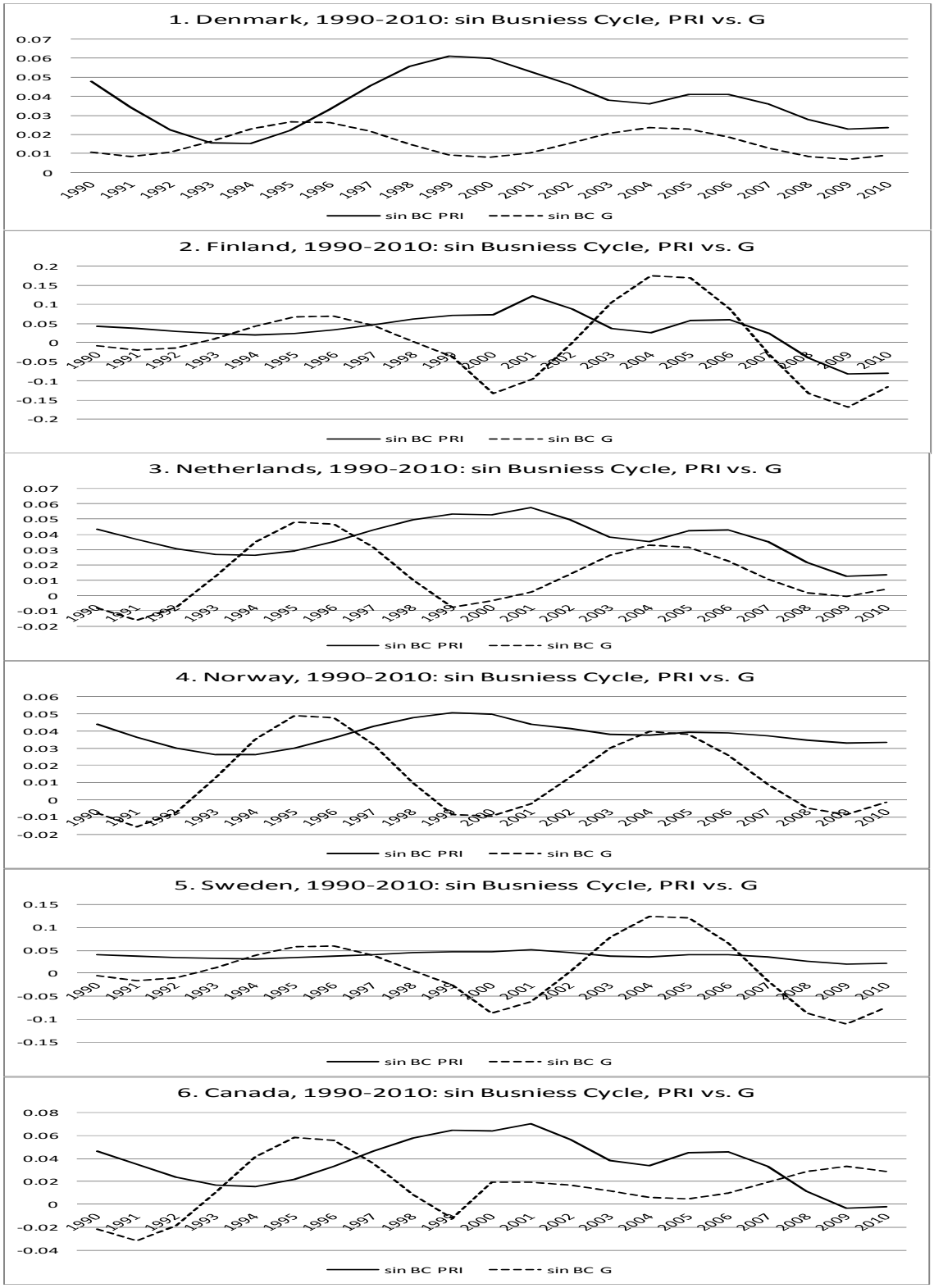
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC1 sin business cycle, G vs. PRI: six developed countries



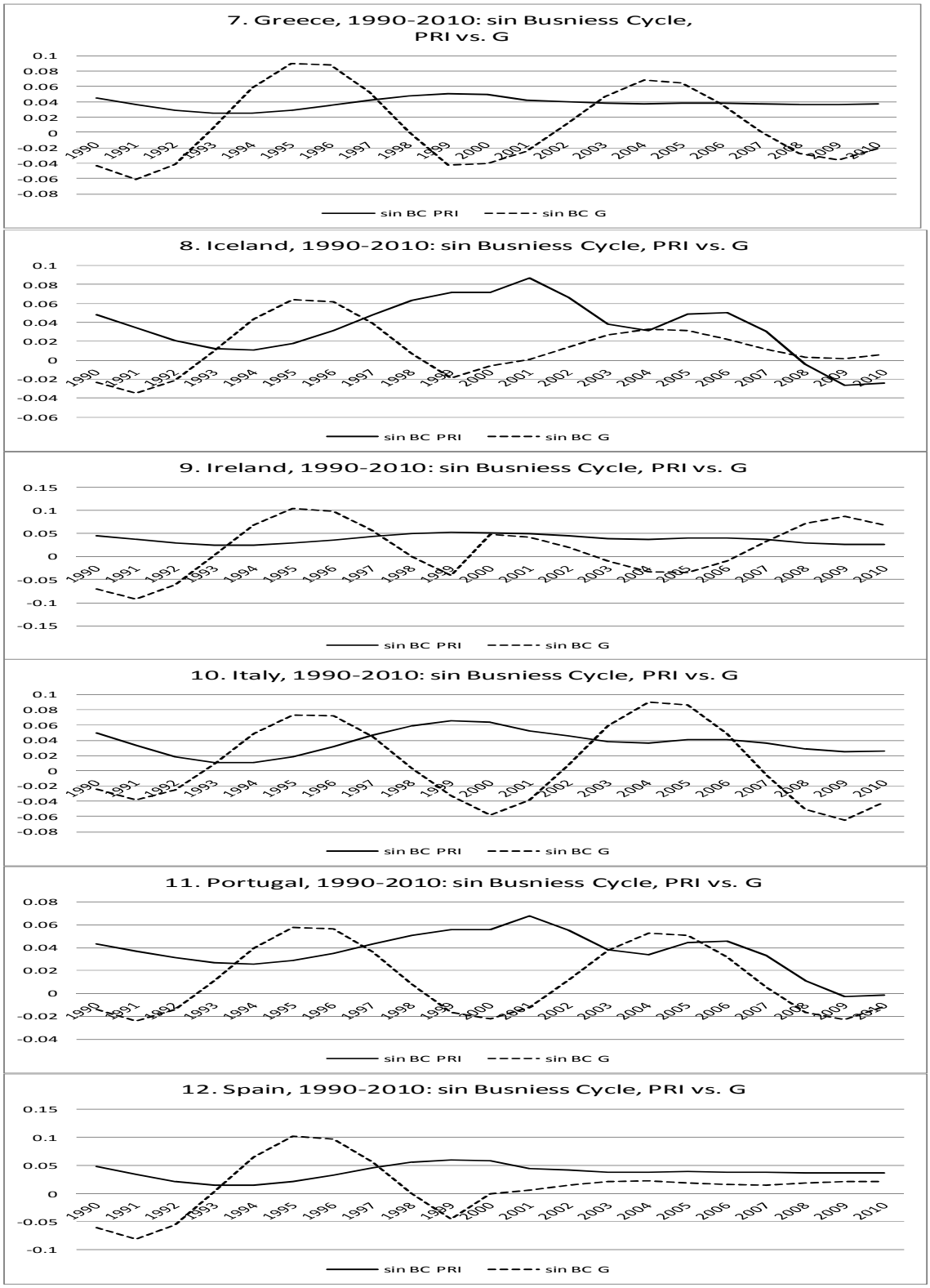
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC2 sin business cycle, G vs. PRI: six developing countries



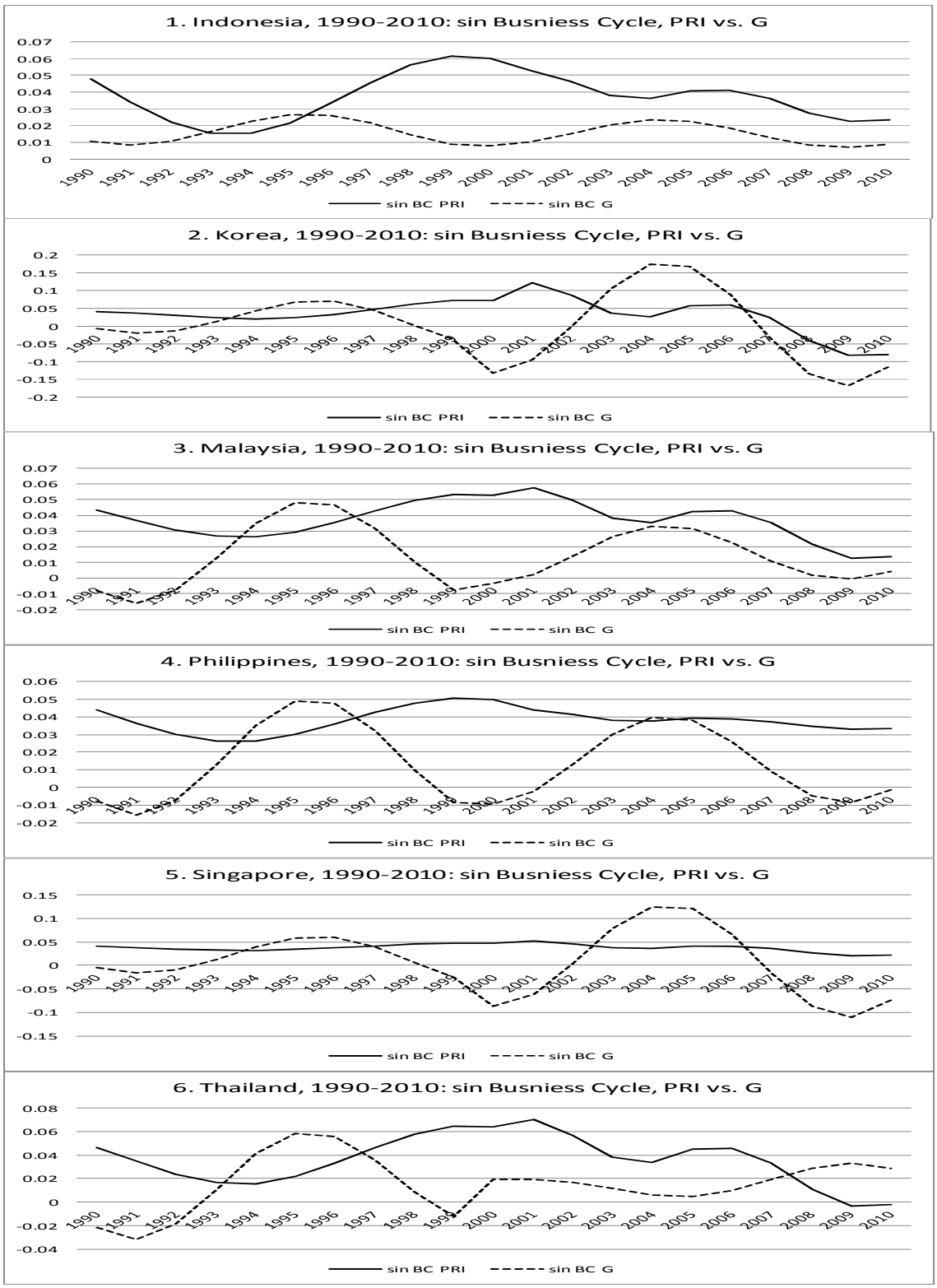
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC3 sin business cycle, G vs. PRI: developed countries with small population



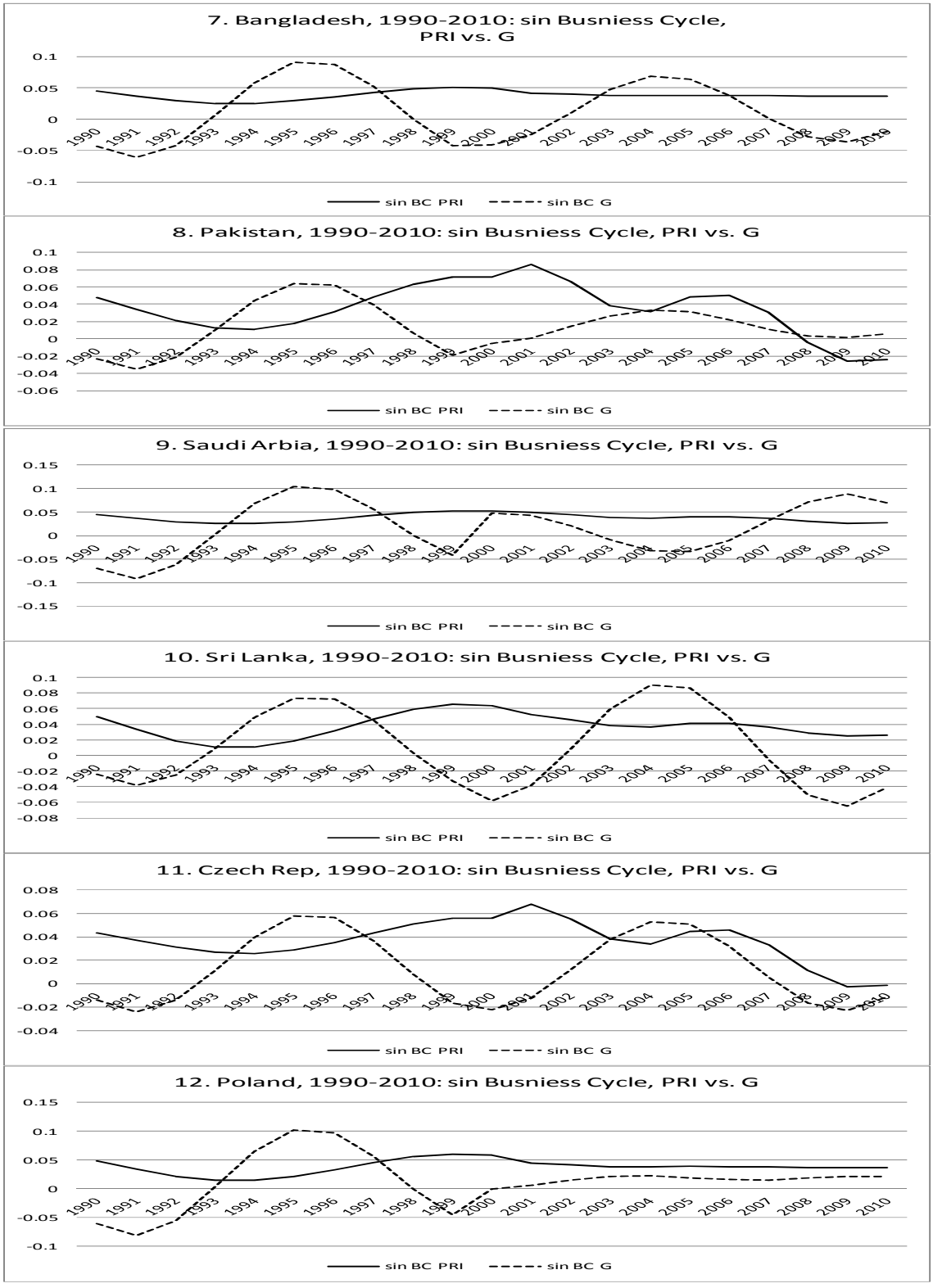
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC4 sin business cycle, G vs. PRI: developed countries with huge debts



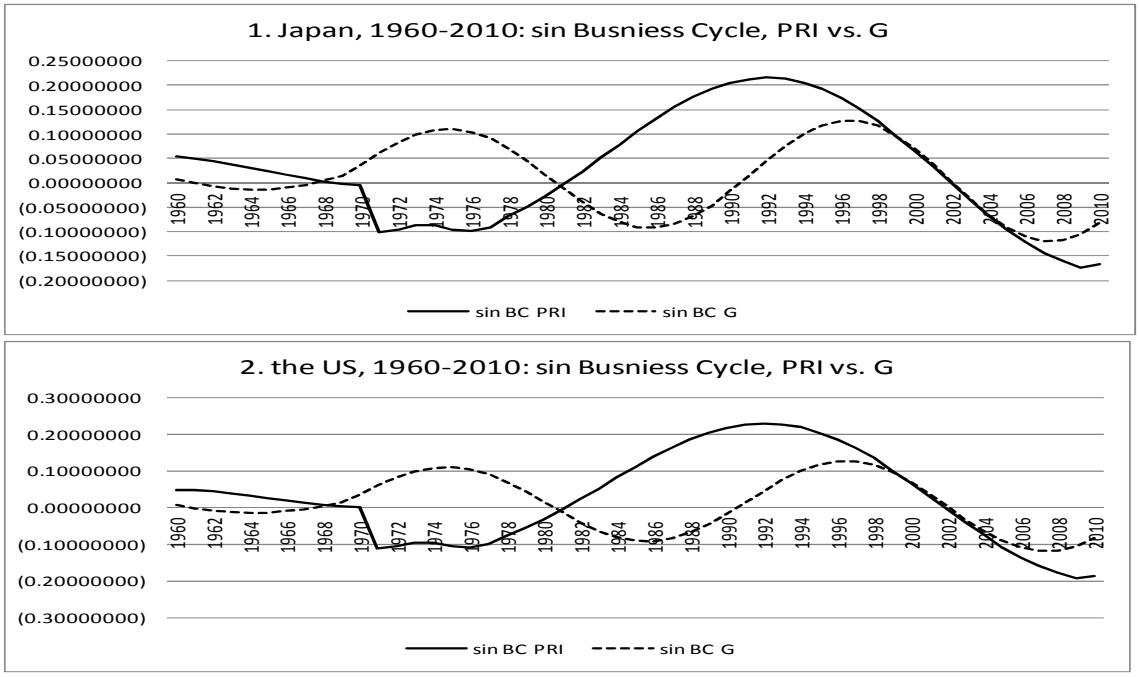
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC5 sin business cycle, G vs. PRI: Asian developing countries

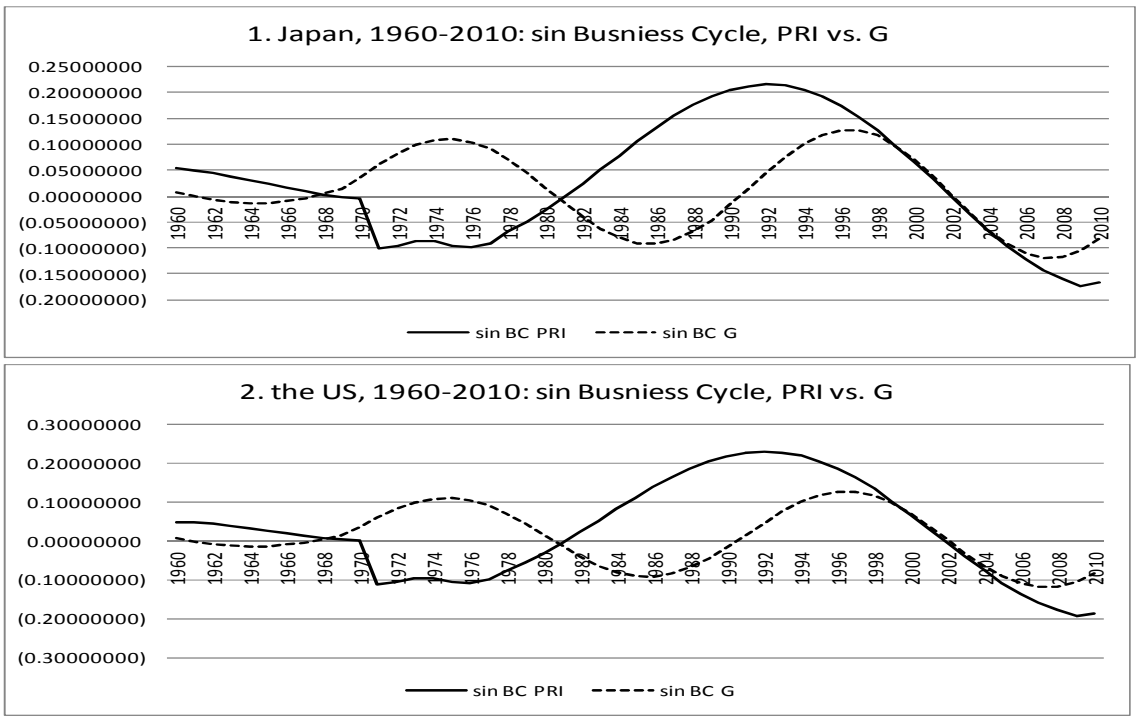


Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC6 sin business cycle, G vs. PRI: unique and East European countries



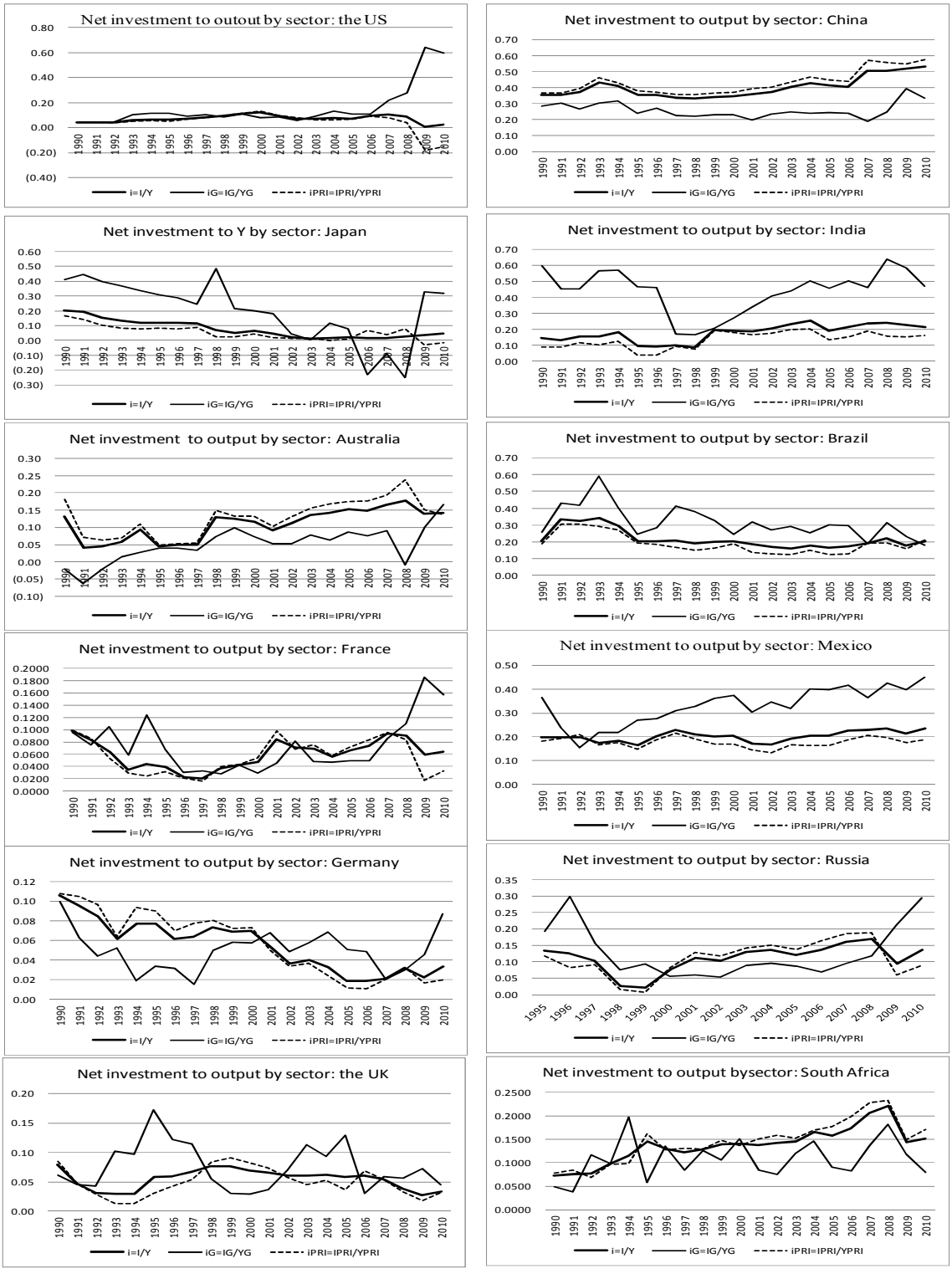
Above before adjustment process and, **below** after adjustment process: Almost no difference. It implies that there exists moderate equilibrium for 51 years at Japan and the US and, data are exact.



Data source: KEWT 6.12-6 by sector, 1960-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

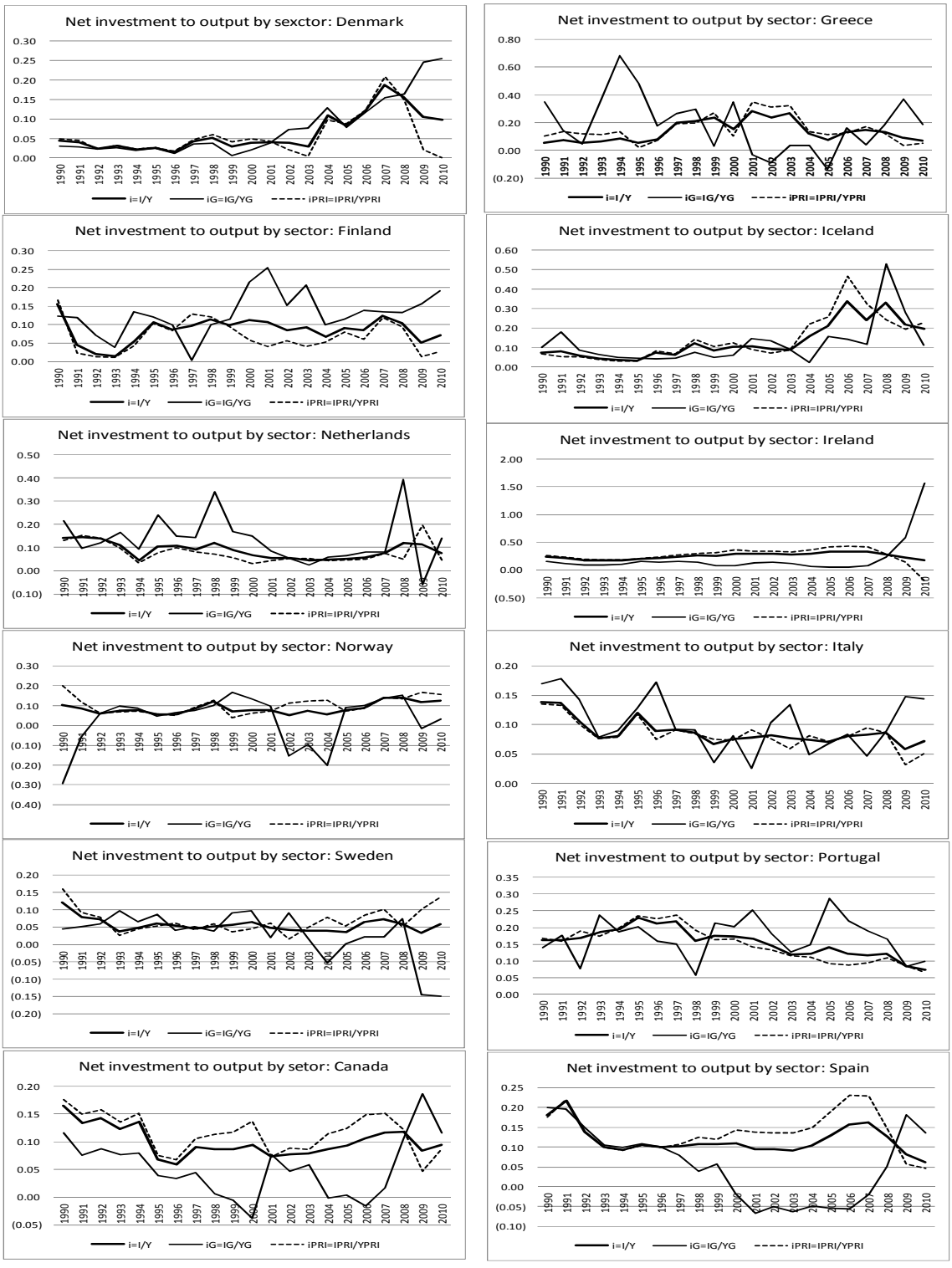
Figure BCL sin business cycle, G vs. PRI: Japan, 1960-2010 and the US, 1960-2010

Chapter 14



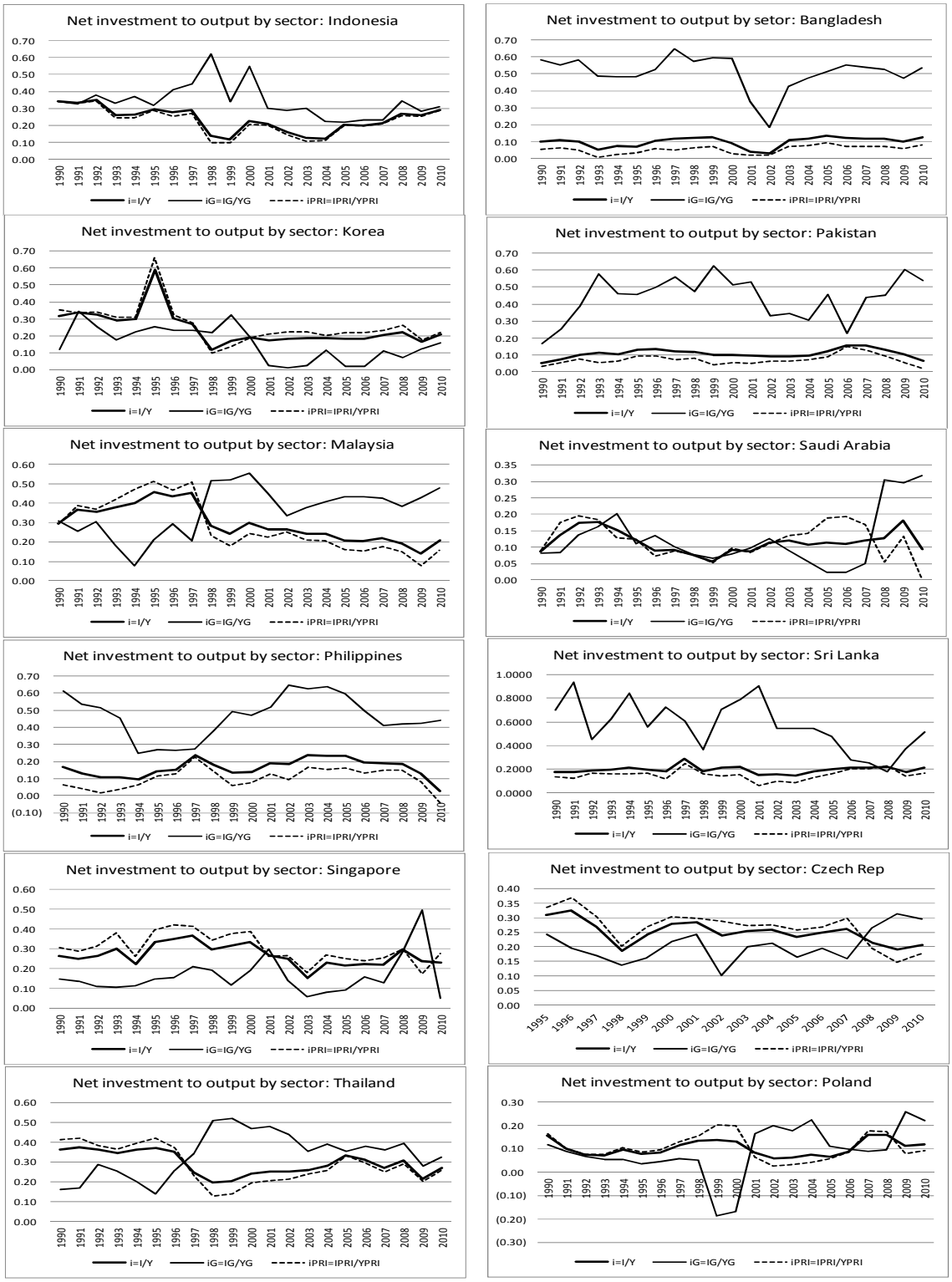
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure IS1 Net investment levels by sector as a base for business cycle: 6 developed countries *vs.* 5 BRICs countries and Mexico



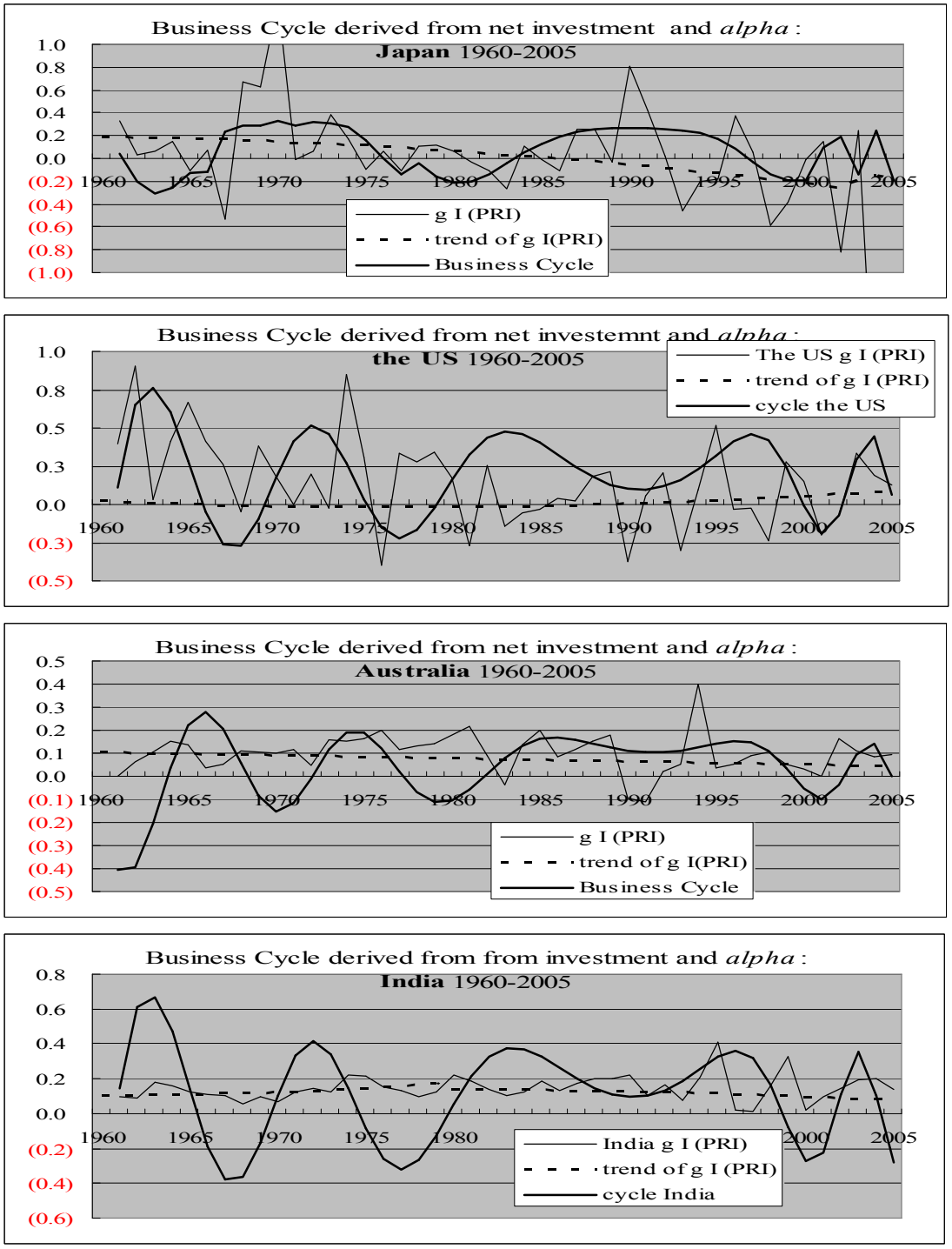
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure IS2 Net investment levels by sector as a base for business cycle: 12 Europe countries



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

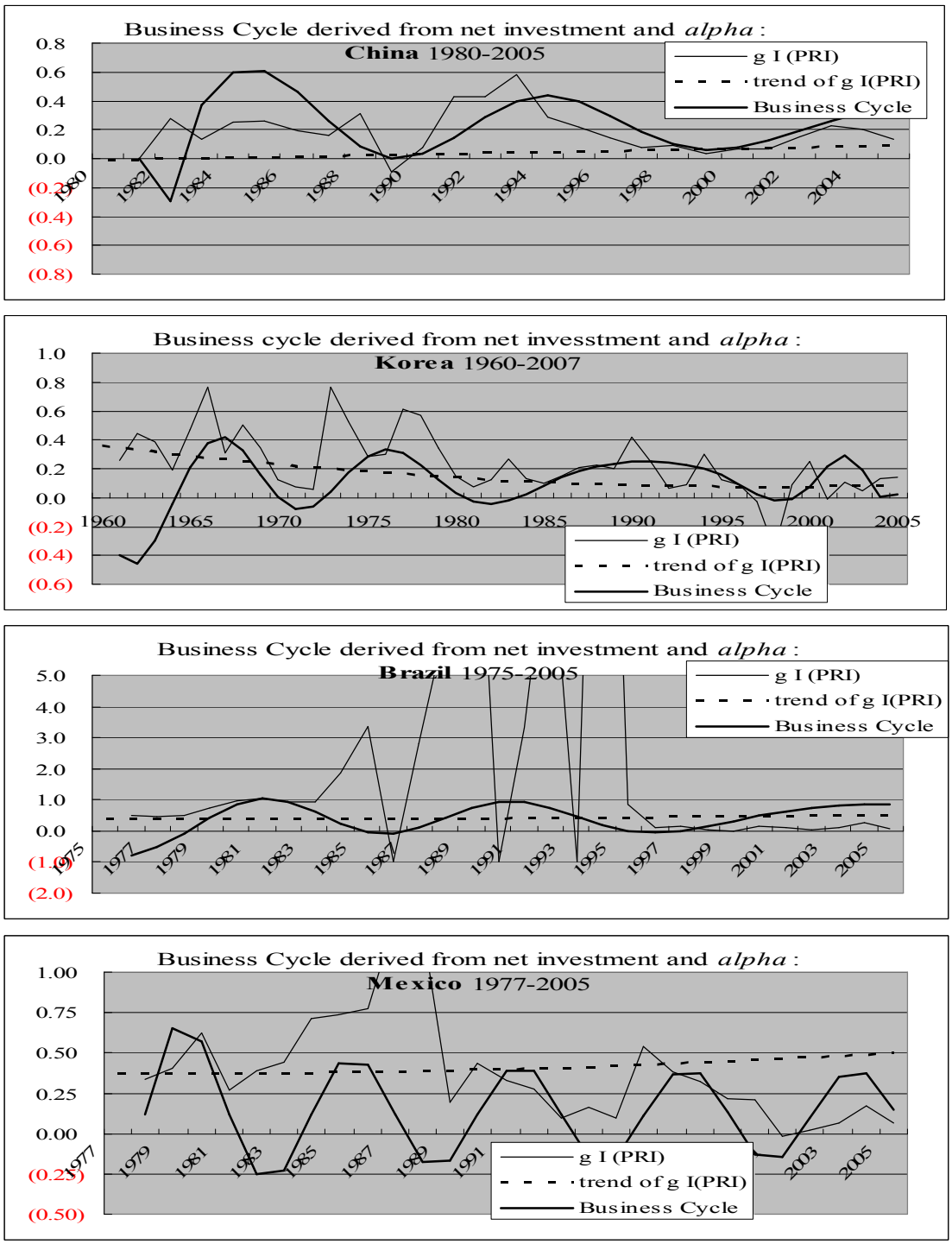
Figure IS3 Net investment levels by sector as a base for business cycle: 12 Asian and Rest countries



Data source: KEWT 1.07

Note: A base of cyclical trend is made of the growth rate of net investment in the private sector and the difference of the economic stage. For whole background analysis to BRICs, China, Korea, Mexico, Russia, see *Finance India* 23 (Sep, 3): 821-866 (FI233-Art02 BRICs 1.07.pdf). The author got Permissions to use, on 19 Aug, 2012.

Figure LBC1 Business cycle: Japan, the US, Australia, and India 1960-2005



Data source: KEWT 1.07

Note: A base of cyclical trend is made of the growth rate of net investment in the private sector and the difference of the economic stage. For whole background analysis to BRICs, China, Korea, Mexico, Russia, see *Finance India* 23 (Sep, 3): 821-866 (FI233-Art02 BRICs 1.07.pdf). The author got Permissions to use, on 19 Aug, 2012.

Figure LBC2 Business cycle: China, Korea, Brazil, and Mexico 1980/60/75/77-2005

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