Chapter 8

Two Disequilibrium Risks of δ_0 and the Speed Years, Essential to Seven Endogenous Parameters

8.1 Essence of Seven Endogenous Parameters in Equilibrium

This chapter reveals the essence of seven endogenous parameters and simulates two risks (δ_0 and $1/\lambda^*$, soon below) against sufficient and necessary conditions lying at the endogenous-equilibrium. The Graphic Dynamics (GD) is a tool and constitutes a highlight in this Chapter. Seven endogenous parameters are the following: The ratio of net investment to output, $i = I/Y$; The rate of change in population, $n_E = n$; The relative share of capital, $\alpha = \Pi/Y$; the capital-output ratio, $\Omega = K/Y$; The diminishing returns to capital (DRC) coefficient, δ_0; and *the speed years* as the inverse of the convergence coefficient, $1/\lambda^*$. Seven endogenous parameters are consistent with the discrete Cobb-Douglas production function under constant returns to scale and cooperatively work for maintaining endogenous equilibrium, by country, sector, and year and, over years. Seven endogenous parameters are each shown by equations. The author formulates seven equations with each theoretical proof separately in the *EES*. For simplicity this chapter does not repeat theoretical proofs of seven endogenous equations.

Two risks against stable equilibrium are selected from seven endogenous parameters: i) the diminishing returns to capital (DRC) coefficient, δ_0, and 2) *the speed years* $1/\lambda^*$ as the inverse of the convergence coefficient, λ^*. These two risks are a quick litmus paper to test a qualitative level of equilibrium. And, these two risks are tightly related to the capital-output ratio and the technology coefficient. These four endogenous parameters are tied up with the character of capital stock and flow. Capital is a rival and composed of qualitative and quantitative. Capital flow is net investment and qualitatively measured. The capital-output ratio, $\Omega = K/Y$, sensitively influences the level of equilibrium while the capital-labor ratio, $k = K/L$, does not. The technology coefficient, β^*, determines the qualitative level of capital flow or net investment. The level of β^* has its effective range lying from above zero to below one; $0 < \beta^* < 1.0$.

At economic stages, the capital-output ratio starts with a low level, e.g., 0.4 to 0.6 and then, gradually gets into a higher level, e.g., 0.9, 1.5, and 2.0. If the capital-output ratio rises rapidly, as seen in some developing countries in Asia, the level of β^* becomes above 1.0 shortly. It implies that the endogenous-equilibrium is broken. This is a basic idea and a fact behind two risks lying among seven endogenous parameters. The fact is also shown by the hyperbola of the capital-output ratio to β^*; $\Omega(\beta^*)$. Chapter 7 explained *the speed years* using hyperbolas of $speed(i)$ and $speed(n)$. To sum up,

$\Omega(\beta^*)$ or $\beta^*(\Omega)$ shows a negative diagonal, similarly to the hyperbolas to the rate of change in population and reinforces seven endogenous parameters. This chapter skips the explanation (for whole version of hyperbolas, see Appendix of the *EES*).

As a result, this chapter shows Graphic Dynamics designed for two disequilibrium risks, using endogenous parameters, δ_0 and *the speed years*, each to the capital-output ratio. Figure 1 to Figure 9 cover 36 countries, 2010, where each figure compares Graphic Dynamics of the government sector with that of the private sector. Readers understand how deeply the government sector is involved in the total economy. It is beyond description. In another word, the government sector determines qualitative levels of capital stock and endogenous equilibrium. Net investment is fully qualitative and does not include any level of quantitative net investment. This is discussed in Chapter 14 with business cycle.

Graphic Dynamics in this chapter shows results of simulations. The author also simulates some aspects, for example, population and growth. These simulations are distinguished with the results of recursive programming (see Chapter 16). Graphic dynamics is non-linear and impossible to be treated in econometrics. Econometrics has improved steadily and surprisingly for the last 60 or more years at Keynesian and neo-classical schools. This chapter does not touch econometrics since each character completely differs. For the differences between the endogenous system and econometrics, the author will compare the results of endogenous data with statistics actual data in the following few chapters by aspect.

8.2 The Graphic Dynamics to Examine Two Risks to Disequilibrium

Two risks of δ_0 and *the speed years* result in disequilibrium. The author first classifies two risks into two different cases: One is numerically mismatching combination. The other is an uncontrollable case, extremely out of a right road. Mismatching case happens when the ratio of qualitative technology coefficient divided by quantitative technology coefficient, $B^* = (1-\beta^*)/\beta^*$ is incalculable:

1) $\beta^* = 0.5$ or $B^* = 1.0$.
2) $\beta^* = 0.8$ or $B^* = 0.25$ under the capital-output ratio is 4.0 or its inverse is 0.25.
3) $\beta^* = 1.0$ or $B^* = 0$. This comes from numerical character of δ_0. $\delta_0 = 1 + \frac{LN(\Omega)}{LN(B^*)}$ or $\delta_0 = 1 - \frac{LN(1/\Omega)}{LN(B^*)}$. If $\beta^* > 1.0$, mismatching combination turns to the other case of no controllable disequilibrium.

The other case always expresses disequilibrium. The endogenous system does not approve a condition of $\beta^* > 1.0$. Or, when quantitative capital is more than qualitative capital, capital does not exist in the Cobb-Douglas production function. Nevertheless, interesting to say, the relationship between β_0 and the capital-output ratio is dynamic and changeable quickly. Some countries have experienced $\beta^* < 1.0$ even if the capital-output ratio is exceptionally high, e.g., $\Omega = 6.0\ or\ 8.0$ under $\Omega \gg 1.0$. This is a high technology case, as shown by Singapore. Other countries have experienced $\beta^* < 1.0$ while $\Omega = 0.6\ or\ 0.8$. These occurrences were intuitively anticipated by Schumpeter, an older teacher of Samuelson. Expansion is not a right road and, extension must be a right road if extension includes continuous qualitative improvement in economic sustainability.

BOX 8-1 Numerical relationship among the capital-output ratio, $\Omega = K/Y$, β^*, and δ_0

Ω	0.4000	0.5000	0.6852	0.8000	**1.0000**	1.2000	2.0000	10.0000	**11.0000**
LN(Ω)	(0.9163)	(0.6931)	(0.3781)	(0.2231)	0.0000	0.1823	0.6931	2.3026	2.3979
$r^*=\alpha/\Omega$	0.5000	0.4000	0.2919	0.2500	0.2000	0.1667	0.1000	0.0200	0.0182
beta*	0.3616	0.4171	**0.5000**	0.5417	**0.6017**	0.6496	0.7726	1.0000	1.0067
B^*	1.7655	1.3977	**1.0001**	0.8460	0.6621	0.5395	0.2943	0.0000	(0.0067)
$LN(B^*)$	0.5684	0.3348	0.0001	(0.1673)	(0.4124)	(0.6172)	(1.2233)	(36.7368)	**#NUM!**
$LN(\Omega)/LN(B^*)$	(1.6119)	(2.0702)	**(3869.66)**	1.3341	**0.0000**	(0.2954)	(0.5666)	(0.0627)	**#NUM!**
$delta_0$	**(0.612)**	**(1.070)**	**(3868.66)**	2.3341	**1.0000**	0.7046	0.4334	0.9373	**#NUM!**

Let the author explain the above **BOX 8-1**. This BOX shows a high-technology oriented country or an economy (the private sector). Leaders' eyes are far ahead and towards next generations. Mismatching case exists when the capital-output ratio shows 0.6852 and results in δ_0=3868.66. No controllable case is shown by $\delta_0 < 0$ and, $\delta_0 = \#NUM!$, where equilibrium falls into disequilibrium. In particular, $\delta_0 = \#NUM!$ shows the worst. This worst occurs at $\Omega = 11.00$ in the above BOX. For example, the highest capital-output ratio is 8.9803 among 86 countries in the world for 23 years, 1990-2012. This is the case of the government sector of Japan, 1990-2012, due to increasing deficit by year and over years. It implies that how the private sector of Japan, 1990-2012, has been strong in technology, while leaders, companies, and people are too instant votes-oriented (notorious 'baramaki') and neglect next generations. The above BOX, for simplicity, excludes *the speed years*. The author discusses *the speed years* empirically in the next section. This is because *the speed years* are determined by two risks and remain results of two risks. *The speed years* include the rate of technological progress that shows qualitative net investment, as discussed in Chapter 7.

Graphic dynamics presents behavioral analysis or behavioral science. This is because decision-making is deeply involved in two risks against disequilibrium. Apparently, graphic dynamics belongs to the products or the real assets-product in the endogenous system. However, deficit by year is determined by leaders and policy-makers. The philosophy of leaders are high and quality-oriented, the results and the above real assets-product become technology-oriented. Deficit belongs not to the financial assets but to the real assets in the endogenous system. Therefore, graphic dynamics clarifies the level of unbalance between the government and private sectors. Of course, developing countries, first of all, need infra-structure to be acceptable by companies in the world. Yet, any country should not drive out of the right road by year and over years. Drivers are the leaders and policy-makers by country. The next section shows empirically drivers' decision-making and the real assets-product or graphic dynamics by sector.

8.3 The Graphic Dynamics (GD) to Avoid Instable Equilibrium

This section is composed of two sub-sections: 1) Processes to connect δ_0 with *the speed years* and the outline of Graphic Dynamics (GD); 2) Empirical results of the GD and summing up of whole economic policies. This section is unique in the *EES* and also a highlight of this chapter. This section presents Graphic Dynamics (GD), 2010, by sector, for 36 countries, selected among 81 countries. The 36 countries are used in other chapters by aspect.

8.3.1 Process to *the speed years* from δ_0 and the outline of the Graphic Dynamics (GD)

The diminishing returns to capital (DRC) coefficient, δ_0, was measured in the previous section, using the ratio of net investment to output/income, $i = I/Y$, the relative share of capital, $\alpha = \Pi/Y$, the rate of change in population, $n_E = n$, and the capital-output ratio, $\Omega = K/Y$. $\Omega = K/Y$ is a key ratio for two risks of $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and *the speed years*, $1/\lambda^*$, where the speed coefficient $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$, and the rate of technological progress $g_A^* = i(1-\beta^*)$ each hold by year and by sector. Therefore, the tie between δ_0 and *the speed years* is the qualitative net investment coefficient, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$, and accordingly, $B^* = \frac{1-\beta^*}{\beta^*}$. Once $B^* = \frac{1-\beta^*}{\beta^*}$ is determined following the level of $\Omega = K/Y$, *the speed years* are simultaneously determined. **Tables 1, 2,** and **3** are results of the above process; the total economy (T), the government sector (G), and the private sector (PRI). For simplicity, other chapters do not show these tables by sector.

The Graphic Dynamics (GD) presents a dynamic level of two risks, $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and *the speed years*, $1/((1-\alpha)n + (1-\delta_0)g_A^*)$, along with $\Omega = K/Y$ and β^*.

The GD is based on the capital-output ratio, $\Omega = \Omega^* = \Omega_0$ and $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

The GD adopts and proves the consistency of $\Omega = \Omega^* = \Omega_0$ with $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$.

As a result, the GD conclusively clarifies dynamic balances between the G sector and the PRI sector, preserving national taste, preferences, culture, and history and cooperatively trading with all the other countries in an open economy.

The relationship between the capital-output ratio and β^* remains unchanged throughout all the GDs, by country, and by sector, as readers well recognize this fact. It is traced back to the essential character of the hyperbola of β^* to Ω, $\beta^*(\Omega)$ or reversely, $\Omega(\beta^*)$ (for explanations of hyperbolas, see Appendix). For confirmation, the author added two figures for twelve countries, 2010, at the end (see **Figures 10** and **11**). Despite, why does the author add the qualitative net investment coefficient β^* to the GD? This is because if the transition of δ_0 is not far from the transition of β^*, the situation is stable and robust. To be easier for observing, β^* and δ_0 have the same scale on the LHS of each graph. *The speed years* are widely scattered; from 2 to 200 years by country and by sector. For *the speed years*, the author has to set a different scale on the RHS each graph. When *the speed years* are relatively short and stable, the situation is well balanced. This is discussed empirically, from the viewpoint of policy sum up, in the next sub-section.

8.3.2 Empirical results of the GD and summing up of whole economic policies

Let the author first empirically watch each Graphic Dynamics (GD) by sector and distinguish stable with instable facts and then, sum up behavioral wisdom accumulated by whole economic policies among countries. For understandable explanations, the author does not use equations and also, symbols except for δ_0 and β^* (see BOX 8-1 above).

Fact-findings of the GD, towards more stable in the endogenous-equilibrium, are the following (see each data and results of **Tables 2** to **4** and **Figures 1** to **9**, for 36 countries).

1. Generally, up to the right trends are each normal. Down to the right trends each are apt to be abnormal.

   Roughly, 90 % or more countries among 36 countries have experienced up to the right trends. But, not always; sometimes suddenly changing. It may be inconsistent decision-making partly due to unstable changes of politics, political power, and dispersive voting. Further, leaders cannot perceive risky ‘down to the right trends’ since there is no method developed in researches except for the GD.

2. The wider the effective range of the capital-output ratio, the more normal the situation is. The narrower the effective range of the capital-output ratio, the more abnormal the situation is.

It is important for policy-makers to know how the effective range is apparently changeable like weather. Policy-makers must be alert at these changes consecutively. Also, it implies that policy mix is difficult to treat since combination of seven endogenous parameters are interrelated each other organically and delicately like human body. Organically is replaced by towards dynamic balances or moderation. Then, policy-makers are relaxed and enjoy executing policies towards moderation.

3. The smaller the differences between the G sector and the PRI sector, the more balanced the situation is.
   Differences between the G sector and the PRI sector differ surprisingly by country. These differences reflect circumstances of each political situation and national taste and culture preserved by country. Political situation immediately spreads economic situation the GD expresses. The above ‘organic’ is replaced by the balances between the G sector and the PRI sector. Economic policies are free in a sense since organic balances between the G and PRI sectors are free.
4. When one of two sectors, G and PRI, is abnormal, policy-makers must pursue its causes and results and amend its abnormality. Otherwise, the situation falls into definite disequilibrium. The symptom measured by *the speed years* is extremely high (more than 70 to 80 yrs) or low (less than 2.0 to 3.0 yrs).
   Abnormal is related to another expression of ‘execute nothing’ or ‘do not execute anything within a few years later,’ as shown in Japan after the 1990s. Also, execute immediately has two ways in terms of redistribution: (1) for next generations far ahead, 30 to 50 yrs ahead and (2) more older people or younger people within the current generation, more selfishly. Typical case of (1) is Singapore and immediate case of (1) will be China. The author shows Singapore and China, comparing with each other concretely using some ratios as follows:

<u>Singapore and China:</u>

Singapore is most typical among 81 countries in that the capital-output ratio increases along with technological progress and breaks a common upper limit of the capital-output ratio. China is also unique in that all the economic policies are immediately and done by year and over years boldly without hesitation, contrarily to Japan. Dear to say, China is still much more quantity-oriented while Singapore is thoroughly quality-oriented since a common upper limit of the capital-output ratio has been meaningless. China, for sustainability, is now urged to be eco-oriented rapidly turning from money to earth, nature, and people.

More concretely, Singapore has taken unique strategies such that by regulation the temperature of inside room must be less than 15^0C, lest the next generation will be born with cleverer brains and such that cities and everywhere be cleaned with education so that private enterprises, by their burden, must accept public clean service of employees who break the clean rule. Thus, Singapore has changed from the dirtiest to the cleanest area in the world surprisingly. The strong leadership made it possible to clean up Singapore.

China has no privately-owned land by following its social system. For example, China government takes yearly rental from people for 60 yrs and from enterprises for 40 yrs. Budgetary burden is much less than that of many privately-owned land countries. As a result, the G and PRI sectors are well balanced but, profits-oriented and quantity-oriented too much hitherto.

Stable versus instable countries:

Unbalances between the G and PRI sectors drive countries to instability from stability. Extremely unbalanced countries have a possibility to fall into instability. Japan (PRI), the US (PRI), South Africa (PRI), Denmark (PRI), Greece (PRI), Iceland (PRI), Ireland (PRI), Spain (PRI), and Poland (PRI). These countries have spent government money extremely after 2007 to save financial institutions. Deficit is a result. Increase in deficit definitely reduces growth in the private sector. Policy-makers do not like to use the phase of Crowded-out but, the above GD exactly expresses crowded-out. A problem is how to recover sustainable growth. A future risk possibility depends on how to cut government expenditure with maintaining a minimum level of net investment. As earlier suggested by Samuelson (575-605, 1942) and W. S. Salant (308-314, 1942), tax increase and investment minimum spending are simultaneously required (for fiscal multiplier, see Chapters 12 and 13).

5. This chapter does not refer to actual/statistics versus endogenous data yet, the unbalances between the G and PRI sectors are another expression of the above unbalances between statistics and endogenous data (for comparisons of statistics and endogenous data, see other chapters related to several points).

Sum up behavioral policies behind the Graphic Dynamics (GD)

1. Any country has its own shape in detail, precisely, widely and universally. Yet, the GD roughly has a common and moderate shape. This situation is called stable one. Stable situation is based on BOX 8-1 explained above in this chapter.
2. The GD expresses the past, the current and even future of a country and its sectors, G and PRI, at a glance. The GD reflects causes and effects/results simultaneously. This is because policies are all determined by leaders and policy-makers, by year, sector, and over years.
3. Leaders and policy-makers have each characteristic by country and are influenced by national characteristics such as taste, culture, history, and more broadly civilization of the East and West. The endogenous system all absorbs these differences by country and globally.
4. Two extremes exist in social sciences related to human-life history, the positive and the

negative. Two extremes are indispensable. Two extremes exist and hold not only in human sciences but also in natural sciences, physics and chemistry, macro and micro. Nevertheless, two extremes have its own natural point of moderation and this moderation is an eternal goal. The author states ‘moderation in reality’ just like ‘in reality’ of Samuelson (1962). The author further steps into Moderation beyond Space and Time (see Chapter 10). Moderation is essentially dynamic and, suddenly changes and matches a new situation.

5. Leaders and policy-makers, regardless of whether or not the spiritual level of ideas and philosophy stand at high or low. Rather, ‘high or low’ is not an appropriate phase but only shows a passing experiment and experience. Human has progressed back and forth gradually, taking time and from fighting and wars to cooperation and peace towards moderation. The goal is coming nearer when human decision-making becomes close to moderation, since moderation makes everything relaxed and happy.
6. The GD suggests how risky it is not to decide the current promptly and at once. Theory and practice are one. The tie is whole economic policies. Theory exists only when practices and experiments are repeated continuously without any delay. Any system becomes slow when it becomes older. The GD checks necessary and sufficient conditions for endogenous equilibrium, related to seven endogenous parameters, and starting with the above BOX 8-1.

8.4 Conclusions

World society has gradually turned to human (decision-makers) from money (object-oriented), particularly after entering the 21st Century. People have begun to know people live with Earth and nature. Wisdom tells us that we need prediction rather than forecasting and that we must know maximum and worst risk. A system of national accounts has its own role to recording as statistics. The endogenous system has its role to policy-making by country, sector, and year, and over years.

In the field of econometrics, Vilfredo, F. Pareto’s (1848-1923) law and optimum are based on the magnitudes of vectors. Houthakker, H. S. (27-31, 1955-56), extending from firm to industry, proves that the Pareto distribution is consistent with the Cobb-Douglas production function using a simple linear approach and suggests that the approach is not fitted for non-linear. Besides, non-linear is difficult to estimate, forecast, and predict, even using econometrics. In short, Pareto’s optimum completely differs from the endogenous system and graphic dynamics in this chapter. Econometrics is one and, graphic dynamics the other. The endogenous system and graphic dynamics do not forecast and predict but measure all the parameters and variables. Leaders and policy-makers need to look for and realize optimum range of two risks of δ_0 and *the speed years*, and accordingly, graphic dynamics; continuously, behaviorally, and simultaneously with changes in environments and circumstances. Conclusively, nature-aspects are implicitly and deeply involved in δ_0, responding with the markets.

Empirically, each country has tried every effort to maintain equilibrium under the price-equilibrium. This reality is beyond description, although leaders' philosophy and intention differs by country, with national taste, preferences, culture, and civilization. Processes to realize and maintain equilibrium are shown by graphic dynamics in Figures 1 to 9, for 36 countries, 2010. These figures consistently correspond with hyperbola graphs and other simulation graphs.

This chapter concentrated on the essence of seven endogenous parameters and revealed graphic dynamics. Other chapters do not repeat the essence of seven endogenous parameters. This chapter empirically appeals the importance of balanced government and private sector.

For readers' convenience: contents of Tables and Figures hereunder

Table EP1 Seven endogenous parameters for 36 countries, 2012: the total economy

Total	**i=I/Y**	**n**	**α**	**Ω**	β^*	B*	δ_0	g_A^*	**$1/\lambda^*$**
1. the US	0.1171	0.00579	0.0992	6.7789	0.9224	0.084	0.2269	0.0091	**81.69**
2. Japan	0.0400	(0.00079)	0.1058	8.9803	0.8934	0.119	0.1799	0.0043	**357.47**
3. Australi	0.2079	0.01363	0.1751	2.7338	0.8117	0.232	0.3117	0.0392	**26.18**
4. France	0.0785	0.01123	0.1057	1.7464	0.7478	0.337	0.4870	0.0198	**49.49**
5. Germany	0.0494	(0.00265)	0.1014	1.8697	0.6422	0.557	(0.0700)	0.0177	**60.52**
6. the UK	0.0290	0.01144	0.2028	0.9741	0.7245	0.380	1.0271	0.0080	**112.32**
7. China	0.4052	0.00636	0.4170	2.7845	0.8353	0.197	0.3693	0.0667	**21.84**
8. India	0.3092	0.00000	0.2409	2.3344	0.7546	0.325	0.2453	0.0759	**17.46**
9. Brazil	0.0209	0.02672	0.1877	1.4735	1.3081	(0.236)	0.7319	(0.0064)	**50.06**
10. Mexico	0.1757	0.01248	0.1153	1.7990	0.7149	0.399	0.3611	0.0501	**23.23**
11. Russia	0.1367	(0.00188)	0.2643	0.8759	0.5375	0.860	1.8809	0.0632	**17.52**
12. S.Africa	0.1421	(0.01924)	0.0924	1.1295	0.4808	1.080	2.5836	0.0738	**(7.45)**

Total	**i=I/Y**	**n**	**α**	**Ω**	β^*	B*	δ_0	g_A^*	**$1/\lambda^*$**
1. Denmark	0.0365	0.00358	0.0953	1.9103	0.7396	0.352	0.3799	0.0095	**109.52**
2. Finland	0.0959	0.00371	0.0974	1.8703	0.6988	0.431	0.2560	0.0289	**40.26**
3. Netherlan	0.0713	0.00240	0.1529	2.0741	0.7307	0.369	0.2692	0.0192	**62.28**
4. Norway	0.9501	0.01012	0.2714	3.5171	0.8362	0.196	0.2286	0.1556	**7.85**
5. Sweden	0.0618	0.01386	0.1209	1.5548	0.7667	0.304	0.6291	0.0144	**57.03**
6. Canada	0.1995	0.01015	0.1236	2.7953	0.7968	0.255	0.2478	0.0405	**25.40**
7. Greece	0.0243	0.00117	0.2555	2.9506	0.8273	0.209	0.3093	0.0042	**265.07**
8. Iceland	0.2109	0.01227	0.0924	2.6276	0.7845	0.275	0.2522	0.0455	**22.16**
9. Ireland	0.2040	0.01104	0.3800	4.3035	0.9043	0.106	0.3502	0.0195	**51.21**
10. Italy	0.0383	0.00611	0.1423	1.8843	0.7823	0.278	0.5047	0.0083	**106.72**
11. Portugal	0.0280	0.00046	0.1706	2.5892	0.7678	0.302	0.2047	0.0065	**180.16**
12. Spain	0.0268	0.01234	0.1439	1.8603	0.9556	0.046	0.7977	0.0012	**92.53**

Total	**i=I/Y**	**n**	**α**	**Ω**	β^*	B*	δ_0	g_A^*	**$1/\lambda^*$**
1. Indonesi	0.3446	0.01255	0.3311	1.7536	0.7438	0.344	0.4731	0.0883	**18.21**
2. Korea	0.1708	0.00554	0.2201	3.0206	0.8157	0.226	0.2569	0.0315	**36.09**
3. Malaysi	0.4381	0.01669	0.2696	2.7604	0.8152	0.227	0.3158	0.0810	**14.80**
4. Philippin	(0.0452)	0.01746	0.1184	0.2799	0.1625	5.153	0.2235	(0.0379)	**71.30**
5. Singapor	0.2055	0.02119	0.3959	2.7001	0.8703	0.149	0.4783	0.0266	**37.45**
6. Thailand	0.2661	0.00315	0.2117	3.6110	0.8289	0.206	0.1863	0.0455	**25.30**
7. Banglad	0.1193	0.01204	0.0927	0.9804	0.5696	0.756	1.0706	0.0514	**137.03**
8. Pakistan	(0.0271)	0.01697	0.3194	0.3593	0.2030	3.926	0.2514	(0.0216)	**216.02**
9. Saudi Ara	0.1662	0.00000	0.2799	2.0211	0.7373	0.356	0.3181	0.0437	**33.59**
10. Sri Lan	0.2510	0.00812	0.1039	1.5179	0.6488	0.541	0.3201	0.0882	**14.88**
11. Czech R	0.2069	0.00000	0.1677	3.3194	0.7995	0.251	0.1327	0.0415	**27.80**
12. Poland	0.1171	0.00000	0.0924	1.3482	0.5976	0.673	0.2450	0.0471	**28.11**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Table EP2 Seven endogenous parameters for 36 countries, 2012: the government sector

GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_{A\ G}^*$	$1/\lambda^*_G$
1. the US	0.6242	0.0141	0.2321	4.9333	0.8818	0.134	0.2057	0.0738	**14.40**
2. Japan	0.3603	(0.0008)	(0.2811)	19.7656	0.9365	0.068	(0.1091)	0.0229	**41.01**
3. Australi	0.3124	0.0136	0.1944	2.8563	0.8095	0.235	0.2744	0.0595	**18.46**
4. France	0.0943	0.0112	(0.1069)	1.4851	0.6507	0.537	0.3643	0.0330	**29.96**
5. Germany	0.0382	(0.0026)	0.0315	1.4701	0.5616	0.781	(0.5560)	0.0167	**42.62**
6. the UK	0.0489	0.0114	(0.2553)	1.0050	0.5775	0.732	0.9841	0.0206	**68.08**
7. China	0.2288	0.0064	0.1218	1.5155	0.6500	0.538	0.3283	0.0801	**16.84**
8. India	0.5307	0.0000	0.2355	4.1837	0.8455	0.183	0.1580	0.0820	**14.48**
9. Brazil	0.0350	0.0267	0.0066	1.4655	1.0469	(0.045)	0.8769	(0.0016)	**37.96**
10. Mexic	0.3848	0.0125	0.2451	3.4351	0.8415	0.188	0.2609	0.0610	**18.35**
11. Russia	0.0083	(0.0019)	0.1165	0.3124	0.2088	3.790	0.1269	0.0066	**243.97**
12. S.Afric	0.0194	0.0295	(0.1421)	0.4614	0.7885	0.268	1.5877	0.0041	**32.00**
GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_{A\ G}^*$	$1/\lambda^*_G$
1. Denmark	0.0327	0.0036	(0.1071)	1.4164	0.6301	0.587	0.3463	0.0121	**84.14**
2. Finland	0.0453	0.0037	(0.0329)	1.9116	0.7048	0.419	0.2556	0.0134	**72.53**
3. Netherla	0.0674	0.0024	(0.0655)	2.0995	0.6890	0.451	0.0677	0.0209	**45.28**
4. Norway	0.0614	0.0101	0.0964	1.2568	0.6704	0.492	0.6781	0.0202	**63.86**
5. Sweden	0.0436	0.0139	0.0571	1.1932	0.7280	0.374	0.8205	0.0119	**65.80**
6. Canada	0.2198	0.0101	0.1029	1.9605	0.7165	0.396	0.2738	0.0623	**18.40**
7. Greece	0.2825	0.0012	(0.9954)	5.2650	0.7314	0.367	(0.6583)	0.0759	**7.80**
8. Iceland	0.1521	0.0123	(0.0239)	1.6012	0.6629	0.509	0.3038	0.0513	**20.72**
9. Ireland	0.2832	0.0110	(0.2200)	4.6975	0.8330	0.200	0.0375	0.0473	**16.96**
10. Italy	0.1324	0.0061	(0.0224)	1.8443	0.6750	0.482	0.1625	0.0430	**23.64**
11. Portuga	0.0599	0.0005	(0.1682)	3.6039	0.7621	0.312	(0.1012)	0.0143	**61.57**
12. Spain	0.4097	0.0123	(0.2867)	1.7305	0.5986	0.671	(0.3719)	0.1644	**4.14**
GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_{A\ G}^*$	$1/\lambda^*_G$
1. Indones	0.3920	0.0126	0.2406	2.1309	0.7574	0.320	0.3356	0.0951	**13.75**
2. Korea	0.0369	0.0055	0.1432	1.4148	0.7040	0.420	0.5995	0.0109	**109.64**
3. Malaysi	0.3410	0.0167	0.0896	4.7086	0.8770	0.140	0.2114	0.0419	**20.72**
4. Philippi	0.0444	0.0175	(0.1767)	1.4205	0.8019	0.247	0.7490	0.0088	**43.94**
5. Singapo	0.0827	0.0212	0.5012	1.7766	0.8826	0.133	0.7151	0.0097	**74.98**
6. Thailan	0.1712	0.0032	0.1712	4.2006	0.8484	0.179	0.1664	0.0260	**41.23**
7. Banglad	0.3085	0.0120	0.3085	3.3217	0.8515	0.174	0.3126	0.0458	**25.12**
8. Pakistan	0.2764	0.0170	(1.6449)	5.0523	0.7656	0.306	(0.3686)	0.0648	**7.49**
9. Saudi Ar	0.2831	0.0000	0.0446	2.7658	0.7433	0.345	0.0429	0.0727	**14.37**
10. Sri Lar	0.5249	0.0081	(0.1514)	3.1040	0.7439	0.344	(0.0620)	0.1344	**6.57**
11. Czech I	0.2945	0.0000	0.0606	3.1131	0.7682	0.302	0.0522	0.0683	**15.45**
12. Poland	0.2193	0.0000	(0.0936)	1.6326	0.5989	0.670	(0.2233)	0.0880	**9.29**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Table EP3 Seven endogenous parameters for 36 countries, 2012: the private sector

PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g_A{}^*_{PRI}$	λ^*_{PRI}
1. the US	(0.1248)	0.01412	0.1368	0.9779	0.4831	1.070	0.6690	(0.0645)	**109.16**
2. Japan	(0.0312)	(0.00079)	0.1919	6.5807	0.9087	0.101	0.1799	(0.0029)	**336.33**
3. Australi	0.1767	0.01363	0.1693	2.6972	0.8154	0.226	0.3322	0.0326	**30.21**
4. France	0.0733	0.01123	0.1766	1.8334	0.7789	0.284	0.5186	0.0162	**58.67**
5. Germany	0.0527	(0.00265)	0.1218	1.9864	0.6622	0.510	(0.0199)	0.0178	**63.23**
6. the UK	0.0241	0.01144	0.3173	0.9664	0.7778	0.286	1.0272	0.0053	**130.48**
7. China	0.4426	0.00636	0.4796	3.0537	0.8615	0.161	0.3894	0.0613	**24.55**
8. India	0.2638	0.00000	0.2419	1.9556	0.7207	0.388	0.2923	0.0737	**19.17**
9. Brazil	0.0161	0.02672	0.2497	1.4762	1.4804	(0.325)	0.6539	(0.0077)	**57.56**
10. Mexic	0.1329	0.01248	0.0887	1.4639	0.6716	0.489	0.4674	0.0436	**28.89**
11. Russia	0.1818	(0.00188)	0.3162	1.0739	0.6062	0.650	0.8347	0.0716	**94.81**
12. S.Afric	0.1709	0.02948	0.1707	1.0953	0.6563	0.524	0.8592	0.0588	**30.57**
PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g_A{}^*_{PRI}$	λ^*_{PRI}
1. Denmark	0.0380	0.00358	0.1780	2.1120	0.7762	0.288	0.3989	0.0085	**124.13**
2. Finland	0.1146	0.00371	0.1456	1.8550	0.7043	0.420	0.2882	0.0339	**36.64**
3. Netherla	0.0674	0.0024	(0.0655)	2.0995	0.6890	0.451	0.0677	0.0209	**45.28**
4. Norway	1.2705	0.01012	0.3346	4.3321	0.8726	0.146	0.2379	0.1619	**7.68**
5. Sweden	0.0704	0.01386	0.1510	1.7249	0.7841	0.275	0.5774	0.0152	**54.98**
6. Canada	0.1927	0.01015	0.1305	3.0735	0.8166	0.225	0.2483	0.0353	**28.26**
7. Greece	(0.0044)	0.00117	0.3945	2.6934	0.6843	0.461	(0.2811)	(0.0014)	**945.84**
8. Iceland	0.2338	0.01227	0.1377	3.0268	0.8152	0.227	0.2539	0.0432	**23.36**
9. Ireland	0.1889	0.01104	0.4943	4.2284	0.9203	0.087	0.4108	0.0150	**69.22**
10. Italy	0.0098	0.00611	0.1921	1.8964	1.0538	(0.051)	0.7849	(0.0005)	**207.20**
11. Portuga	0.0200	0.00046	0.2553	2.3355	0.7714	0.296	0.3025	0.0046	**282.99**
12. Spain	(0.0631)	0.01234	0.2449	1.8908	0.6124	0.633	(0.3925)	(0.0244)	**40.47**
PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g_A{}^*_{PRI}$	λ^*_{PRI}
1. Indones	0.3376	0.01255	0.3446	1.6973	0.7413	0.349	0.4976	0.0873	**19.20**
2. Korea	0.2064	0.00554	0.2406	3.4475	0.8369	0.195	0.2433	0.0337	**33.70**
3. Malaysi	0.4573	0.01669	0.3051	2.3754	0.7959	0.256	0.3643	0.0933	**14.10**
4. Philippi	(0.0550)	0.01746	0.1504	0.1560	0.1157	7.644	0.0866	(0.0486)	**33.81**
5. Singapo	0.2401	0.02119	0.3662	2.9606	0.8720	0.147	0.4343	0.0307	**32.45**
6. Thailan	0.2872	0.00315	0.2207	3.4798	0.8245	0.213	0.1939	0.0504	**23.20**
7. Banglad	0.1006	0.01204	0.0714	0.7489	0.4987	1.005	(54.6692)	0.0504	**0.35**
8. Pakistan	(0.0381)	0.01697	0.3906	0.1891	0.1759	4.686	(0.0784)	(0.0314)	**42.47**
9. Saudi Ar	0.1185	0.00000	0.3759	1.7169	0.7334	0.363	0.4659	0.0316	**59.29**
10. Sri Lar	0.2101	0.00812	0.1420	1.2809	0.6206	0.611	0.4968	0.0797	**21.24**
11. Czech I	0.1761	0.00000	0.2053	3.3920	0.8102	0.234	0.1584	0.0334	**35.55**
12. Poland	0.0931	0.00000	0.1360	1.2814	0.5973	0.674	0.3709	0.0375	**42.39**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Table R4 Two risks, δ_0 and *the speed years* based on the capital-output ratio: stable vs. instable

Total economy	**Omega**					Test of caluculation		3.0000	**Stable case in the endogenous-equilibirum**			
	0.4000	0.5000	0.6000	0.8000	1.2000	1.5000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000
LN(Ω)	(0.9163)	(0.6931)	(0.5108)	(0.2231)	0.1823	0.4055	0.6931	1.0986	1.3863	1.6094	1.7918	0.0000
$r^*=\alpha/\Omega$	0.5000	0.4000	0.3333	0.2500	0.1667	0.1333	0.1000	0.0667	0.0500	0.0400	0.0333	0.2000
beta*	0.3616	0.4171	0.4646	0.5417	0.6496	0.7058	0.7726	0.8535	0.9006	0.9315	0.9533	0.6017
B*	1.7655	1.3977	1.1525	0.8460	0.5395	0.4169	0.2943	0.1716	0.1103	0.0736	0.0490	0.6621
LN(B*)	0.5684	0.3348	0.1419	(0.1673)	(0.6172)	(0.8750)	(1.2233)	(1.7623)	(2.2041)	(2.6096)	(3.0151)	(0.4124)
LN(Ω)/LN(B*	(1.6119)	(2.0702)	(3.5993)	1.3341	(0.2954)	(0.4634)	(0.5666)	(0.6234)	(0.6289)	(0.6167)	(0.5943)	0.0000
$delta_0$	**(0.612)**	**(1.070)**	**(2.60)**	2.3341	0.7046	0.5366	0.4334	0.3766	0.3711	0.3833	0.4057	1.0000
i=I/Y	**0.075**		alpha	**0.2000**		n	**0.0075**					
g_A^*	0.0479	0.0437	0.0402	0.0344	0.0263	0.0221	0.0171	0.0110	0.0075	0.0051	0.0035	0.0299
$1-delta_0$	1.6119	2.0702	3.5993	(1.3341)	0.2954	0.4634	0.5666	0.6234	0.6289	0.6167	0.5943	0.0000
$(1-delta_0)g$	0.0772	0.0905	0.1445	(0.0459)	0.0078	0.0102	0.0097	0.0068	0.0047	0.0032	0.0021	0.0000
$(1-\alpha)n$	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
lambda*	0.0832	0.0965	0.1505	(0.0399)	0.0138	0.0162	0.0157	0.0128	0.0107	0.0092	0.0081	0.0060
Speed years	12.02	10.36	6.64	(25.09)	72.65	61.63	63.85	77.82	93.56	109.06	123.71	166.67

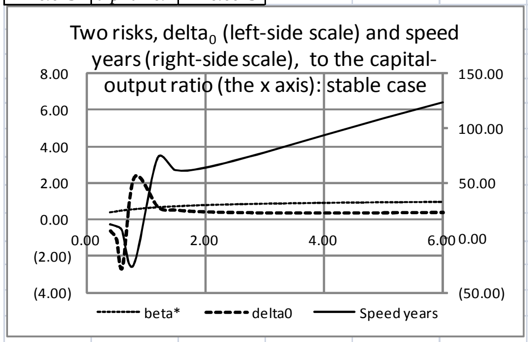
Fact findings

(1) Numerically, most risky point of equilibirum is *beta* *=0.5 and *beta* *>1.0 since capital is always plus.

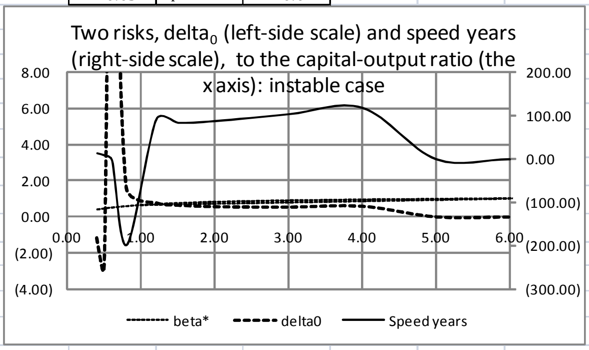
(2) If the inverse number of the capital-output ratio happens to be equal to B^*, the situation suddenly falls into disequilibrum.

(3) If the capital-output ratio becomes beyond a certain high level, the situation turns to disequilibirum, regardless of the level of B^*.

i =0.075 | *alpha* =0.2 | *n* =0.0075

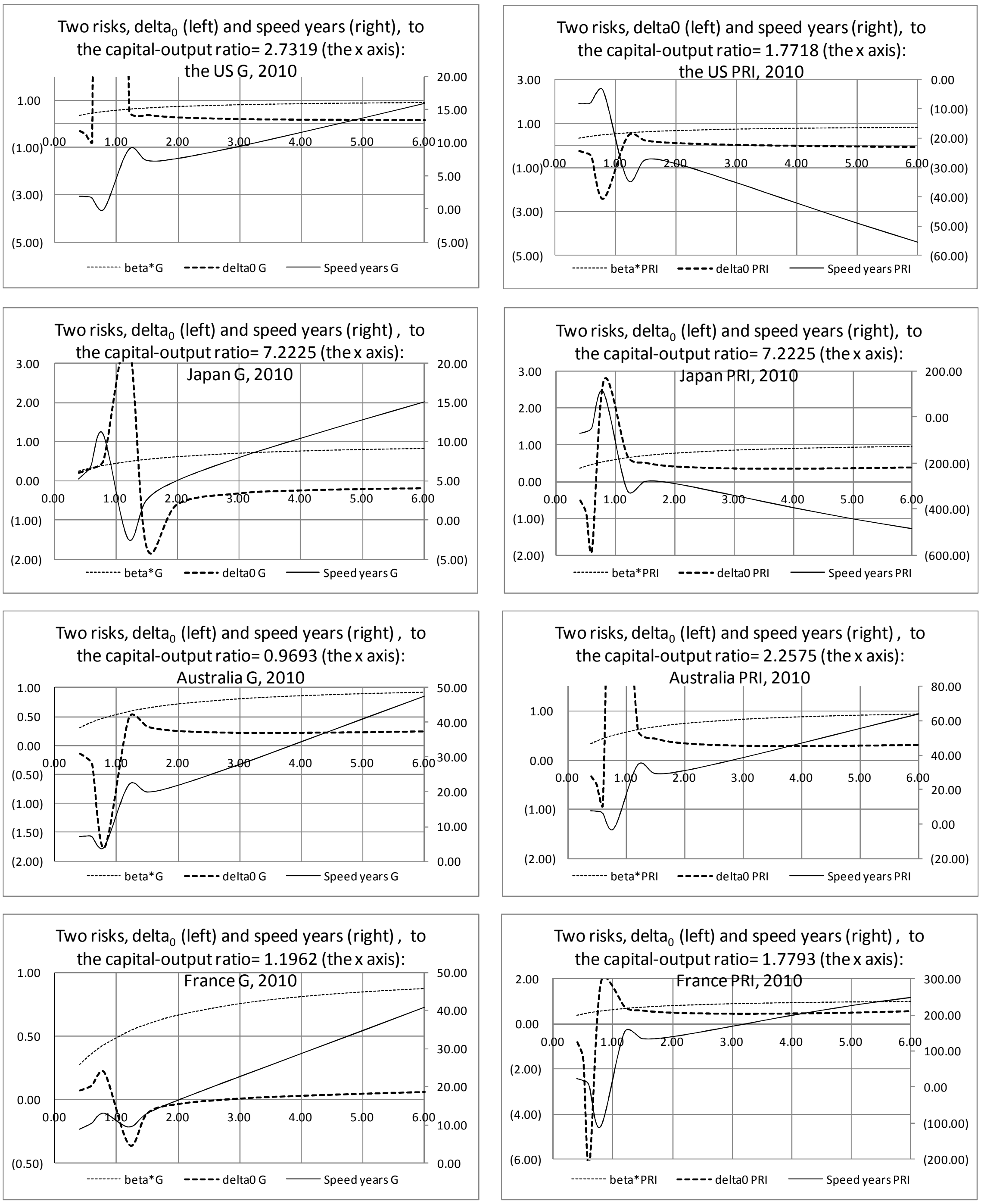


i =0.05 | *alpha* =0.225 | *n* =0.01



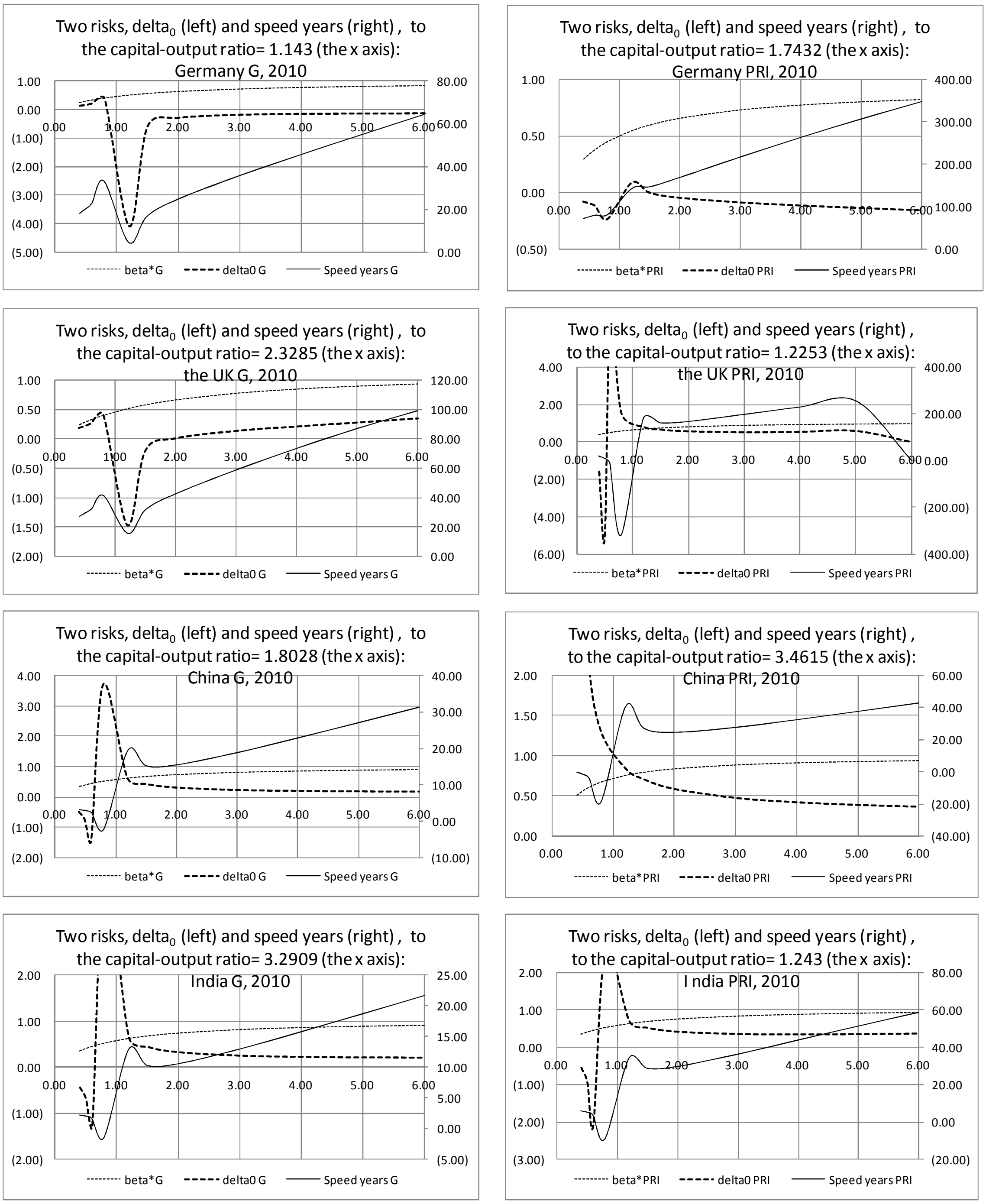
	Omega					Test of caluculation		3.0000	**Instable case in the endogenous-equilibrium**			
	0.4000	0.5000	0.6000	0.8000	1.2000	1.5000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000
LN(Ω)	(0.9163)	(0.6931)	(0.5108)	(0.2231)	0.1823	0.4055	0.6931	1.0986	1.3863	1.6094	1.7918	0.0000
$r^*=\alpha/\Omega$	0.5625	0.4500	0.3750	0.2813	0.1875	0.1500	0.1125	0.0750	0.0563	0.0450	0.0375	0.2250
beta*	0.3953	0.4551	0.5062	0.5888	0.7036	0.7631	0.8336	0.9185	0.9678	1.0000	1.0227	0.6527
B*	1.5300	1.1974	0.9757	0.6985	0.4213	0.3104	0.1996	0.0887	0.0333	0.0000	(0.0222)	0.5322
LN(B*)	0.4253	0.1802	(0.0246)	(0.3588)	(0.8644)	(1.1698)	(1.6116)	(2.4225)	(3.4033)	#NUM!	#NUM!	(0.6308)
LN(Ω)/LN(B*	(2.1545)	(3.8471)	20.7475	0.6219	(0.2109)	(0.3466)	(0.4301)	(0.4535)	(0.4073)	#NUM!	#NUM!	0.0000
$delta_0$	**(1.154)**	**(2.847)**	**21.75**	1.6219	0.7891	0.6534	0.5699	0.5465	0.5927	#NUM!	#NUM!	1.0000
i=I/Y	**0.050**		alpha	**0.2250**		n	**0.01**					
g_A^*	0.0302	0.0272	0.0247	0.0206	0.0148	0.0118	0.0083	0.0041	0.0016	0.0000	(0.0011)	0.0174
$1-delta_0$	2.1545	3.8471	(20.7475)	(0.6219)	0.2109	0.3466	0.4301	0.4535	0.4073	#NUM!	#NUM!	0.0000
$(1-delta_0)g$	0.0651	0.1048	(0.5123)	(0.0128)	0.0031	0.0041	0.0036	0.0018	0.0007	#NUM!	#NUM!	0.0000
$(1-\alpha)n$	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
lambda*	0.0729	0.1126	(0.5046)	(0.0050)	0.0109	0.0119	0.0113	0.0096	0.0084	#NUM!	#NUM!	0.0078
Speed years	13.72	8.88	(1.98)	(198.52)	91.94	84.35	88.28	104.20	118.97	#NUM!	#NUM!	129.03

Note: The figure on the LHS shows a stable combination of δ_0 and *the speed years*. The figure on the RHS shows an instable combination of δ_0 and *the speed years*. When the level of the capital-output ratio stays at 0.5 or so, any economy is difficult to control the level of equilibrium expressed by *the speed years*. When the level of the capital-output ratio increases more than 3.0 or 4.0 partly due to extreme deficit, the economy also suffers from a high speed years.



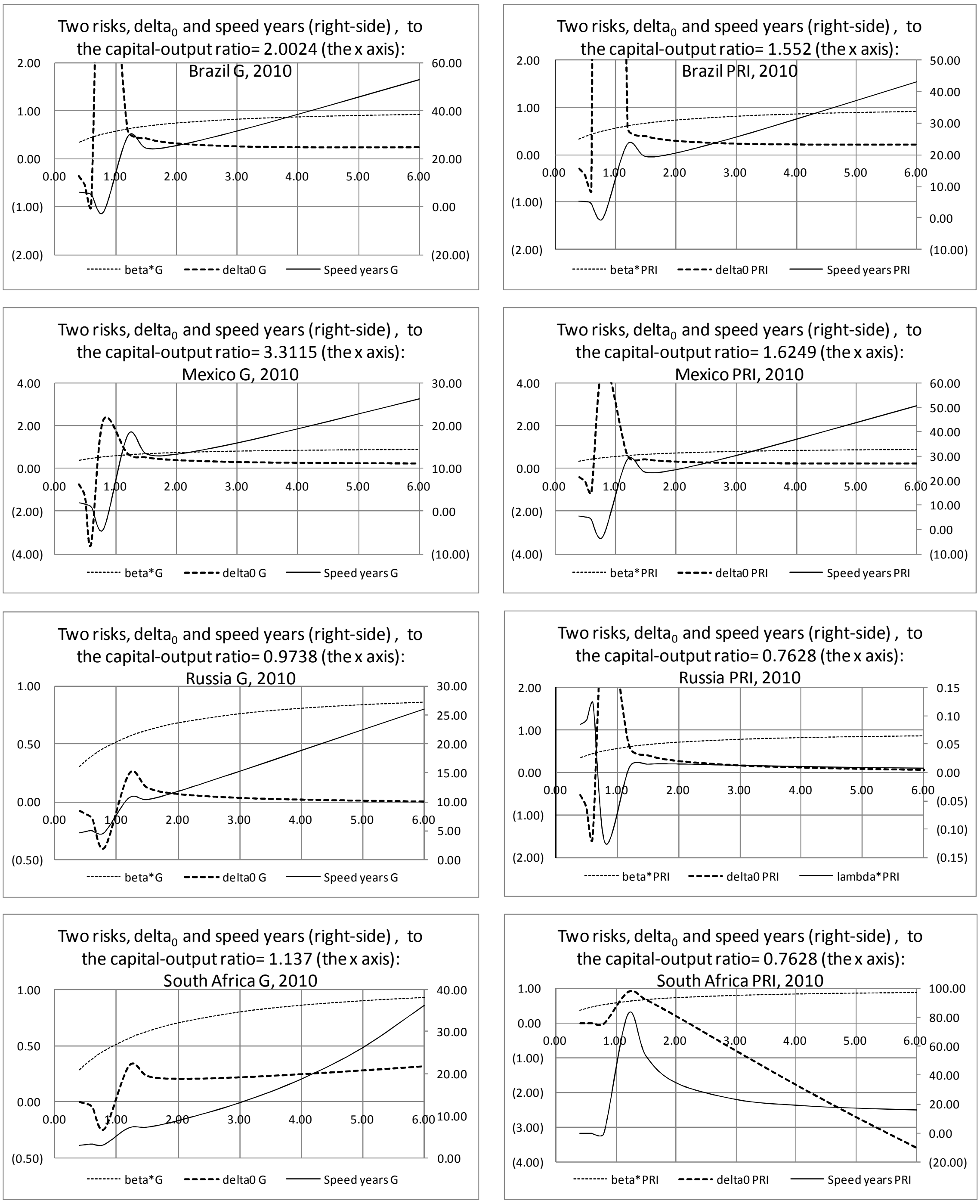
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R1 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: the US, Japan, Australia, and France



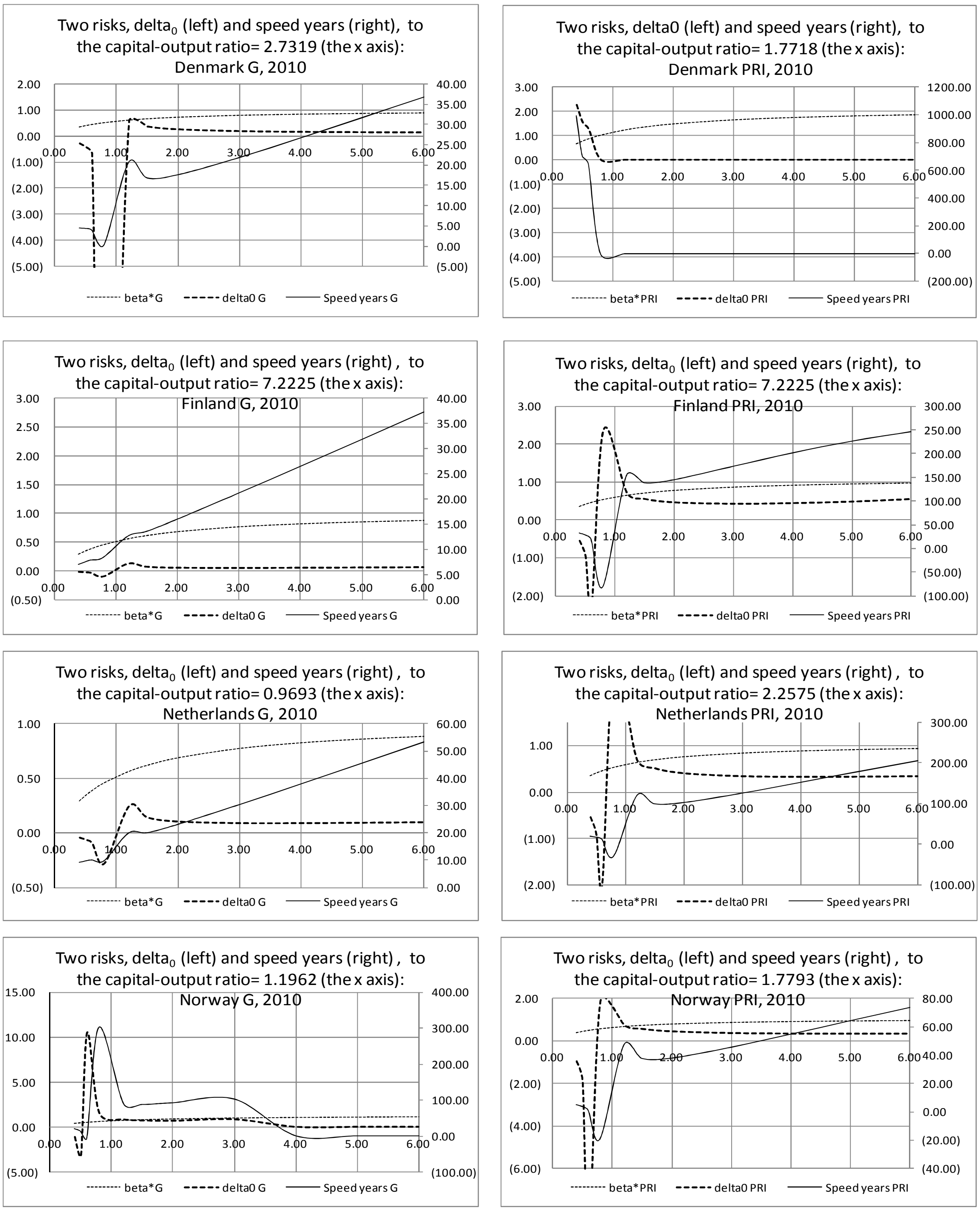
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R2 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Germany, the UK, China, and India



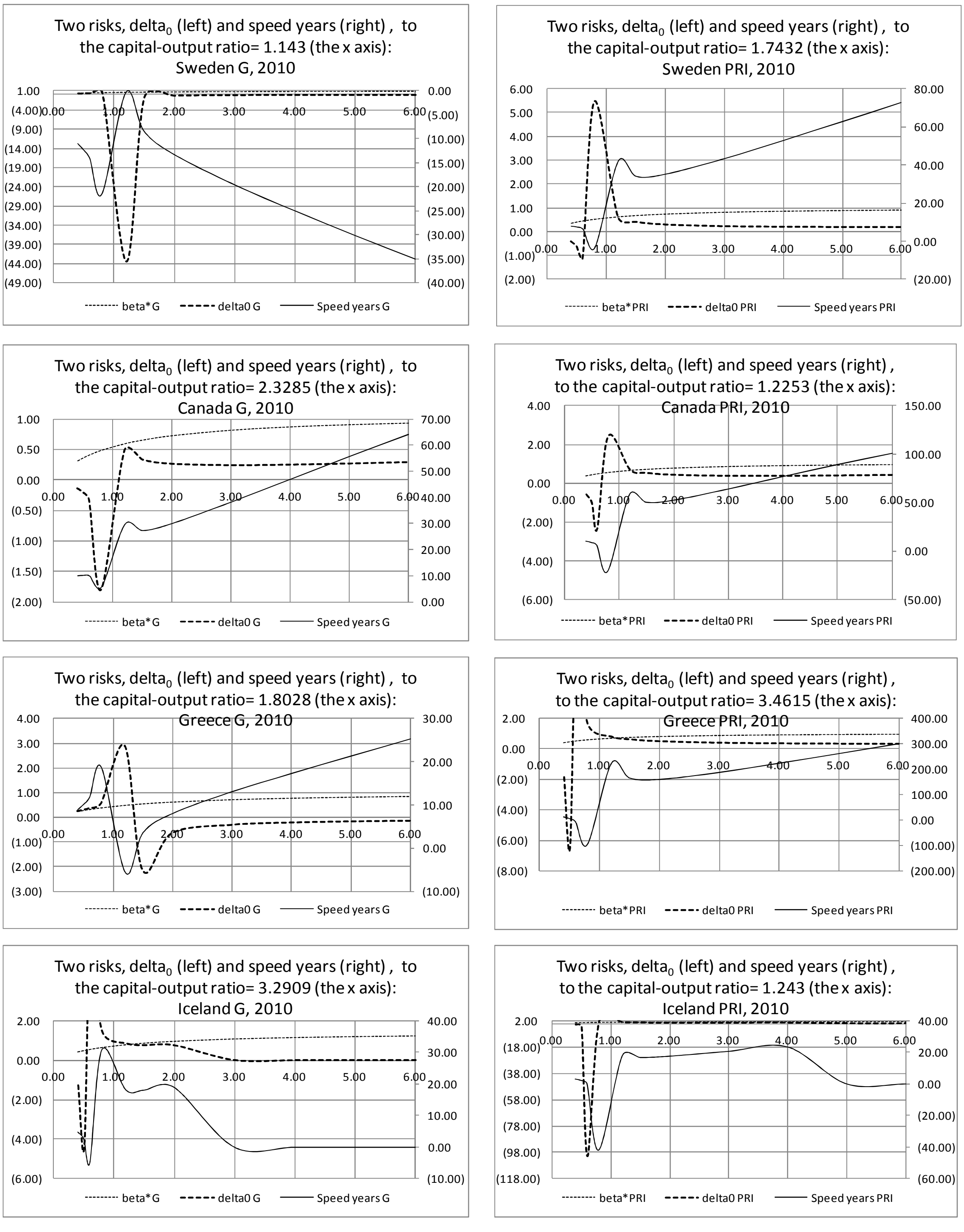
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R3 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Brazil, Mexico, Russia, and South Africa



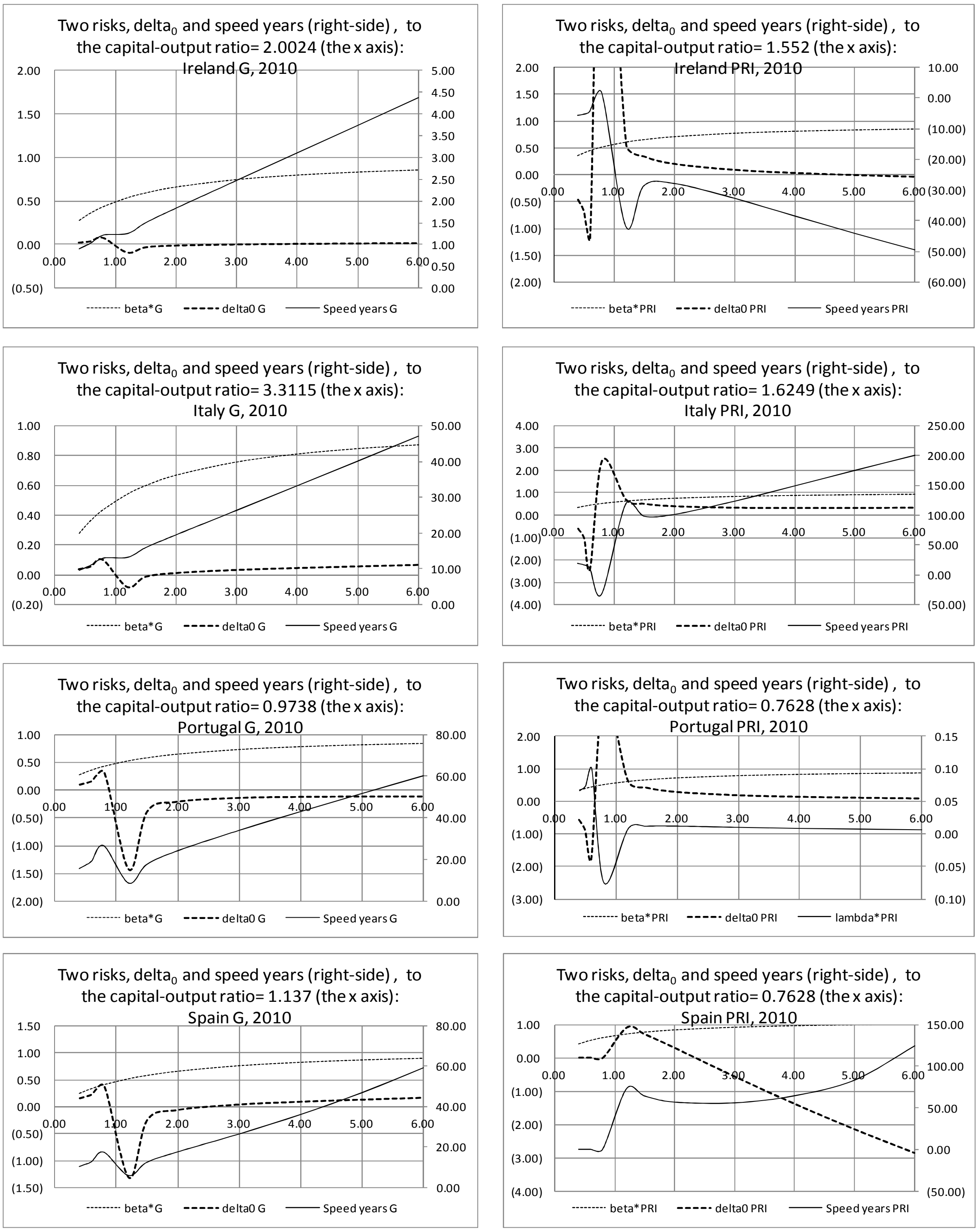
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R4 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Denmark, Finland, Netherlands, and Norway



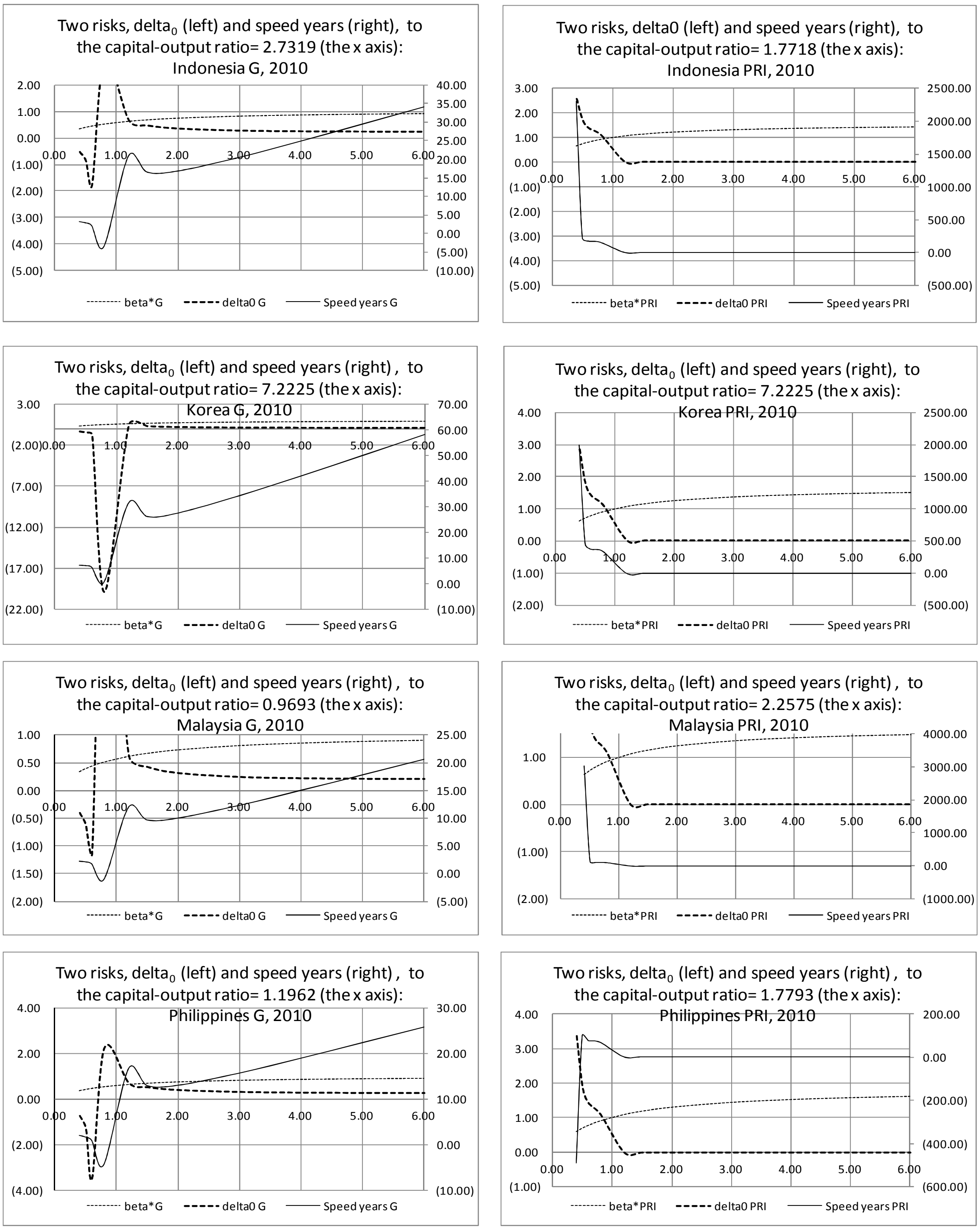
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R5 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Sweden, Canada, Greece, and Iceland



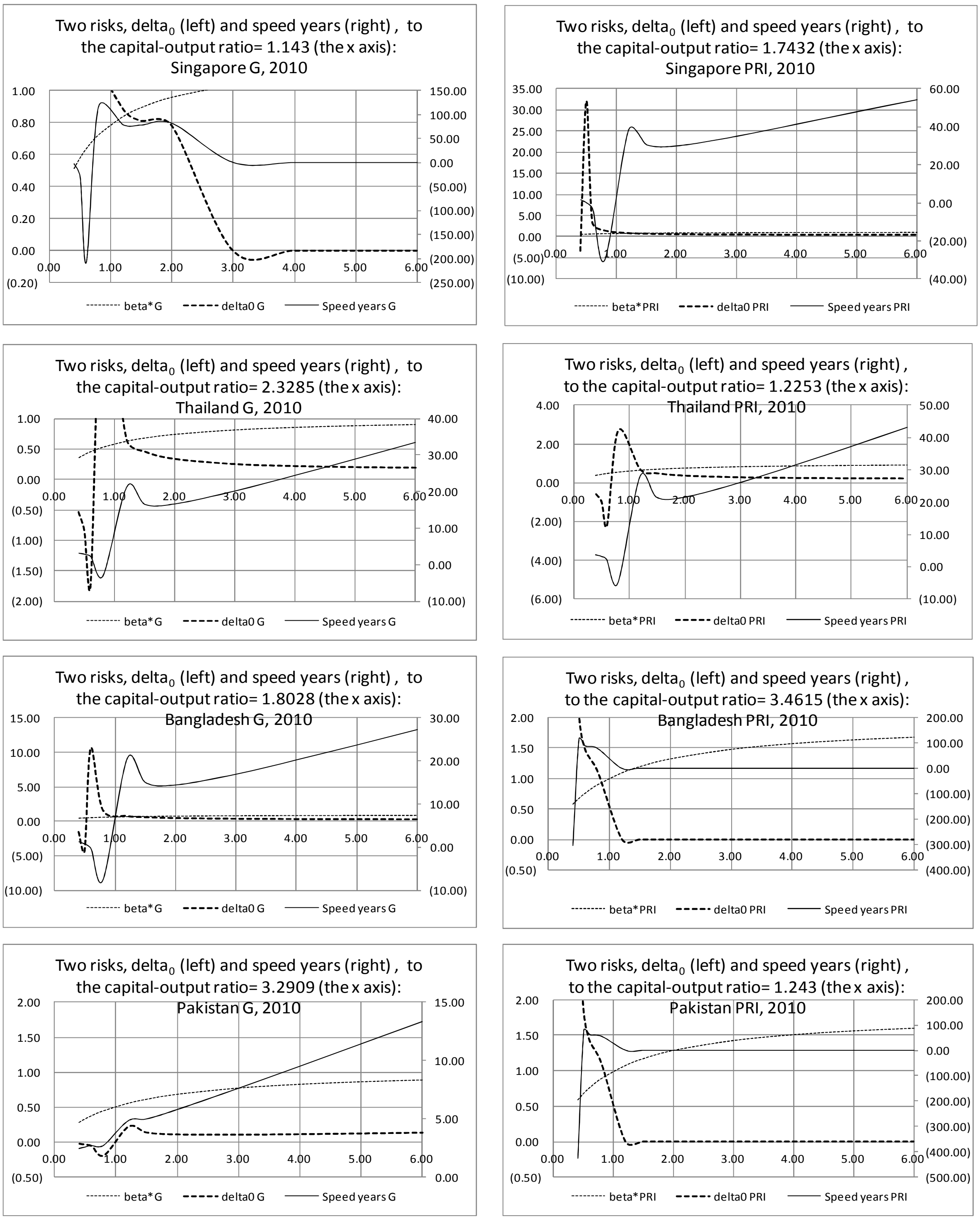
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R6 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Ireland, Italy, Portugal, and Spain



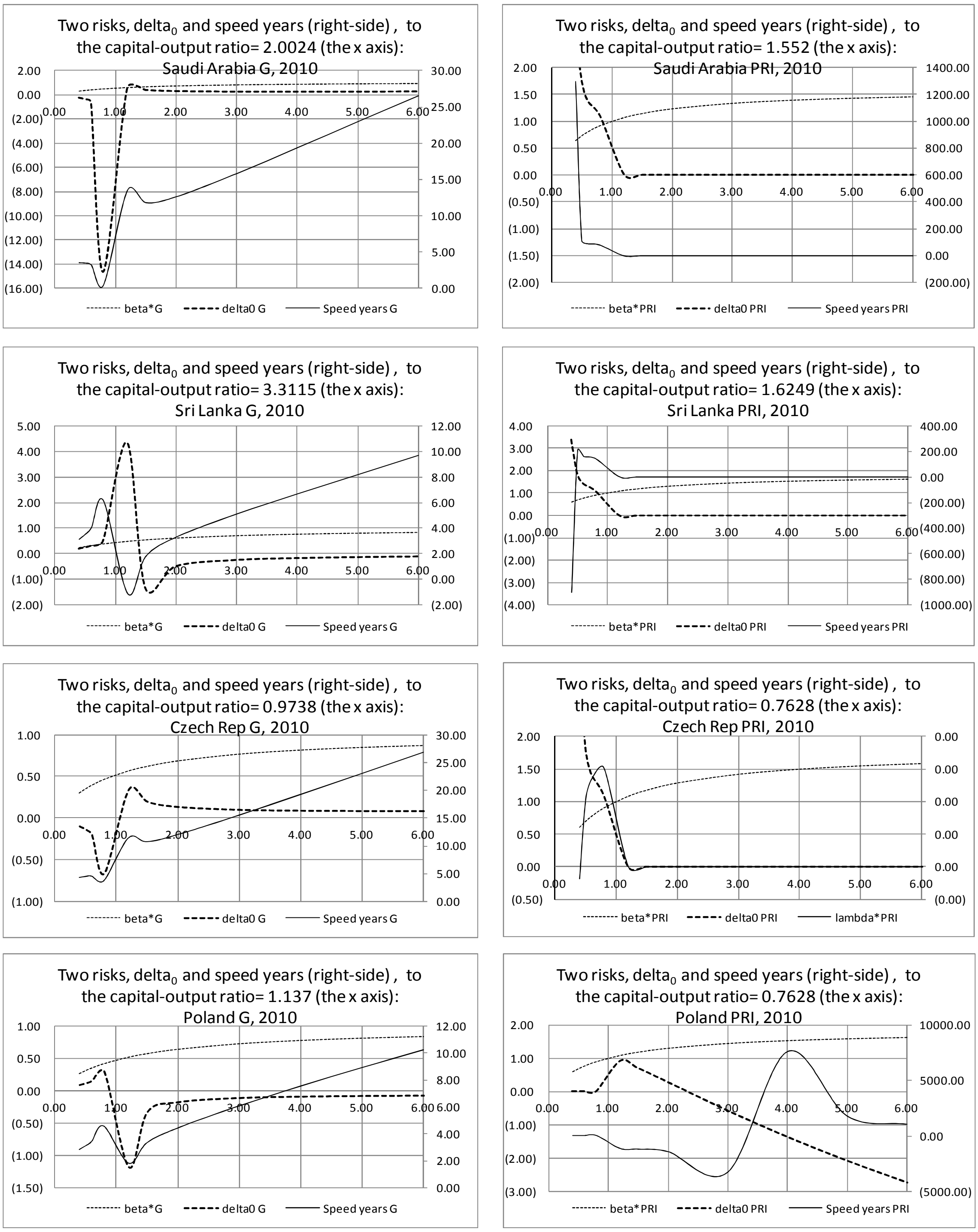
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R7 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Indonesia, Korea, Malaysia, and Philippines



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

Figure R8 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Singapore, Thailand, Bangladesh, and Pakistan



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

Figure R9 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Saudi Arabia, Sri Lanka, Czech Rep, and Poland

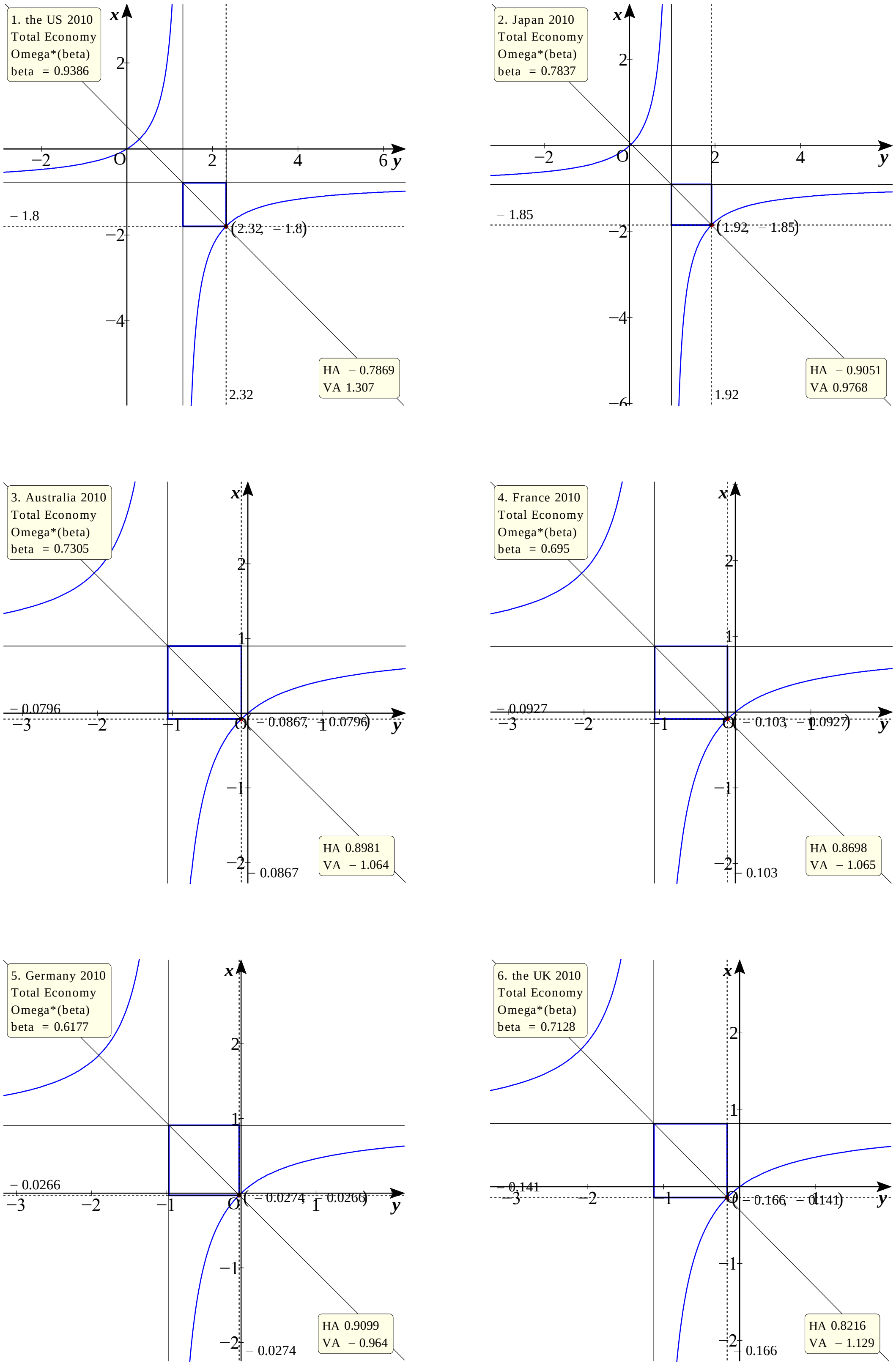


Figure H10 $\Omega(\beta^*)$ by country 2010: the US, Japan, Australia, France, Germany, the UK

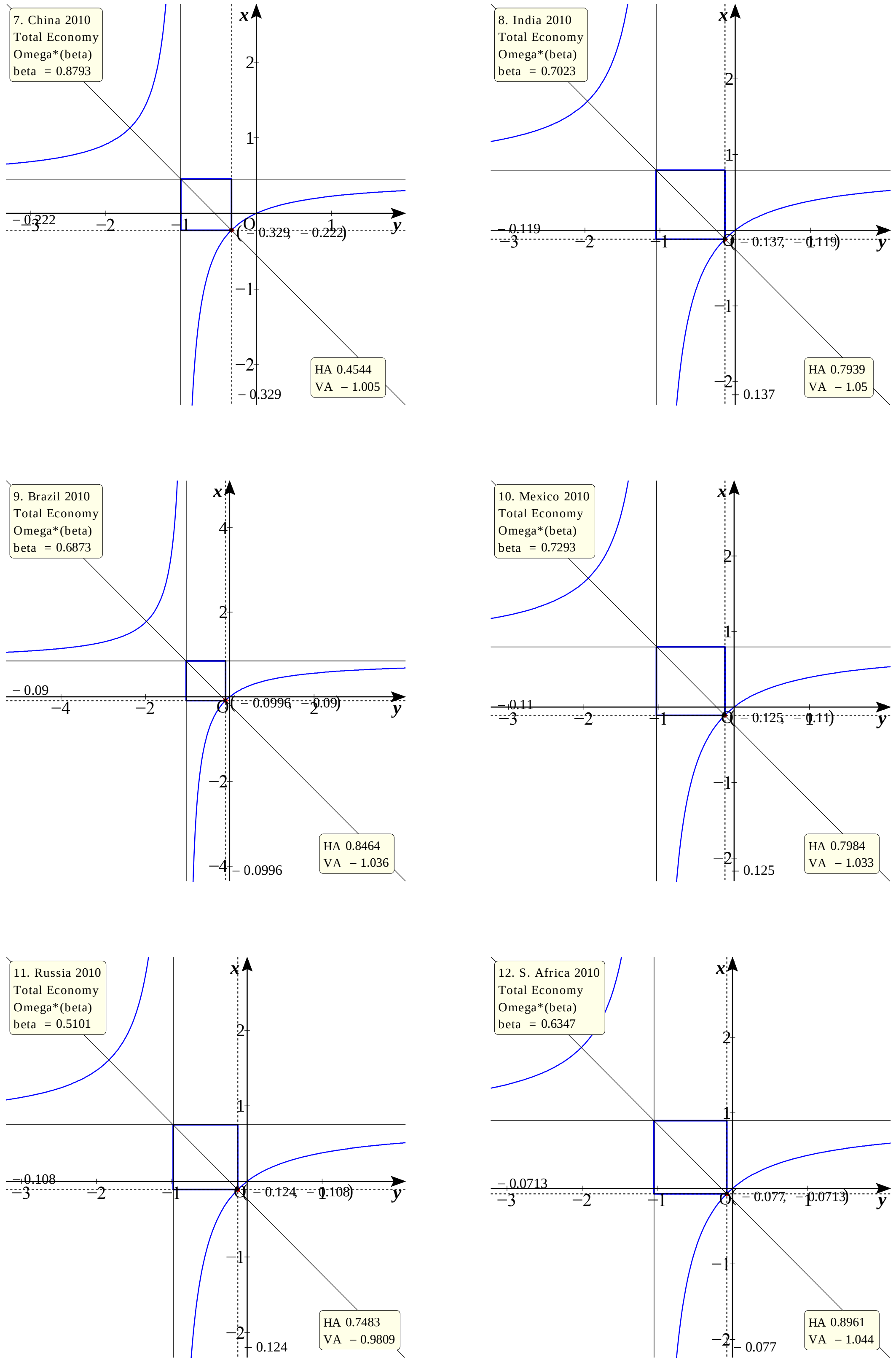


Figure H11 Hyperbola of $\Omega(\beta^*)$: China, India, Brazil, Mexico, Russia, South Africa, 2010