

# Chapter 7

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

### Background of *the speed years*

With R. A. Musgrave's comment on Ryuzo Sato (1963)

Musgrave celebrates Sato's seventies birthday and talks on Sep 9, 2000. Let the author here allow to cite Musgrave's one phrase related to Sato's (16-23, 1963) first use of *the speed years*: 'At that time, neoclassical perfection had just triumphed over Keynesian rigidities and we were both concerned with how long it takes for the growth rate to respond to changes in policy.' Its background is interpreted: Neo-classical models conquered Keynesians' disequilibrium by proving complete substitution between capital and labor.

The author measures the level of equilibrium by country and sector using *the speed years* and replaces the literature's exogenous *speed years* by author's endogenous *speed years*. *The speed years* support the *EES*. Further, this Chapter reveals its structure.

### 7.1 Introduction

The purpose of this chapter is first to structurally clarify the dynamics of *the speed years* for convergence in equilibrium by country and, second to empirically show how to use simulations for *the speed years*. The author has theoretically explained *the speed years* for convergence in equilibrium by country (hereunder, *the speed years*) in related chapters, connecting *the speed years* with a few aspects. The level of endogenous-equilibrium is straight measured by *the speed years*. What conditions determine the differences of the endogenous-equilibrium? There are an optimum equilibrium, a modest equilibrium, a close-to-disequilibrium, and disequilibrium. An optimum equilibrium is a moderate equilibrium that satisfies the conditions of a maximized rate of return under a minimized net investment to output, and by sector. The author proves the optimum equilibrium empirically using hyperbola by country (see Chapters 5, 11, 15).

This chapter processes the cases not only at the total economy but also at two sectors, the government and private sectors, using twelve countries: the US, Japan, China, France, Germany, Greece, Ireland, Spain, Sweden, the UK, Turkey, and Singapore. These cases are, in the same way, extended to the two sectors, government and private, using endogenous data by sector.

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The conditions for a moderate range of the endogenous-equilibrium are structurally determined by three items, the capital-output ratios,  $\Omega^* = K/Y$ , the quantitative net investment coefficient,  $\beta^*$ , and the diminishing returns to capital coefficient,  $\delta_0$ . Three items constitute the structural combinations of the three items (hereunder, the structure of *the speed years*). This structure includes all the parameters to determine *the speed year* equations by sector,  $1/\lambda^*$ ,  $1/\lambda^*_G$ ,  $1/\lambda^*_{PRI}$ . *The speed years* of the total economy is shown by  $\lambda^* = (1 - \alpha)n + (1 - \delta_0)g_A^*$ . The capital-output ratio is a driver that manipulates and calibrates *the speed years* by carefully watching  $\beta^*$  and  $\delta_0$ . A reason why the conditions leading to a moderate equilibrium is difficult comes from structural combinations of the three items.

For example,  $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$  exists and  $B^* = (1 - \beta^*)/\beta^*$  is used for the denominator of  $\delta_0$ . A good example: If  $\beta^*=0.5$ , then  $1 - \beta^*$  is 0.5 and as a result,  $B^* = 1.0$  holds. This case is arithmetically a moment case. A bad example is the case of  $\beta^*=1.0$ ; it results in  $B^* = \text{impossible}$ , and accordingly, *the speed years* fall into impossible. Actually, in this bad case, the rate of technological progress,  $g_A^* = i(1 - \beta^*)$ , is zero and no growth is guaranteed. When a sign of #NUM! appears, policy-makers must discriminate each contents; whether a mere arithmetical result or a serious symptom closer to disequilibrium. A moment shock comes from purely arithmetic calculation. An aggravating shock comes from serious real-asset unbalances by year.

Chapter 8 will clarify the mechanics of the capital-output ratio thoroughly, after widely spreading the essence of *the speed years* for convergence in this chapter. This chapter is speed years-oriented and implicitly suggests what differences lying between *the endogenous speed years* and *the speed years* in the literature through the structural analysis of *the speed years*.

### 7.2 Background of Endogenous Equilibrium and *the Speed Years*

This section broadly summarizes a version of the structure of *the speed years* to sustainable robustness and economic stages by country. There are ‘economic indicators’ such as estimated by the World Bank, whose data are actually taken from *International Financial Statistics Yearbook*, IMF. Economic Indicators in the literature are statistics-oriented and, not endogenously related to real, fiscal, financial, and market policies. Policy-makers need to have theoretical data consistently with all other data by year. Statistics data are given exogenously and used independently under the market principles.

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For example, there exists an equation for *the speed years* for convergence in the literature yet, this equation is independent of empirical results. For empirical analysis, panel data in statistics are solely exogenously used. The results differ by data and, the causes at the real assets are not clarified at the same time. In the case of the endogenous system, *the speed years* for convergence are endogenously measured without using panel data in statistics. *The speed years* by country and by sector is inevitably related to the endogenous-equilibrium, where no panel data of certain countries by year are required for measurement, differently from *the speed years* in the literature.

*The speed years* in the endogenous-equilibrium are measured by the inverse number of an endogenous speed coefficient of  $\lambda^* = (1 - \alpha)n_E + (1 - \delta_0)g_A^*$ . The endogenous speed coefficient is measured differently using such nine parameters as are required for the endogenous system:  $\alpha, \beta^*, \delta_0, \Omega, \lambda^*$ , and  $i, i_G, n_E, n_{E(G)}$ . The endogenous speed coefficient,  $\lambda^*$ , does not include the ratio of net investment to output in equilibrium,  $i = I/Y$ , but the rate of change in population in equilibrium,  $n_E$ . The endogenous equilibrium is determined by adjusting  $i = I/Y$  with the change in *the speed years* in equilibrium.

Policy-oriented core parameters are the relative share of capital,  $\alpha$ , the capital-output ratio,  $\Omega^*$ , and the rate of return,  $r^*$ , each in equilibrium and these three constitute  $\alpha = \Omega^* \cdot r^*$ . The inverse of the endogenous speed coefficient,  $1/\lambda^*$ , determines *the speed years* for convergence in equilibrium by country (i.e., *the speed years*). The three items of  $\beta^*, \delta_0, \Omega$  constitute the structure of *the speed years*. This chapter focuses the structure of *the speed years* to answer related unsolved problems between causes and effects in the literature. Four items of  $i, i_G, n_E, n_{E(G)}$  constitute independent variables by sector when endogenous equations are each reduced to hyperbolas. There are several related hyperbolas such as,  $speed(i), speed(n_E), \Omega^*(i), \Omega^*(n_E), r^*(i),$  and  $r^*(n_E)$ . Note,  $r^*(n_E)$  is reduces to linear, where gradient and intercept each are still expressed by some of nine endogenous parameters. Each hyperbola has its attributes such as the vertical asymptote (VA) and/or the horizontal asymptote (HA), the Width, the Shape, and the Curvature (for each definition and its equation, see Appendix at the end of the *EES*). These attributes in each hyperbola are all expressed using some of nine endogenous parameters. These attributes widely constitute the ‘mechanics’ in equilibrium using hyperbolas implicitly and explicitly.

Back to the structure of *the speed years*, the structure holds not at a closed but an open economy, and, by country and by sector. There is an assumption, behind of the structure of *the speed years*, that the actual balance of payments equals the

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endogenous balance of payments and that the actual budget deficit equals the endogenous budget deficit. This assumption is useful to guarantee an equation of  $(S_{ENDOG} - S_{ACTUAL}) = -(I_{ENDOG} - I_{ACTUAL})$  as firm as a rock at the real assets. Suppose that endogenous net investment equals actual net investment. Then, the difference between the current situation and the endogenous situation disappears. Suppose that this equation holds within an optimum range of equilibrium, e.g., between  $0.25\text{Width}$  and  $0.5\text{Width}$ . Then, the current situation shows that policy-makers well acted to reach the optimum range. On the other hand, suppose that a country fell into disequilibrium. The difference between the current situation and the endogenous situation never disappears. The final manoeuvre is to decrease the rate of change in population in equilibrium, as intentionally shown at KEWT 5.11, 1990-2009. It implies that unemployment in equilibrium occurs. The length of the  $\text{Width}$  measured by  $i = I/Y$  at the speed year hyperbola of  $i = I/Y$  is in proportion to the robustness of sustainable economy: the longer the  $\text{Width}$  the more robust an economy is in equilibrium.

From the viewpoint of economic stages, the rate of return hyperbola of  $i = I/Y$  controls the transition from developing to developed stage;  $r^*(i)$ . The lower the  $i = I/Y$  the higher the rate of return in equilibrium is.  $r^*(i)$  is simultaneously related to the above speed year hyperbola of  $i = I/Y$ ;  $speed(i)$ . Nevertheless, developing countries want to maintain a high rate of output, where a high  $i = I/Y$  is attractive, assuming that  $\beta^*$  or  $\widetilde{\beta}^* = 1 - \beta^*$  is fixed. As a result, the developing country soon reaches a developed country, with an unexpected decline of robustness. This is because the capital-output ratio soon hits its upper limit, e.g., 2.0 to 2.5. It is possible for policy-makers to maintain sustainable robustness and economic stage to some extent, not to decreasing the growth rate of output too much. This is to promote technology and increase  $\widetilde{\beta}^* = 1 - \beta^*$  by shifting quantitative to qualitative net investment through ecological and environmental R&D and education, with intentional reduction of  $i = I/Y$  in equilibrium. This action leads to a minimized rate of return to a minimized net investment to output at an optimum point of  $i = I/Y$ .

Preferable combinations for the structure of *the speed years* are (1)  $speed(i)$  and  $speed(n_E)$ , (2)  $\Omega^*(i)$  and  $\Omega^*(n_E)$ , and (3)  $r^*(i)$  and  $r^*(n_E)$ . It is interesting that  $speed(i)$  and  $speed(n_E)$  each have the VA and  $r^*(i)$  has the HA, while  $\Omega^*(i)$  and  $\Omega^*(n_E)$  each have the VA and the HA. For reverse calculation to serve policy-makers,  $i(speed)$ ,  $n_E(speed)$ ,  $i(\Omega^*)$ ,  $n_E(\Omega^*)$ ,  $i(r^*)$ , and  $n_E(r^*)$  need to be formulated (for comparison, see Appendix of the *EES*).

In short, it is the mission of policy-makers to control sustainable robustness and economic stages in order to maintain a moderate growth rate of output in the long run by year. For this purpose, it is necessary for policy-makers to perceive the structure of *the speed years*, adjusting nine endogenous parameters by year. The

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characteristics of the structure of *the speed years* are clarified by establishing the framework of simulations.

### 7.3 Empirical Results and Implications by Country

This section discusses empirical results using KEWT 5.11 and summarizes implications by country. First, highlighted using BOX 7-1, 7-2, and 7-3 in the text each based on Tables S-1 to S-4 for simulations. Second, very shortly, Tables C1 and C2 for differences of economic stages; Tables A1 and A2 for the structure of *the speed years*; Tables E1 to E4 for endogenous elasticity values of parameters and variables each w.r.t.  $\alpha$  and  $\beta^*$ ; Tables F1 and F3 for frequencies to total numbers that falls into disequilibrium and close-to-disequilibrium. Third, very shortly, Figures P1 to P7, are presented widely for the mechanics in equilibrium.

First, **Tables S1 to S4** show selected frameworks in simulation, with processes and results by aspect, and compare each other in detail. There are two manoeuvres for simulations; (i) what hyperbolas should be preferably combined and (ii), what endogenous parameters should be selected as basic poles of simulations. For (i) combinations, the author sets two combinations: Combination 1;  $\Omega^*(i)$  and  $r^*(i)$ , and Combination 2;  $speed(i)$  and  $speed(n_E)$ . Combination 1 determines economic stages based on the upper limit of the HA of  $\Omega^*(i)$ . The lower the difference between the HA of  $\Omega^*(i)$  and the current capital-output ratio, the more risky a country becomes.

This is the stage risk. A high level of capital-output ratio inevitably decreases the growth rate of output. Combination 2 determines the relationship between equilibrium and unemployment, integrating optimum range of *the speed years* with the non-accelerating-inflation rate of unemployment (endogenous NAIRU). Combination 2 shows final results of policies by country. Combination 2, in other words, clarifies the entrance and exit of essential policies by country simultaneously, where the entrance is the level of endogenous equilibrium and the exit is full-employment with a low rate of inflation. The HA of  $r^*(i)$  shows the endogenous rate of inflation. Therefore, the HA of  $r^*(i)$  is a tie to connect Combination 1 with Combination 2.

For (ii) simulations, the author selects two parameters each as a basic pole of simulations: relative share,  $1 - \alpha$ ; and technology,  $1 - \beta^*$ . When each pole is used, the author assumes that  $i = I/Y$  and  $n_E$  are fixed in simulation. Relative share,  $1 - \alpha$ , directly works for balancing sustainable robustness and economic stages while technology,  $1 - \beta^*$ , works for promoting technological progress as a base for the dynamic balance between robustness and stages. The two poles,  $1 - \alpha$  and  $1 - \beta^*$ , do not match always so that policy-makers must design their own directions

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and extents. Philosophy underlying determines the directions and extents of the dynamic balance. Suppose that these two poles each change the six hyperbolas towards the same good or bad direction. In this case, it is not needed for an operator to simulate two times of  $1 - \alpha$  and  $1 - \beta^*$ . And, the relationship between philosophy and results is simply clarified.

However, in simulations, results examined by pole differ significantly. In particular, the increase in relative share,  $1 - \alpha$ , results in a linear decrease of *the speed years*. On the contrary, the increase in technology,  $1 - \beta^*$ , results in a convex curve of *the speed years* from upwards to downwards after reaching maximum point. As a result, optimum range of *the speed years* similarly changes, as measured by the vertical asymptote of the speed,  $i_{VA(speed)}$ , and the Width,  $i_{Width(speed)}$ . This implies that it is essential to maintain robustness by continuously improving technology. Also, when technology improves with a low  $i = I/Y$ , economic stage never becomes matured or developed in a hurry. For economic stages, the capital-output ratio hyperbola to  $i = I/Y$ ,  $\Omega^*(i)$ , and its horizontal asymptote,  $\Omega^*_{HA(i)}$ , are the targets.

As a result, Combination 1,  $\Omega^*(i)$  and  $r^*(i)$ , and Combination 2,  $speed(i)$  and  $speed(n_E)$ , are simulated, each by using two poles,  $1 - \alpha$  and  $1 - \beta^*$  separately. For Combination 1, the author examines the changes in the following items:  $\Omega^*$ ,  $i_{VA(\Omega^*)}$ ,  $\Omega^*_{HA(i)}$ ,  $r^*$ ,  $r^*_{HA(i)}$ ,  $g_Y^*$ ,  $\alpha/i \cdot \beta^*$  that shows the relationship between  $r^*$  and  $g_Y^*$ ,  $Curvature_{\Omega^*(i)}$ , and  $\Omega^*_{HA(i)}/r^*_{HA(i)}$ . These items constitute a half part of the mechanics in equilibrium. For Combination 2, the author examines the changes in the following items:  $\delta_0$ ,  $speed = 1/\lambda^*$ ,  $i_{VA(speed)}$ ,  $i_{Width(speed)}$ , sum of  $i_{VA(speed)} + i_{Width(speed)}$ ,  $n_{VA(speed)}$ ,  $n_{Width(speed)}$ ,  $r^*_{HA(i)}$ , and  $\Omega^*_{HA(i)}/r^*_{HA(i)}$ . These items also constitute a remaining part of the mechanics in equilibrium. The simulation results of the mechanics in equilibrium clarify the characteristics of related hyperbolas. The structure of *the speed years* of  $\alpha = \Omega^* \cdot r^*$  seems to be rather complicated when the author explains simulation processes step by step. The simulation results by country show common characteristics among country and thus, are useful to policy-makers.

Let's illustrate the essence of each simulation. **BOXES 7-1, 7-2, and 7-3** each highlight the results of simulations, using symbols drawn by trend.

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**BOX 7-1** Results of simulations 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, and 4-2 in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$

Movements between Cases 1 & 2 and Cases 3 & 4						differs		differs					
equilibrium	$i$	$n$	$\alpha$	$\Omega^*$	$\beta^*$	$iVA(\Omega)$	$\Omega^*_{HA(i)}$	$i\text{Width}(\Omega)$	Curvat. ( $\Omega^*$ )	$iVA(\Omega)+i\text{Width}(\Omega)$	$r^*_{HA(i)}$	$i\text{Width}(r^*)$	$\Omega^*_{HA(i)}/r^*_{HL}$
Case 1-1			rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 1-2					rises	↓	↑	↑	↓	↑	↓	↘	↑
Case 2-1		rises	rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 2-2		rises			rises	↓	↑	↑	↓	↑	↓	↘	↑
equilibrium	$i$	$n$	$\alpha$	$\Omega^*$	$\beta^*$	$iVA(\Omega)$	$\Omega^*_{HA(i)}$	$i\text{Width}(\Omega)$	Curvat. ( $\Omega^*$ )	$iVA(\Omega)+i\text{Width}(\Omega)$	$r^*_{HA(i)}$	$i\text{Width}(r^*)$	$\Omega^*_{HA(i)}/r^*_{HL}$
Case 3-1	falls		rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 3-2	falls				rises	↓	↑	↑	↓	↓	↓	↘	↑
Case 4-1	rises		rises			↗	↘	↘	↗	↘	↑	↗	↓
Case 4-2	rises				rises	↓	↑	↑	↓	↑	↓	↘	↑
Movements between Cases 1 & 2 and Cases 3 & 4						differs		differs		differs		differs	
equilibrium	$\Delta r_0$	$r^*$	$r_{REAL} = r^* - r_0$	$\alpha/i\beta^*$	$E_Y^*$	$E_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$iVA(\text{speed})$	$i\text{Width}(\text{speed})$	$DVA(\text{speed})$	$D\text{Width}(\text{speed})$
Case 1-1	↑	↑	↑	↑	↗	→	↗	↘	↘	↗	↗	↘	↗
Case 1-2	↘	↓	↘	↘	↓	↓	↘	↘	↘	↘	↘	↘	→
Case 2-1	↗	↑	↑	↑	↗	→	↗	↓	↓	↘	↗	↘	↗
Case 2-2	↗	↓	↘	↘	↓	↓	↘	↘	↘	↘	↘	↘	→
equilibrium	$\Delta r_0$	$r^*$	$r_{REAL} = r^* - r_0$	$\alpha/i\beta^*$	$E_Y^*$	$E_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$iVA(\text{speed})$	$i\text{Width}(\text{speed})$	$DVA(\text{speed})$	$D\text{Width}(\text{speed})$
Case 3-1	↗	↑	↑	↑	↗	→	↗	↘	↘	↘	↗	↗	↗
Case 3-2	↘	↓	↘	↘	↓	↓	↘	↘	↘	↘	↘	↘	→
Case 4-1	↗	↑	↗	↑	↗	→	↗	↘	↘	↗	↗	↘	↗
Case 4-2	↗	↓	↘	↘	↓	↓	↘	↘	↘	↘	↘	↘	→

**BOX 7-2** Results of simulations for capital-output ratio and related ratios in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$

Movements between Cases 1 & 2 and Cases 3 & 4						differs		differs					
equilibrium	$i$	$n$	$\alpha$	$\Omega^*$	$\beta^*$	$iVA(\Omega)$	$\Omega^*_{HA(i)}$	$i\text{Width}(\Omega)$	Curvat. ( $\Omega^*$ )	$iVA(\Omega)+i\text{Width}(\Omega)$	$r^*_{HA(i)}$	$i\text{Width}(r^*)$	$\Omega^*_{HA(i)}/r^*_{HL}$
Case 1-1			rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 1-2					rises	↓	↑	↑	↓	↑	↓	↘	↑
Case 2-1		rises	rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 2-2		rises			rises	↓	↑	↑	↓	↑	↓	↘	↑
equilibrium	$i$	$n$	$\alpha$	$\Omega^*$	$\beta^*$	$iVA(\Omega)$	$\Omega^*_{HA(i)}$	$i\text{Width}(\Omega)$	Curvat. ( $\Omega^*$ )	$iVA(\Omega)+i\text{Width}(\Omega)$	$r^*_{HA(i)}$	$i\text{Width}(r^*)$	$\Omega^*_{HA(i)}/r^*_{HL}$
Case 3-1	falls		rises			↗	↘	↘	↗	↘	↑	↑	↓
Case 3-2	falls				rises	↓	↑	↑	↓	↓	↓	↘	↑
Case 4-1	rises		rises			↗	↘	↘	↗	↘	↑	↗	↓
Case 4-2	rises				rises	↓	↑	↑	↓	↑	↓	↘	↑

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### BOX 7-3 Results of simulations for *the speed years* and related ratios in equilibrium: by changing $\alpha$ & $\beta^*$ , with changes in $n$ and $i = I/Y$

	differs		differs				Movements between Cases 1 & 2 and Cases 3 & 4			differs		differs		differs		differs	
equilibrium	$\Delta\alpha_0$	$r^*$	$r_{REAL} = r^* - r_E$	$\alpha/\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$D_{VA(speed)}$	$D_{Width(speed)}$				
Case 1-1	↑	↑	↑	↑	↗	→	↗	↘	↘	↗	↗	↘	↗				
Case 1-2	↘	↓	↘	↘	↓	↓	↪	↘	↘	↪	↪	↘	→				
Case 2-1	↗	↑	↑	↑	↗	→	↗	↓	↓	↘	↗	↘	↗				
Case 2-2	↗	↓	↘	↘	↓	↓	↪	↪	↪	↪	↪	↪	→				
Case 3-1	↗	↑	↑	↑	↗	→	↗	↘	↓	↘	↗	↗	↗				
Case 3-2	↘	↓	↘	↘	↓	↓	↪	↪	↪	↓	↪	↪	→				
Case 4-1	↗	↑	↗	↑	↗	→	↗	↘	↪	↗	↗	↘	↗				
Case 4-2	↗	↓	↘	↘	↓	↓	↪	↘	↪	↪	↪	↪	→				

#### Notes:

In Case 1-1, rise; in Case 1-2,  $\beta^*$  rises.

In Case 2-1,  $\alpha$  rises with a rise of  $n$ ; and in Case 2-2,  $\beta^*$  rises with the same rise of  $n$ .

In Case 3-1,  $\alpha$  rises; in Case 3-2,  $\beta^*$  rises, each with a fall of  $i = I/Y$ .

In Case 4-1,  $\alpha$  rises and in Case 4-2,  $\beta^*$  rise, each with a rise of  $i = I/Y$ . Simulation of each case has nine levels, increasing and/or decreasing.

Next, **Tables C1** and **C2** show the differences of economic stages using the structure of *the speed years*, where economic stages are divided into five cases including extreme deficit case. **Tables A1** and **A2** each show results of the structure of *the speed years*, by country and by sub-area in Europe and Asia. **Tables E1** to **E4** show endogenous elasticity values of parameters and variables each w.r.t.  $\alpha$  and  $\beta^*$ , in the discrete time, where the elasticity of substitution is 1.0, as proved (2009). **Tables F1** and **F2** show frequency to total numbers that falls into ‘disequilibrium’ and frequency to total numbers that falls into ‘close-to-disequilibrium,’ by country for the 1990-2008, where disequilibrium is measured by *the speed years* < 0 and close-to-disequilibrium is measured by  $0 < \text{the speed years} < 5$ . **Table F3** shows endogenous real rate of return and endogenous inflation/deflation rate for the NAIRU by country in 2008. This is another expression of disequilibrium since the adjustments by  $n_E$  is the last manoeuvre to equilibrium.

Finally, **Figures P1** to **P7** each show the mechanics in equilibrium for three Europe sub-areas in Europe. ‘Mechanics’ in these figures broadly means the characteristics shown by using some specific ratios in endogenous equations and related hyperbolas.



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### 7.4 Conclusions

This chapter aims at clarifying a version of the structure of *the speed years* empirically using endogenous equations. One specific point in this chapter is the use of KEWT 5.11 data-sets. This is because KEWT 5.11 data-sets each leave an endogenous rate of unemployment as a final adjustment for maintaining a moderate range of endogenous equilibrium. The structure of *the speed years* locates at the centre of the endogenous-equilibrium and the endogenous system; made of two attributes, the capital-output ratio and the quantitative net investment coefficient,  $\beta^*$ . And, this chapter connects endogenous equations with corresponding hyperbolas. A hyperbola is a reduced form of an endogenous equation and reinforces the endogenous system by measuring vertical and/or horizontal asymptotes.

The policy-oriented core parameters, i.e., relative share of capital, the capital-output ratio, and the rate of return, or  $\alpha = \Omega^* \cdot r^*$  are overlapped in the structure of *the speed years*. Related hyperbolas are a few times explained in other chapters from different viewpoints of sustainability so that readers may be relaxed in this chapter.

The other specific point of this chapter is the use of ‘the origin’ of each related hyperbola. The origin of a hyperbola is visibly shown at the centre of the four quadrants and determines accurate spots of parameters and variables. The optimum point of  $i = I/Y$  of the rate of return hyperbola to  $i = I/Y$  is, even though, difficult to find the maximum rate of return corresponding to the minimum  $i = I/Y$  since this spot is not obtained by point but by a narrow range.

The author recalls a story of genius pianist, Tsujii Nobuyuki broadcasted on 19 May 2012 at TV Asahi. Tsujii won the highest pianist record in the world and today keeps “the youngest winner” by the age of twenty years, despite of blindness. A judge praised: He played piano with mind and spirit or his spirit played his piano.

The simulations based on related hyperbolas are visible and accordingly testable. Yet in a sense, it is important for an operator/policy-maker to work spiritually rather than to stick to mechanical method and its results. The parabolic maximization is replaced by an optimum range of the endogenous-equilibrium to satisfy the maximum rate of return under the minimum  $i = I/Y$ . The origin of a hyperbola overlaps one corner of the right rectangular that helps to draw hyperbolic curve. By imaging the rectangular, the optimum point by hyperbola will be confirmed, not intuitively but accurately. Two dimensional rectangular reinforces the hyperbola and, empirically determines the original point and a range of the maximum and minimum spots. The origin and the vertical and horizontal asymptotes constitute each body of the endogenous system and are related to

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hyperbolas. Not any corner of a rectangular but a whole of the rectangle determines the optimization by hyperbola. This image is similar to human body and further human mind and body (see Chapter 10).

Conclusively, Chapters 7, 8, and 9 each deepens direct measure of the speed years for convergence in the endogenous-equilibrium. The endogenous-equilibrium is the best surrogate for the price-equilibrium. The speed years harmoniously reinforces the market principles in the price-equilibrium. The endogenous-equilibrium is robustly connected with the capital-output ratio. When the capital-output ratio is constant by country, by sector (G and PRI), and year and over years, the endogenous-equilibrium is most modest and optimized. This fact is expressed by a constant capital-output ratio,  $\Omega = \Omega^* = \Omega_0 = K/Y$  (**Axiom 1**). Remember Essence of Earth Endogenous System: Three Axioms and six Nature-Aspects at the beginning of the EES).

For readers' convenience: contents of Tables and Figures hereunder

Table S1 to S2: Simulations 1-1, 1-2, 2-1, and 2-2 in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $i = I/Y$ ,  $n$ , and  $\delta_0$

Table S3 to S4: Simulations 3-1, 3-2, 4-1, and 4-2 in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $i = I/Y$  and  $\delta_0$

Table C1: Case study of endogenous parameters and synergy structure of  $\Omega^*(i)$  and  $r^*(i)$  2008

Table C2: Case study to  $\delta_0$ , the speed of convergence, DRC, and variables 2008 (2)

Table A1: Endogenous parameters and synergy structure of  $\Omega^*(i)$  and  $r^*(i)$  by country and area 2008

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Figure P5 to P7: Mechanics in equilibrium; the 12 Euro currency countries; the 5 Non-Euro currency developed countries; the 11 developing countries in Europe

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table S1** Simulations 1-1, 1-2, 2-1, and 2-2 (1) in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$

$i$	$n$	$\alpha$	$\Omega^*$	$\beta^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)+i_{Width(\Omega)}}$	$r_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_H$
<b>Simu 1-1: changing <math>\alpha</math></b>												
0.2	0.005	<b>0.05</b>	3.926	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.2	0.005	<b>0.1</b>	3.743	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.2	0.005	<b>0.15</b>	3.557	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.2	0.005	<b>0.2</b>	3.369	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.2	0.005	<b>0.25</b>	3.179	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.2	0.005	<b>0.3</b>	2.986	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.2	0.005	<b>0.35</b>	2.791	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.2	0.005	<b>0.4</b>	2.593	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.2	0.005	<b>0.45</b>	2.393	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
<b>Simu 1-2 changing <math>\beta^*</math></b>												
0.2	0.005	0.25	1.070	<b>0.6</b>	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.2	0.005	0.25	1.316	<b>0.65</b>	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.2	0.005	0.25	1.639	<b>0.7</b>	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.2	0.005	0.25	2.083	<b>0.75</b>	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.2	0.005	0.25	2.730	<b>0.8</b>	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.2	0.005	0.25	3.761	<b>0.85</b>	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.2	0.005	0.25	5.660	<b>0.9</b>	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.2	0.005	0.25	10.326	<b>0.95</b>	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.2	0.005	0.25	25.781	<b>0.99</b>	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833
<b>Simu 2-1: changing <math>\alpha</math></b>												
0.2	<b>0.010</b>	<b>0.05</b>	3.495	0.825	(0.0537)	4.434	0.4882	1.448	0.4344	0.0113	0.0246	393.25
0.2	<b>0.010</b>	<b>0.1</b>	3.348	0.825	(0.0509)	4.201	0.4625	1.529	0.4116	0.0238	0.0348	176.47
0.2	<b>0.010</b>	<b>0.15</b>	3.198	0.825	(0.0481)	3.967	0.4368	1.619	0.3887	0.0378	0.0426	104.94
0.2	<b>0.010</b>	<b>0.2</b>	3.045	0.825	(0.0453)	3.734	0.4111	1.720	0.3658	0.0536	0.0492	69.72
0.2	<b>0.010</b>	<b>0.25</b>	2.888	0.825	(0.0424)	3.501	0.3854	1.835	0.3430	0.0714	0.0550	49.02
0.2	<b>0.010</b>	<b>0.3</b>	2.727	0.825	(0.0396)	3.267	0.3597	1.966	0.3201	0.0918	0.0603	35.58
0.2	<b>0.010</b>	<b>0.35</b>	2.563	0.825	(0.0368)	3.034	0.3340	2.117	0.2973	0.1154	0.0651	26.30
0.2	<b>0.010</b>	<b>0.4</b>	2.394	0.825	(0.0339)	2.801	0.3083	2.293	0.2744	0.1428	0.0696	19.61
0.2	<b>0.010</b>	<b>0.45</b>	2.222	0.825	(0.0311)	2.567	0.2826	2.502	0.2515	0.1753	0.0739	14.65
<b>Simu 2-2 changing <math>\beta^*</math></b>												
0.2	<b>0.010</b>	0.25	1.019	<b>0.6</b>	(0.0186)	1.114	0.1438	4.917	0.1252	0.2244	0.0645	4.96
0.2	<b>0.010</b>	0.25	1.247	<b>0.65</b>	(0.0212)	1.379	0.1711	4.134	0.1498	0.1813	0.0620	7.61
0.2	<b>0.010</b>	0.25	1.542	<b>0.7</b>	(0.0248)	1.733	0.2071	3.414	0.1823	0.1443	0.0598	12.01
0.2	<b>0.010</b>	0.25	1.940	<b>0.75</b>	(0.0297)	2.228	0.2572	2.749	0.2275	0.1122	0.0577	19.85
0.2	<b>0.010</b>	0.25	2.505	<b>0.8</b>	(0.0371)	2.970	0.3321	2.129	0.2950	0.0842	0.0559	35.29
0.2	<b>0.010</b>	0.25	3.373	<b>0.85</b>	(0.0495)	4.208	0.4564	1.549	0.4069	0.0594	0.0542	70.83
0.2	<b>0.010</b>	0.25	4.874	<b>0.9</b>	(0.0743)	6.683	0.7045	1.004	0.6302	0.0374	0.0527	178.66
0.2	<b>0.010</b>	0.25	8.097	<b>0.95</b>	(0.1485)	14.109	1.4475	0.488	1.2990	0.0177	0.0513	796.25
0.2	<b>0.010</b>	0.25	15.599	<b>0.99</b>	(0.7426)	73.515	7.3885	0.096	6.6459	0.0034	0.0503	21618

## Chapter 7

**Table S2 Simulations 1-1, 1-2, 2-1, and 2-2 (2) in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$**

$dcl\alpha_0$	$r^*$	$i_{REAL} = i - T_H$	$\alpha/\beta^*$	$g_Y$	$g_A$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{width(speed)}$	$n_{VA(speed)}$	$n_{width(speed)}$
<b>Simu 1-1: changing <math>\alpha</math></b>												
0.1180	0.0127	0.0015	0.3030	0.0420	0.0350	28.07	0.0680	1.3597	(0.0308)	0.0255	(0.0325)	0.0103
0.1488	0.0267	0.0030	0.6061	0.0441	0.0350	29.16	0.0488	0.4880	(0.0302)	0.0259	(0.0331)	0.0105
0.1816	0.0422	0.0045	0.9091	0.0464	0.0350	30.40	0.0316	0.2106	(0.0297)	0.0264	(0.0337)	0.0108
0.2166	0.0594	0.0061	1.2121	0.0490	0.0350	31.83	0.0166	0.0829	(0.0292)	0.0270	(0.0343)	0.0112
0.2541	0.0786	0.0076	1.5152	0.0519	0.0350	33.49	0.0041	0.0163	(0.0287)	0.0277	(0.0348)	0.0115
0.2944	0.1005	0.0091	1.8182	0.0553	0.0350	35.47	(0.0056)	(0.0186)	(0.0283)	0.0285	(0.0353)	0.0120
0.3380	0.1254	0.0106	2.1212	0.0591	0.0350	37.85	(0.0120)	(0.0342)	(0.0281)	0.0294	(0.0356)	0.0124
0.3854	0.1542	0.0121	2.4242	0.0636	0.0350	40.80	(0.0146)	(0.0364)	(0.0279)	0.0305	(0.0358)	0.0129
0.4373	0.1881	0.0136	2.7273	0.0690	0.0350	44.56	(0.0127)	(0.0282)	(0.0279)	0.0319	(0.0358)	0.0135
<b>Simu 1-2: changing <math>\beta^*</math></b>												
0.8342	0.2338	0.0104	2.0833	0.1122	0.0800	58.79	0.5842	2.3370	(0.0566)	0.0388	(0.0177)	0.0115
0.5567	0.1900	0.0096	1.9231	0.0988	0.0700	28.75	0.3067	1.2267	(0.0242)	0.0254	(0.0414)	0.0115
0.4166	0.1525	0.0089	1.7857	0.0854	0.0600	25.80	0.1666	0.6665	(0.0214)	0.0239	(0.0467)	0.0115
0.3319	0.1200	0.0083	1.6667	0.0720	0.0500	26.91	0.0819	0.3276	(0.0225)	0.0245	(0.0445)	0.0115
0.2755	0.0916	0.0078	1.5625	0.0586	0.0400	30.55	0.0255	0.1018	(0.0259)	0.0263	(0.0386)	0.0115
0.2363	0.0665	0.0074	1.4706	0.0452	0.0300	37.51	(0.0137)	(0.0548)	(0.0327)	0.0295	(0.0305)	0.0115
0.2111	0.0442	0.0069	1.3889	0.0318	0.0200	51.21	(0.0389)	(0.1558)	(0.0475)	0.0356	(0.0210)	0.0115
0.2071	0.0242	0.0066	1.3158	0.0184	0.0100	85.62	(0.0429)	(0.1716)	(0.0946)	0.0502	(0.0106)	0.0115
0.2928	0.0097	0.0063	1.2626	0.0077	0.0020	193.63	0.0428	0.1712	(0.5303)	0.1189	(0.0019)	0.0115
<b>Simu 2-1: changing <math>\alpha</math></b>												
0.1930	0.0143	0.0030	0.3030	0.0472	0.0350	26.49	0.1430	2.8600	(0.0673)	0.0266	(0.0297)	0.0103
0.2206	0.0299	0.0061	0.6061	0.0493	0.0350	27.57	0.1206	1.2064	(0.0660)	0.0271	(0.0303)	0.0105
0.2502	0.0469	0.0091	0.9091	0.0516	0.0350	28.78	0.1002	0.6679	(0.0648)	0.0276	(0.0309)	0.0108
0.2819	0.0657	0.0121	1.2121	0.0542	0.0350	30.18	0.0819	0.4095	(0.0637)	0.0282	(0.0314)	0.0112
0.3160	0.0866	0.0152	1.5152	0.0571	0.0350	31.81	0.0660	0.2641	(0.0627)	0.0289	(0.0319)	0.0115
0.3530	0.1100	0.0182	1.8182	0.0605	0.0350	33.73	0.0530	0.1765	(0.0618)	0.0297	(0.0324)	0.0120
0.3931	0.1366	0.0212	2.1212	0.0644	0.0350	36.05	0.0431	0.1231	(0.0612)	0.0307	(0.0327)	0.0124
0.4370	0.1671	0.0242	2.4242	0.0689	0.0350	38.90	0.0370	0.0924	(0.0609)	0.0319	(0.0328)	0.0129
0.4852	0.2026	0.0273	2.7273	0.0743	0.0350	42.52	0.0352	0.0783	(0.0611)	0.0333	(0.0328)	0.0135
<b>Simu 2-2: changing <math>\beta^*</math></b>												
0.9530	0.2453	0.0208	2.0833	0.1177	0.0800	88.79	0.7030	2.8119	(0.3987)	0.0729	(0.0050)	0.0115
0.6437	0.2005	0.0192	1.9231	0.1043	0.0700	30.82	0.3937	1.5747	(0.0601)	0.0283	(0.0333)	0.0115
0.4890	0.1621	0.0179	1.7857	0.0908	0.0600	26.20	0.2390	0.9559	(0.0489)	0.0255	(0.0409)	0.0115
0.3970	0.1289	0.0167	1.6667	0.0773	0.0500	26.56	0.1470	0.5878	(0.0497)	0.0258	(0.0402)	0.0115
0.3375	0.0998	0.0156	1.5625	0.0639	0.0400	29.41	0.0875	0.3501	(0.0566)	0.0275	(0.0353)	0.0115
0.2991	0.0741	0.0147	1.4706	0.0504	0.0300	35.05	0.0491	0.1963	(0.0713)	0.0308	(0.0280)	0.0115
0.2792	0.0513	0.0139	1.3889	0.0369	0.0200	45.63	0.0292	0.1166	(0.1040)	0.0372	(0.0192)	0.0115
0.2897	0.0309	0.0132	1.3158	0.0235	0.0100	68.48	0.0397	0.1588	(0.2112)	0.0531	(0.0095)	0.0115
0.4022	0.0160	0.0126	1.2626	0.0127	0.0020	115.00	0.1522	0.6086	(1.2545)	0.1293	(0.0016)	0.0115

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table S3** Simulations 3-1, 3-2, 4-1, and 4-2 (1) in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$

i	n	$\alpha$	$\Omega^*$	$\beta^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)+i_{Width(\Omega)}}$	$\Gamma_{HA(i)}$	$i_{Width(\Gamma^*)}$	$\Omega^*_{HA(i)}/\Gamma^*_{HA(i)}$
<b>Simu 3-1: changing alpha</b>												
0.075	0.005	0.05	3.276	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.075	0.005	0.1	3.148	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.075	0.005	0.15	3.016	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.075	0.005	0.2	2.879	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.075	0.005	0.25	2.739	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.075	0.005	0.3	2.595	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.075	0.005	0.35	2.446	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.075	0.005	0.4	2.293	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.075	0.005	0.45	2.135	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
<b>Simu 3-2: changing beta *</b>												
0.075	0.005	0.25	0.996	0.6	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.075	0.005	0.25	1.213	0.65	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.075	0.005	0.25	1.494	0.7	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.075	0.005	0.25	1.867	0.75	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.075	0.005	0.25	2.390	0.8	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.075	0.005	0.25	3.176	0.85	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.075	0.005	0.25	4.485	0.9	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.075	0.005	0.25	7.107	0.95	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.075	0.005	0.25	12.365	0.99	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833
<b>Simu 4-1: changing alpha</b>												
0.4	0.005	0.05	4.174	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.4	0.005	0.1	3.968	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.4	0.005	0.15	3.760	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.4	0.005	0.2	3.551	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.4	0.005	0.25	3.340	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.4	0.005	0.3	3.128	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.4	0.005	0.35	2.914	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.4	0.005	0.4	2.699	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.4	0.005	0.45	2.483	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
<b>Simu 4-2: changing beta *</b>												
0.4	0.005	0.25	1.094	0.6	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.4	0.005	0.25	1.350	0.65	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.4	0.005	0.25	1.689	0.7	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.4	0.005	0.25	2.158	0.75	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.4	0.005	0.25	2.852	0.8	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.4	0.005	0.25	3.981	0.85	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.4	0.005	0.25	6.143	0.9	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.4	0.005	0.25	11.950	0.95	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.4	0.005	0.25	38.224	0.99	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833

## Chapter 7

**Table S4** Simulations 3-1, 3-2, 4-1, and 4-2 (2) in equilibrium: by changing  $\alpha$  &  $\beta^*$ , with changes in  $n$  and  $i = I/Y$

$\delta a_0$	$r^*$	$r_{REAL}^* - r^*$	$\alpha / r\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$D_{VA(speed)}$	$D_{Width(speed)}$
<b>Simu 3-1: changing <math>\alpha</math></b>												
0.2346	0.0153	0.0040	0.8081	0.0189	0.0131	67.59	0.1846	3.6929	(0.0355)	0.0273	(0.0106)	0.0103
0.2605	0.0318	0.0081	1.6162	0.0197	0.0131	70.39	0.1605	1.6047	(0.0348)	0.0278	(0.0108)	0.0105
0.2881	0.0497	0.0121	2.4242	0.0205	0.0131	73.57	0.1381	0.9210	(0.0341)	0.0283	(0.0110)	0.0108
0.3179	0.0695	0.0162	3.2323	0.0215	0.0131	77.21	0.1179	0.5897	(0.0335)	0.0289	(0.0112)	0.0112
0.3501	0.0913	0.0202	4.0404	0.0226	0.0131	81.43	0.1001	0.4004	(0.0330)	0.0297	(0.0114)	0.0115
0.3850	0.1156	0.0242	4.8485	0.0238	0.0131	86.42	0.0850	0.2834	(0.0325)	0.0305	(0.0115)	0.0120
0.4231	0.1431	0.0283	5.6566	0.0253	0.0131	92.40	0.0731	0.2088	(0.0322)	0.0315	(0.0116)	0.0124
0.4648	0.1744	0.0323	6.4646	0.0270	0.0131	99.76	0.0648	0.1620	(0.0320)	0.0327	(0.0117)	0.0129
0.5109	0.2108	0.0364	7.2727	0.0290	0.0131	109.06	0.0609	0.1353	(0.0321)	0.0342	(0.0117)	0.0135
<b>Simu 3-2: changing <math>\beta^*</math></b>												
1.0109	0.2511	0.0278	5.5556	0.0452	0.0300	292.24	0.7609	3.0437	0.8572	#NUM!	0.0004	0.0115
0.6875	0.2060	0.0256	5.1282	0.0402	0.0263	83.66	0.4375	1.7499	(0.0343)	0.0302	(0.0109)	0.0115
0.5265	0.1674	0.0238	4.7619	0.0352	0.0225	69.43	0.2765	1.1060	(0.0264)	0.0265	(0.0142)	0.0115
0.4316	0.1339	0.0222	4.4444	0.0301	0.0188	69.41	0.1816	0.7264	(0.0264)	0.0265	(0.0142)	0.0115
0.3714	0.1046	0.0208	4.1667	0.0251	0.0150	75.88	0.1214	0.4854	(0.0298)	0.0282	(0.0126)	0.0115
0.3339	0.0787	0.0196	3.9216	0.0201	0.0113	88.94	0.0839	0.3354	(0.0375)	0.0316	(0.0100)	0.0115
0.3170	0.0557	0.0185	3.7037	0.0151	0.0075	112.71	0.0670	0.2679	(0.0549)	0.0383	(0.0068)	0.0115
0.3340	0.0352	0.0175	3.5088	0.0100	0.0038	160.06	0.0840	0.3358	(0.1126)	0.0548	(0.0033)	0.0115
0.4527	0.0202	0.0168	3.3670	0.0060	0.0008	240.36	0.2027	0.8109	(0.6852)	0.1352	(0.0005)	0.0115
<b>Simu 4-1: changing <math>\alpha</math></b>												
0.0784	0.0120	0.0008	0.1515	0.0791	0.0700	14.44	0.0284	0.5687	(0.0295)	0.0249	(0.0679)	0.0103
0.1112	0.0252	0.0015	0.3030	0.0832	0.0700	14.99	0.0112	0.1115	(0.0289)	0.0254	(0.0691)	0.0105
0.1459	0.0399	0.0023	0.4545	0.0878	0.0700	15.62	(0.0041)	(0.0276)	(0.0284)	0.0259	(0.0703)	0.0108
0.1828	0.0563	0.0030	0.6061	0.0929	0.0700	16.34	(0.0172)	(0.0861)	(0.0280)	0.0264	(0.0715)	0.0112
0.2222	0.0748	0.0038	0.7576	0.0988	0.0700	17.18	(0.0278)	(0.1110)	(0.0276)	0.0271	(0.0726)	0.0115
0.2646	0.0959	0.0045	0.9091	0.1055	0.0700	18.19	(0.0354)	(0.1182)	(0.0272)	0.0279	(0.0735)	0.0120
0.3102	0.1201	0.0053	1.0606	0.1132	0.0700	19.40	(0.0398)	(0.1138)	(0.0269)	0.0288	(0.0743)	0.0124
0.3596	0.1482	0.0061	1.2121	0.1223	0.0700	20.91	(0.0404)	(0.1010)	(0.0268)	0.0299	(0.0747)	0.0129
0.4135	0.1812	0.0068	1.3636	0.1329	0.0700	22.83	(0.0365)	(0.0811)	(0.0268)	0.0312	(0.0746)	0.0135
<b>Simu 4-2: changing <math>\beta^*</math></b>												
0.7787	0.2285	0.0052	1.0417	0.2194	0.1600	25.53	0.5287	2.1147	(0.0424)	0.0336	(0.0472)	0.0115
0.5153	0.1852	0.0048	0.9615	0.1926	0.1400	13.96	0.2653	1.0611	(0.0221)	0.0243	(0.0905)	0.0115
0.3816	0.1480	0.0045	0.8929	0.1658	0.1200	12.83	0.1316	0.5262	(0.0202)	0.0232	(0.0990)	0.0115
0.2997	0.1158	0.0042	0.8333	0.1390	0.1000	13.55	0.0497	0.1990	(0.0214)	0.0239	(0.0934)	0.0115
0.2440	0.0877	0.0039	0.7813	0.1122	0.0800	15.57	(0.0060)	(0.0240)	(0.0248)	0.0257	(0.0806)	0.0115
0.2035	0.0628	0.0037	0.7353	0.0854	0.0600	19.40	(0.0465)	(0.1860)	(0.0314)	0.0289	(0.0637)	0.0115
0.1738	0.0407	0.0035	0.6944	0.0586	0.0400	27.18	(0.0762)	(0.3048)	(0.0454)	0.0348	(0.0441)	0.0115
0.1575	0.0209	0.0033	0.6579	0.0318	0.0200	48.54	(0.0925)	(0.3700)	(0.0890)	0.0487	(0.0225)	0.0115
0.2071	0.0065	0.0032	0.6313	0.0104	0.0040	144.48	(0.0429)	(0.1716)	(0.4729)	0.1123	(0.0042)	0.0115

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table C1** Economic stage case study of endogenous parameters and synergy  
structure of  $\Omega^*(i)$  and  $r^*(i)$  2008

equilibrium	i	n	$\alpha$	$\Omega^*$	$\beta^*$	$\dot{v}_{A(\Omega)}$	$\Omega^*_{HA(i)}$	i Width( $\Omega$ )	Curvat.( $\Omega^*$ )	$\dot{v}_{A(\Omega)} + \dot{v}_{wid(\Omega)}$	$r^*_{HA(i)}$	i Width( $r^*$ )	$\Omega^*_{HA(i)}/r^*_{HA(i)}$
Case 1 developed good tech.	0.1	(0.0050)	0.275	4.3382	0.825	0.0208	3.4350	0.2674	2.6442	0.2882	0.0801	0.0408	42.91
	0.1	(0.0025)	0.275	3.8234	0.825	0.0104	3.4264	0.1886	3.7489	0.1990	0.0803	0.0289	42.69
	0.1	0.0000	0.275	3.4179	0.825	0.0000	3.4179	0.0000	#DIV/0!	0.0000	0.0805	0.0000	42.48
	0.1	0.0025	0.275	3.0901	0.825	(0.0103)	3.4093	0.1877	3.7677	0.1773	0.0807	0.0289	42.27
	0.1	0.0050	0.275	2.8197	0.825	(0.0206)	3.4009	0.2648	2.6708	0.2441	0.0809	0.0408	42.06
	0.1	0.0075	0.275	2.5928	0.825	(0.0308)	3.3924	0.3235	2.1861	0.2926	0.0811	0.0500	41.85
	0.1	0.0100	0.275	2.3997	0.825	(0.0410)	3.3840	0.3726	1.8979	0.3315	0.0813	0.0577	41.64
	0.1	0.0125	0.275	2.2334	0.825	(0.0511)	3.3757	0.4155	1.7018	0.3644	0.0815	0.0645	41.44
	0.1	0.0150	0.275	2.0886	0.825	(0.0612)	3.3673	0.4541	1.5573	0.3928	0.0817	0.0707	41.23
Case 2 developing good tech.	0.3	(0.0050)	0.375	2.2692	0.775	0.0140	2.1636	0.1738	4.0689	0.1877	0.1733	0.0492	12.48
	0.3	(0.0025)	0.375	2.2094	0.775	0.0070	2.1582	0.1226	5.7687	0.1295	0.1738	0.0348	12.42
	0.3	0.0000	0.375	2.1528	0.775	0.0000	2.1528	0.0000	#DIV/0!	0.0000	0.1742	0.0000	12.36
	0.3	0.0025	0.375	2.0989	0.775	(0.0069)	2.1474	0.1220	5.7976	0.1150	0.1746	0.0348	12.30
	0.3	0.0050	0.375	2.0477	0.775	(0.0138)	2.1421	0.1721	4.1098	0.1582	0.1751	0.0492	12.24
	0.3	0.0075	0.375	1.9990	0.775	(0.0207)	2.1368	0.2102	3.3640	0.1895	0.1755	0.0602	12.18
	0.3	0.0100	0.375	1.9525	0.775	(0.0275)	2.1315	0.2421	2.9205	0.2146	0.1759	0.0696	12.12
	0.3	0.0125	0.375	1.9081	0.775	(0.0343)	2.1262	0.2700	2.6186	0.2357	0.1764	0.0778	12.06
	0.3	0.0150	0.375	1.8657	0.775	(0.0411)	2.1210	0.2951	2.3964	0.2540	0.1768	0.0852	12.00
Case 3 developing unstable	0.05	(0.0050)	0.15	11.2451	0.85	0.0285	4.8409	0.3713	1.9045	0.3998	0.0310	0.0297	156.23
	0.05	(0.0025)	0.15	6.7445	0.85	0.0142	4.8287	0.2619	2.7002	0.2761	0.0311	0.0210	155.44
	0.05	0.0000	0.15	4.8167	0.85	0.0000	4.8167	0.0000	#DIV/0!	0.0000	0.0311	0.0000	154.67
	0.05	0.0025	0.15	3.7459	0.85	(0.0141)	4.8047	0.2606	2.7137	0.2464	0.0312	0.0210	153.90
	0.05	0.0050	0.15	3.0647	0.85	(0.0282)	4.7927	0.3676	1.9237	0.3394	0.0313	0.0297	153.13
	0.05	0.0075	0.15	2.5931	0.85	(0.0422)	4.7808	0.4491	1.5746	0.4069	0.0314	0.0364	152.37
	0.05	0.0100	0.15	2.2473	0.85	(0.0561)	4.7690	0.5173	1.3670	0.4612	0.0315	0.0420	151.62
	0.05	0.0125	0.15	1.9828	0.85	(0.0700)	4.7572	0.5769	1.2257	0.5069	0.0315	0.0470	150.87
	0.05	0.0150	0.15	1.7741	0.85	(0.0837)	4.7455	0.6304	1.1217	0.5467	0.0316	0.0514	150.13
Case 4 Huge deficit	0.05	(0.0050)	0.2	(137.67)	0.925	0.0536	9.9162	0.7291	0.9699	0.7827	0.0202	0.0329	491.66
	0.05	(0.0025)	0.2	21.26	0.925	0.0267	9.8914	0.5142	1.3751	0.5410	0.0202	0.0232	489.20
	0.05	0.0000	0.2	9.8667	0.925	0.0000	9.8667	0.0000	#DIV/0!	0.0000	0.0203	0.0000	486.76
	0.05	0.0025	0.2	6.4243	0.925	(0.0266)	9.8421	0.5117	1.3820	0.4851	0.0203	0.0232	484.33
	0.05	0.0050	0.2	4.7627	0.925	(0.0531)	9.8176	0.7218	0.9796	0.6687	0.0204	0.0329	481.92
	0.05	0.0075	0.2	3.7840	0.925	(0.0794)	9.7932	0.8818	0.8019	0.8024	0.0204	0.0403	479.54
	0.05	0.0100	0.2	3.1389	0.925	(0.1056)	9.7690	1.0157	0.6962	0.9101	0.0205	0.0465	477.16
	0.05	0.0125	0.2	2.6818	0.925	(0.1317)	9.7449	1.1328	0.6242	1.0011	0.0205	0.0520	474.81
	0.05	0.0150	0.2	2.3408	0.925	(0.1576)	9.7209	1.2379	0.5712	1.0802	0.0206	0.0569	472.47
Case 5 balanced growth and inequality	0.2	(0.0050)	0.3	2.6287	0.775	0.0156	2.4232	0.1946	3.6329	0.2103	0.1238	0.0440	19.57
	0.2	(0.0025)	0.3	2.5152	0.775	0.0078	2.4172	0.1373	5.1506	0.1451	0.1241	0.0311	19.48
	0.2	0.0000	0.3	2.4111	0.775	0.0000	2.4111	0.0000	#DIV/0!	0.0000	0.1244	0.0000	19.38
	0.2	0.0025	0.3	2.3153	0.775	(0.0078)	2.4051	0.1366	5.1765	0.1288	0.1247	0.0311	19.28
	0.2	0.0050	0.3	2.2268	0.775	(0.0155)	2.3991	0.1927	3.6694	0.1772	0.1250	0.0440	19.19
	0.2	0.0075	0.3	2.1448	0.775	(0.0232)	2.3932	0.2354	3.0035	0.2123	0.1254	0.0539	19.09
	0.2	0.0100	0.3	2.0686	0.775	(0.0308)	2.3872	0.2712	2.6076	0.2404	0.1257	0.0622	19.00
	0.2	0.0125	0.3	1.9977	0.775	(0.0384)	2.3813	0.3024	2.3381	0.2640	0.1260	0.0696	18.90
	0.2	0.0150	0.3	1.9315	0.775	(0.0460)	2.3755	0.3305	2.1396	0.2845	0.1263	0.0762	18.81

**Note:** Shaded cells each show abnormal results due to close-to-disequilibrium or disequilibrium, far from a moderate range of endogenous equilibrium.

## Chapter 7

**Table C2** Economic stage case study to  $\delta_0$ , the speed of convergence, DRC, and variables 2008 (2)

equilibrium	$\delta_0$	$r^*$	$r_{REAL}^* - r^*$	$\alpha/\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$\Pi_{VA(speed)}$	$\Pi_{Width(speed)}$
<b>Case 1</b> developed good tech.	0.0536	0.0634	(0.0167)	3.3333	0.0190	0.0175	77.30	(0.2214)	(0.8050)	0.0219	0.0246	(0.0228)	0.0117
	0.1351	0.0719	(0.0083)	3.3333	0.0216	0.0175	75.05	(0.1399)	(0.5088)	0.0120	0.0257	(0.0209)	0.0117
	0.2074	0.0805	0.0000	3.3333	0.0241	0.0175	72.09	(0.0676)	(0.2458)	0.0000	0.0269	(0.0191)	0.0117
	0.2724	0.0890	0.0083	3.3333	0.0267	0.0175	68.75	(0.0026)	(0.0094)	(0.0142)	0.0280	(0.0176)	0.0117
	0.3315	0.0975	0.0167	3.3333	0.0293	0.0175	65.26	0.0565	0.2053	(0.0310)	0.0292	(0.0161)	0.0117
	0.3856	0.1061	0.0250	3.3333	0.0318	0.0175	61.77	0.1106	0.4021	(0.0506)	0.0305	(0.0148)	0.0117
	0.4355	0.1146	0.0333	3.3333	0.0344	0.0175	58.38	0.1605	0.5836	(0.0734)	0.0318	(0.0136)	0.0117
	0.4818	0.1231	0.0417	3.3333	0.0369	0.0175	55.15	0.2068	0.7520	(0.0999)	0.0332	(0.0125)	0.0117
0.5250	0.1317	0.0500	3.3333	0.0395	0.0175	52.12	0.2500	0.9092	(0.1308)	0.0347	(0.0115)	0.0117	
<b>Case 2</b> developing good tech.	0.3374	0.1653	(0.0081)	1.6129	0.1025	0.0675	24.04	(0.0376)	(0.1001)	0.0210	0.0259	(0.0716)	0.0126
	0.3590	0.1697	(0.0040)	1.6129	0.1052	0.0675	23.98	(0.0160)	(0.0426)	0.0108	0.0263	(0.0692)	0.0126
	0.3800	0.1742	0.0000	1.6129	0.1080	0.0675	23.90	0.0050	0.0134	0.0000	0.0268	(0.0670)	0.0126
	0.4005	0.1787	0.0040	1.6129	0.1108	0.0675	23.79	0.0255	0.0680	(0.0116)	0.0272	(0.0647)	0.0126
	0.4205	0.1831	0.0081	1.6129	0.1135	0.0675	23.67	0.0455	0.1213	(0.0240)	0.0277	(0.0626)	0.0126
	0.4400	0.1876	0.0121	1.6129	0.1163	0.0675	23.54	0.0650	0.1732	(0.0372)	0.0282	(0.0605)	0.0126
	0.4590	0.1921	0.0161	1.6129	0.1191	0.0675	23.38	0.0840	0.2240	(0.0513)	0.0287	(0.0584)	0.0126
	0.4776	0.1965	0.0202	1.6129	0.1219	0.0675	23.22	0.1026	0.2736	(0.0665)	0.0292	(0.0564)	0.0126
0.4958	0.2010	0.0242	1.6129	0.1246	0.0675	23.04	0.1208	0.3220	(0.0826)	0.0297	(0.0545)	0.0126	
<b>Case 3</b> developing unstable	(0.3951)	0.0133	(0.0176)	3.5294	0.0038	0.0075	160.95	(0.5451)	(3.6340)	0.0203	0.0219	(0.0123)	0.0108
	(0.1004)	0.0222	(0.0088)	3.5294	0.0063	0.0075	163.19	(0.2504)	(1.6692)	0.0129	0.0246	(0.0097)	0.0108
	0.0937	0.0311	0.0000	3.5294	0.0088	0.0075	147.12	(0.0563)	(0.3754)	0.0000	0.0271	(0.0080)	0.0108
	0.2386	0.0400	0.0088	3.5294	0.0113	0.0075	127.63	0.0886	0.5909	(0.0186)	0.0296	(0.0067)	0.0108
	0.3543	0.0489	0.0176	3.5294	0.0139	0.0075	109.98	0.2043	1.3623	(0.0439)	0.0321	(0.0057)	0.0108
	0.4507	0.0578	0.0265	3.5294	0.0164	0.0075	95.28	0.3007	2.0045	(0.0774)	0.0348	(0.0048)	0.0108
	0.5332	0.0667	0.0353	3.5294	0.0189	0.0075	83.33	0.3832	2.5546	(0.1214)	0.0378	(0.0041)	0.0108
	0.6054	0.0756	0.0441	3.5294	0.0214	0.0075	73.61	0.4554	3.0358	(0.1795)	0.0411	(0.0035)	0.0108
0.6695	0.0846	0.0529	3.5294	0.0240	0.0075	65.67	0.5195	3.4633	(0.2572)	0.0449	(0.0029)	0.0108	
<b>Case 4</b> Huge deficit	#NUM!	(0.0015)	(0.0216)	4.3243	(0.0003)	0.0038	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0112
	(0.2167)	0.0094	(0.0108)	4.3243	0.0022	0.0038	390.24	(0.4167)	(2.0834)	0.0219	0.0331	(0.0057)	0.0112
	0.0888	0.0203	0.0000	4.3243	0.0047	0.0038	292.66	(0.1112)	(0.5559)	0.0000	0.0383	(0.0043)	0.0112
	0.2596	0.0311	0.0108	4.3243	0.0072	0.00375	209.36	0.0596	0.2980	(0.0360)	0.0424	(0.0035)	0.0112
	0.3787	0.0420	0.0216	4.3243	0.0097	0.00375	157.98	0.1787	0.8937	(0.0858)	0.0463	(0.0029)	0.0112
	0.4703	0.0529	0.0324	4.3243	0.0122	0.00375	125.21	0.2703	1.3515	(0.1510)	0.0502	(0.0025)	0.0112
	0.5447	0.0637	0.0432	4.3243	0.0147	0.00375	103.01	0.3447	1.7234	(0.2343)	0.0541	(0.0021)	0.0112
	0.6073	0.0746	0.0541	4.3243	0.0172	0.00375	87.17	0.4073	2.0367	(0.3396)	0.0583	(0.0018)	0.0112
0.6615	0.0854	0.0649	4.3243	0.0198	0.00375	75.36	0.4615	2.3073	(0.4726)	0.0628	(0.0016)	0.0112	
<b>Case 5</b> balanced growth and inequality	0.2185	0.1141	(0.0097)	1.9355	0.0590	0.0450	31.58	(0.0815)	(0.2716)	0.0199	0.0238	(0.0502)	0.0120
	0.2542	0.1193	(0.0048)	1.9355	0.0616	0.0450	31.44	(0.0458)	(0.1526)	0.0104	0.0244	(0.0479)	0.0120
	0.2884	0.1244	0.0000	1.9355	0.0643	0.0450	31.23	(0.0116)	(0.0387)	0.0000	0.0250	(0.0457)	0.0120
	0.3212	0.1296	0.0048	1.9355	0.0669	0.045	30.96	0.0212	0.0706	(0.0115)	0.0256	(0.0436)	0.0120
	0.3527	0.1347	0.0097	1.9355	0.0696	0.045	30.65	0.0527	0.1757	(0.0240)	0.0262	(0.0416)	0.0120
	0.3830	0.1399	0.0145	1.9355	0.0723	0.045	30.29	0.0830	0.2768	(0.0378)	0.0268	(0.0397)	0.0120
	0.4123	0.1450	0.0194	1.9355	0.0749	0.045	29.90	0.1123	0.3742	(0.0529)	0.0275	(0.0378)	0.0120
	0.4405	0.1502	0.0242	1.9355	0.0776	0.045	29.47	0.1405	0.4683	(0.0695)	0.0282	(0.0360)	0.0120
0.4677	0.1553	0.0290	1.9355	0.0803	0.045	29.03	0.1677	0.5591	(0.0877)	0.0289	(0.0342)	0.0120	
<b>equilibrium</b>	$\delta_0$	$r^*$	$r_{REAL}^* - r^*$	$\alpha/\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$\Pi_{VA(speed)}$	$\Pi_{Width(speed)}$



## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table A1** Endogenous parameters and synergy structure of  $\Omega^*(i)$  and  $r^*(i)$  by country and area 2008

equilibrium	i	n	$\alpha$	$\Omega^*$	$\beta^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)^+}$	$i_{width(\Omega^*)}$	$\Gamma_{HA(i)}$	$i_{width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
17 pacific on	0.1998	0.01098	0.2595	2.2267	0.7742	(0.0356)	2.5110	0.2990	2.3649	0.2634	0.1034	0.0607	24.29	
the U S	0.0826	0.00972	0.1415	1.9034	0.7604	(0.0345)	2.6979	0.3050	2.3182	0.2705	0.0524	0.0425	51.45	
Canada	0.1168	0.00941	0.0956	1.9623	0.7361	(0.0319)	2.4991	0.2825	2.5027	0.2506	0.0382	0.0349	65.37	
Australia	0.1553	0.01055	0.0924	1.9246	0.7234	(0.0343)	2.3493	0.2837	2.4922	0.2495	0.0393	0.0367	59.74	
New Zealand	0.0795	0.00955	0.1018	2.0910	0.7765	(0.0380)	3.0908	0.3427	2.0633	0.3047	0.0329	0.0354	93.83	
Mexico	0.2335	0.00995	0.1973	1.4306	0.6646	(0.0236)	1.5752	0.1928	3.6681	0.1692	0.1252	0.0544	12.58	
China	0.3657	0.00509	0.4602	2.3978	0.8231	(0.0155)	2.4992	0.1966	3.5967	0.1811	0.1841	0.0534	13.57	
India	0.3762	0.01437	0.4843	1.9679	0.8101	(0.0385)	2.1692	0.2889	2.4473	0.2504	0.2233	0.0927	9.72	
Indonesia	0.2646	0.01193	0.2827	1.2181	0.6523	(0.0243)	1.3301	0.1799	3.9315	0.1555	0.2125	0.0719	6.26	
Japan	0.0149	(0.00086)	0.1220	3.7570	0.7692	0.0033	2.9285	0.0981	7.2068	0.1014	0.0417	0.0117	70.28	
Korea	0.2232	0.00396	0.2304	2.3473	0.7641	(0.0129)	2.4827	0.1788	3.9554	0.1659	0.0928	0.0346	26.76	
Malaysia	0.1912	0.01656	0.3788	2.4713	0.8442	(0.0649)	3.3108	0.4637	1.5249	0.3988	0.1144	0.0862	28.94	
Philippines	0.0831	0.01837	0.1708	1.4579	0.7571	(0.0616)	2.5377	0.3953	1.7887	0.3337	0.0673	0.0644	37.71	
Singapore	0.2838	0.02895	0.4112	3.1437	0.8954	(0.1584)	4.8979	0.8808	0.8028	0.7224	0.0839	0.1153	58.34	
Thailand	0.3274	0.00612	0.4645	3.1010	0.8620	(0.0236)	3.3245	0.2802	2.5240	0.2565	0.1397	0.0574	23.79	
Vietnam	0.4370	0.01357	0.2398	2.3391	0.7748	(0.0452)	2.5811	0.3416	2.0701	0.2964	0.0929	0.0648	27.78	
Sri Lanka	0.2104	0.00914	0.0996	1.2448	0.6051	(0.0206)	1.3670	0.1680	4.2095	0.1473	0.0728	0.0388	18.77	
Brazil	0.2062	0.00973	0.1605	1.5549	0.6771	(0.0251)	1.7438	0.2090	3.3826	0.1840	0.0920	0.0480	18.95	
equilibrium	i	n	$\alpha$	$\Omega^*$	$\beta^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)^+}$	$i_{width(\Omega^*)}$	$\Gamma_{HA(i)}$	$i_{width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
13EMU on a	0.1464	0.00416	0.1276	1.6295	0.6683	(0.0109)	1.7508	0.1381	5.1191	0.1272	0.0729	0.0282	24.03	
Austria	0.1284	0.00361	0.1439	2.0015	0.7180	(0.0109)	2.1717	0.1540	4.5918	0.1431	0.0662	0.0269	32.78	
Belgium	0.1024	0.00570	0.0929	1.1066	0.5786	(0.0122)	1.2383	0.1229	5.7539	0.1107	0.0750	0.0302	16.51	
Finland	0.1082	0.00379	0.1092	1.2347	0.5999	(0.0084)	1.3306	0.1057	6.6877	0.0973	0.0821	0.0263	16.22	
France	0.1107	0.00535	0.0964	1.4526	0.6446	(0.0135)	1.6301	0.1485	4.7625	0.1350	0.0591	0.0283	27.58	
Germany	0.0423	(0.00097)	0.1006	1.4886	0.6103	0.0022	1.4097	0.0562	12.5714	0.0585	0.0714	0.0127	19.76	
Greece	0.1307	0.00270	0.2271	1.3739	0.6508	(0.0060)	1.4366	0.0925	7.6415	0.0866	0.1581	0.0307	9.09	
Ireland	0.2722	0.01835	0.2584	2.8219	0.8339	(0.0804)	3.6557	0.5423	1.3040	0.4618	0.0707	0.0754	51.73	
Italy	0.0838	0.00489	0.1173	1.3805	0.6425	(0.0120)	1.5784	0.1377	5.1352	0.1257	0.0743	0.0299	21.24	
Luxemburg	0.0768	0.01028	0.2986	1.0046	0.6463	(0.0202)	1.2686	0.1600	4.4188	0.1398	0.2354	0.0689	5.39	
Netherlands	0.0966	0.00425	0.1712	1.2219	0.6186	(0.0092)	1.3383	0.1110	6.3722	0.1018	0.1279	0.0343	10.46	
Portugal	0.1117	0.00376	0.2014	1.7977	0.7118	(0.0104)	1.9648	0.1428	4.9521	0.1324	0.1025	0.0326	19.16	
Slovenia	0.3028	(0.05600)	0.3091	0.9633	0.4913	0.0806	0.7070	0.2387	2.9627	0.3192	0.4372	0.1877	1.62	
Spain	0.1434	0.00999	0.1078	1.5513	0.6764	(0.0273)	1.8463	0.2244	3.1516	0.1971	0.0584	0.0399	31.63	
equilibrium	i	n	$\alpha$	$\Omega^*$	$\beta^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)^+}$	$i_{width(\Omega^*)}$	$\Gamma_{HA(i)}$	$i_{width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
16 Europe of	0.1752	0.00176	0.0956	0.7464	0.4567	(0.0029)	0.7588	0.0471	15.0212	0.0442	0.1260	0.0192	6.02	
Bulgaria	0.3459	(0.00654)	0.1007	1.3657	0.5911	0.0145	1.3085	0.1377	5.1357	0.1522	0.0770	0.0334	17.00	
Czech Rep.	0.2479	0.00487	0.2361	2.4235	0.7726	(0.0163)	2.5827	0.2050	3.4490	0.1887	0.0914	0.0386	28.25	
Denmark	0.1638	0.00183	0.2037	1.2053	0.6080	(0.0037)	1.2327	0.0677	10.4418	0.0640	0.1652	0.0248	7.46	
Hungary	0.0742	(0.00340)	0.0970	0.9789	0.4977	0.0061	0.8979	0.0742	9.5279	0.0803	0.1080	0.0257	8.31	
Iceland	0.4585	0.05263	0.1430	1.7393	0.7448	(0.1679)	2.3763	0.6317	1.1194	0.4638	0.0602	0.1005	39.50	
Latvia	0.2952	(0.00441)	0.0963	1.5695	0.6250	0.0107	1.5128	0.1270	5.5675	0.1377	0.0637	0.0261	23.77	
Norway	0.1385	0.01059	0.3278	1.0477	0.6428	(0.0197)	1.1969	0.1537	4.6018	0.1339	0.2739	0.0735	4.37	
Poland	0.1270	(0.00079)	0.0966	0.9044	0.4973	0.0014	0.8943	0.0356	19.8779	0.0370	0.1080	0.0124	8.28	
Romania	0.2489	(0.00420)	0.0280	0.8972	0.4710	0.0077	0.8693	0.0820	8.6191	0.0898	0.0322	0.0158	27.00	
Russia	0.1711	(0.00387)	0.0927	0.6447	0.4059	0.0059	0.6223	0.0608	11.6298	0.0667	0.1490	0.0297	4.18	
Slovak	0.1814	0.00070	0.1175	1.4623	0.6259	(0.0017)	1.4757	0.0495	14.2858	0.0478	0.0796	0.0115	18.53	
Sweden	0.0672	0.00546	0.1491	1.1675	0.6196	(0.0121)	1.3784	0.1294	5.4653	0.1172	0.1081	0.0362	12.75	
Switzerland	0.1163	0.00399	0.2700	2.0696	0.7585	(0.0120)	2.2837	0.1657	4.2667	0.1537	0.1182	0.0377	19.31	
Turkey	0.1245	0.01247	0.1073	0.5911	0.4368	(0.0195)	0.6838	0.1155	6.1210	0.0960	0.1569	0.0553	4.36	
the U K	0.0295	0.00542	0.1734	1.3869	0.7228	(0.0161)	2.1431	0.1856	3.8105	0.1695	0.0809	0.0361	26.48	

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

## Chapter 7

**Table A2**  $\delta_0$ , the speed of convergence, DRC,  
and variables by country and area 2008 (2)

equilibrium	delta <sub>0</sub>	r*	r <sub>REAL</sub> -r* - r <sub>F</sub>	α/iβ*	g <sub>Y</sub> *	g <sub>A</sub> *	1/λ*	δ <sub>0</sub> -α	(δ <sub>0</sub> -α)/α	i <sub>VA</sub> (speed)	i <sub>Width</sub> (speed)	D <sub>VA</sub> (speed)	D <sub>Width</sub> (speed)
17 pacific c	0.3503	0.1166	0.0132	1.6775	0.0695	0.0451	26.70	0.0907	0.3496	(0.0554)	0.0261	(0.0396)	0.0116
the U S	0.4426	0.0743	0.0219	2.2520	0.0330	0.0198	51.60	0.3011	2.1282	(0.0625)	0.0274	(0.0129)	0.0108
Canada	0.3428	0.0487	0.0105	1.1117	0.0438	0.0308	34.77	0.2472	2.5875	(0.0491)	0.0240	(0.0224)	0.0105
Australia	0.3191	0.0480	0.0087	0.8224	0.0584	0.0429	25.76	0.2267	2.4540	(0.0509)	0.0230	(0.0322)	0.0105
New Zealand	0.4077	0.0487	0.0158	1.6500	0.0295	0.0178	52.37	0.3059	3.0041	(0.0648)	0.0275	(0.0117)	0.0106
Mexico	0.4765	0.1379	0.0127	1.2715	0.1085	0.0783	20.42	0.2792	1.4151	(0.0455)	0.0239	(0.0511)	0.0112
China	0.4312	0.1919	0.0078	1.5290	0.1255	0.0647	25.29	(0.0290)	(0.0630)	(0.0273)	0.0315	(0.0682)	0.0136
India	0.5334	0.2461	0.0228	1.5890	0.1549	0.0714	24.55	0.0491	0.1014	(0.0837)	0.0336	(0.0646)	0.0139
Indonesia	0.6865	0.2321	0.0195	1.6377	0.1417	0.0920	26.74	0.4038	1.4285	(0.0785)	0.0303	(0.0402)	0.0118
Japan	(0.0996)	0.0325	(0.0092)	10.6419	0.0031	0.0034	330.56	(0.2216)	(1.8158)	0.0030	0.0199	(0.0043)	0.0107
Korea	0.2739	0.0981	0.0054	1.3511	0.0726	0.0526	24.23	0.0435	0.1890	(0.0178)	0.0242	(0.0497)	0.0114
Malaysia	0.4646	0.1533	0.0389	2.3470	0.0653	0.0298	38.11	0.0857	0.2263	(0.1233)	0.0346	(0.0257)	0.0127
Philippines	0.6684	0.1171	0.0498	2.7128	0.0432	0.0202	45.59	0.4976	2.9139	(0.1891)	0.0352	(0.0081)	0.0110
Singapore	0.4665	0.1308	0.0468	1.6179	0.0808	0.0297	30.41	0.0553	0.1346	(0.3055)	0.0423	(0.0269)	0.0130
Thailand	0.3823	0.1498	0.0101	1.6458	0.0910	0.0452	32.06	(0.0823)	(0.1771)	(0.0385)	0.0342	(0.0521)	0.0137
Vietnam	0.3124	0.1025	0.0096	0.7082	0.1448	0.0984	12.82	0.0726	0.3027	(0.0666)	0.0254	(0.0890)	0.0115
Sri Lanka	0.4866	0.0800	0.0071	0.7821	0.1023	0.0831	19.65	0.3870	3.8869	(0.0406)	0.0222	(0.0474)	0.0105
Brazil	0.4041	0.1032	0.0112	1.1491	0.0898	0.0666	20.90	0.2436	1.5181	(0.0425)	0.0228	(0.0473)	0.0109
equilibrium	delta <sub>0</sub>	r*	r <sub>REAL</sub> -r* - r <sub>F</sub>	α/iβ*	g <sub>Y</sub> *	g <sub>A</sub> *	1/λ*	δ <sub>0</sub> -α	(δ <sub>0</sub> -α)/α	i <sub>VA</sub> (speed)	i <sub>Width</sub> (speed)	D <sub>VA</sub> (speed)	D <sub>Width</sub> (speed)
13EMU or	0.3032	0.0783	0.0054	1.3038	0.0601	0.0486	26.69	0.1756	1.3765	(0.0157)	0.0208	(0.0388)	0.0107
Austria	0.2574	0.0719	0.0056	1.5602	0.0461	0.0362	33.35	0.1136	0.7893	(0.0148)	0.0219	(0.0314)	0.0108
Belgium	0.6805	0.0839	0.0089	1.5673	0.0535	0.0432	52.75	0.5876	6.3279	(0.0384)	0.0273	(0.0152)	0.0105
Finland	0.4795	0.0884	0.0064	1.6826	0.0526	0.0433	38.61	0.3703	3.3916	(0.0162)	0.0219	(0.0253)	0.0106
France	0.3728	0.0663	0.0072	1.3507	0.0491	0.0393	33.89	0.2765	2.8692	(0.0217)	0.0212	(0.0273)	0.0105
Germany	0.1128	0.0676	(0.0038)	3.8935	0.0174	0.0165	72.65	0.0122	0.1212	0.0025	0.0170	(0.0163)	0.0105
Greece	0.4898	0.1653	0.0072	2.6701	0.0619	0.0456	39.41	0.2626	1.1562	(0.0117)	0.0237	(0.0301)	0.0114
Ireland	0.3570	0.0916	0.0209	1.1381	0.0804	0.0452	23.43	0.0986	0.3817	(0.1274)	0.0306	(0.0392)	0.0116
Italy	0.4498	0.0850	0.0107	2.1788	0.0390	0.0300	48.08	0.3325	2.8346	(0.0219)	0.0225	(0.0187)	0.0106
Luxemburg	0.9925	0.2972	0.0619	6.0175	0.0494	0.0272	134.83	0.6939	2.3238	(2.7067)	0.1937	(0.0003)	0.0119
Netherlands	0.5854	0.1401	0.0122	2.8649	0.0489	0.0369	53.18	0.4142	2.4195	(0.0223)	0.0251	(0.0184)	0.0110
Portugal	0.3512	0.1120	0.0095	2.5340	0.0442	0.0322	41.87	0.1498	0.7437	(0.0161)	0.0231	(0.0262)	0.0112
Slovenia	(0.0763)	0.3208	(0.1164)	2.0778	0.1544	0.1540	7.87	(0.3854)	(1.2468)	0.0707	0.0135	(0.2399)	0.0120
Spain	0.4043	0.0695	0.0111	1.1109	0.0625	0.0464	27.35	0.2965	2.7516	(0.0462)	0.0228	(0.0310)	0.0106
equilibrium	delta <sub>0</sub>	r*	r <sub>REAL</sub> -r* - r <sub>F</sub>	α/iβ*	g <sub>Y</sub> *	g <sub>A</sub> *	1/λ*	δ <sub>0</sub> -α	(δ <sub>0</sub> -α)/α	i <sub>VA</sub> (speed)	i <sub>Width</sub> (speed)	D <sub>VA</sub> (speed)	D <sub>Width</sub> (speed)
16 Europe	(0.6832)	0.1281	0.0021	1.1948	0.1072	0.0952	6.18	(0.7788)	(8.1481)	(0.0017)	0.0105	(0.1771)	0.0105
Bulgaria	0.1541	0.0737	(0.0032)	0.4925	0.1497	0.1414	8.79	0.0534	0.5304	0.0170	0.0170	(0.1330)	0.0105
Czech Rep	0.2762	0.0974	0.0060	1.2329	0.0790	0.0564	22.46	0.0401	0.1697	(0.0226)	0.0246	(0.0534)	0.0114
Denmark	0.5744	0.1690	0.0038	2.0447	0.0826	0.0642	34.73	0.3707	1.8205	(0.0088)	0.0245	(0.0343)	0.0112
Hungary	(1.3553)	0.0991	(0.0089)	2.6274	0.0377	0.0372	11.81	(1.4523)	(14.9759)	0.0026	0.0092	(0.0971)	0.0105
Iceland	0.4833	0.0822	0.0220	0.4186	0.1963	0.1170	9.47	0.3403	2.3801	(0.3421)	0.0275	(0.0706)	0.0108
Latvia	0.1175	0.0614	(0.0023)	0.5220	0.1175	0.1107	10.67	0.0213	0.2208	0.0120	0.0174	(0.1081)	0.0105
Norway	0.9207	0.3129	0.0390	3.6832	0.0849	0.0495	90.56	0.5929	1.8088	(0.2514)	0.0594	(0.0058)	0.0122
Poland	(8.2042)	0.1068	(0.0012)	1.5294	0.0698	0.0639	1.70	(8.3008)	(85.9353)	0.0002	0.0046	(0.6505)	0.0105
Romania	0.0640	0.0312	(0.0010)	0.2387	0.1307	0.1316	8.39	0.0361	1.2885	0.0082	0.0142	(0.1268)	0.0101
Russia	(0.1524)	0.1438	(0.0052)	1.3346	0.1077	0.1017	8.80	(0.2451)	(2.6440)	0.0051	0.0121	(0.1291)	0.0105
Slovak	0.2618	0.0803	0.0007	1.0347	0.0777	0.0679	19.72	0.1443	1.2285	(0.0023)	0.0190	(0.0568)	0.0106
Sweden	0.6826	0.1277	0.0195	3.5801	0.0357	0.0256	78.38	0.5335	3.5795	(0.0385)	0.0288	(0.0095)	0.0108
Switzerland	0.3645	0.1305	0.0122	3.0613	0.0426	0.0281	48.16	0.0945	0.3498	(0.0190)	0.0255	(0.0244)	0.0117
Turkey	(1.0682)	0.1815	0.0246	1.9735	0.0920	0.0701	6.41	(1.1755)	(10.9577)	(0.0096)	0.0093	(0.1624)	0.0106
the U K	0.6587	0.1251	0.0441	8.1440	0.0154	0.0082	137.60	0.4852	2.7978	(0.0473)	0.0325	(0.0034)	0.0110

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table E1** Elasticity values of parameters and variables w.r.t.  $\alpha$  and  $\beta^*$  in simulations (1)

i	n	$\alpha$	$\Omega^*$	$b^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)+i_{wid(\Omega)}}$	$\Gamma^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/\Gamma^*_{HA(i)}$
<b>Simu 1-1: changing alpha</b>					<b>To alpha: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.2	0.005	<b>0.05</b>	3.926	0.825								
0.2	0.005	<b>0.1</b>	3.743	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.2	0.005	<b>0.15</b>	3.557	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.2	0.005	<b>0.2</b>	3.369	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.2	0.005	<b>0.25</b>	3.179	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.2	0.005	<b>0.3</b>	2.986	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.2	0.005	<b>0.35</b>	2.791	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.2	0.005	<b>0.4</b>	2.593	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.2	0.005	<b>0.45</b>	2.393	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
<b>Simu 1-2 changing beta*</b>					<b>To beta*: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.2	0.005	0.25	1.070	<b>0.6</b>								
0.2	0.005	0.25	1.316	<b>0.65</b>	1.667	1.596	0.814	(1.000)	(1.023)	(1.202)	0.188	(10.515)
0.2	0.005	0.25	1.639	<b>0.7</b>	2.077	1.477	0.839	(1.000)	(1.018)	(1.171)	0.163	(12.112)
0.2	0.005	0.25	2.083	<b>0.75</b>	2.636	1.375	0.864	(1.000)	(1.014)	(1.141)	0.138	(14.273)
0.2	0.005	0.25	2.730	<b>0.8</b>	3.444	1.286	0.889	(1.000)	(1.011)	(1.113)	0.113	(17.355)
0.2	0.005	0.25	3.761	<b>0.85</b>	4.714	1.207	0.914	(1.000)	(1.008)	(1.085)	0.088	(22.097)
0.2	0.005	0.25	5.660	<b>0.9</b>	7.000	1.136	0.940	(1.000)	(1.005)	(1.058)	0.063	(30.249)
0.2	0.005	0.25	10.326	<b>0.95</b>	12.333	1.071	0.967	(1.000)	(1.003)	(1.031)	0.038	(46.869)
0.2	0.005	0.25	25.781	<b>0.99</b>	32.333	1.017	0.992	(1.000)	(1.001)	(1.008)	0.015	(90.099)
<b>Simu 2-1: changing alpha</b>					<b>To alpha: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.2	<b>0.010</b>	<b>0.05</b>	3.495	0.825								
0.2	<b>0.010</b>	<b>0.1</b>	3.348	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.2	<b>0.010</b>	<b>0.15</b>	3.198	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.2	<b>0.010</b>	<b>0.2</b>	3.045	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.2	<b>0.010</b>	<b>0.25</b>	2.888	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.2	<b>0.010</b>	<b>0.3</b>	2.727	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.2	<b>0.010</b>	<b>0.35</b>	2.563	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.2	<b>0.010</b>	<b>0.4</b>	2.394	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.2	<b>0.010</b>	<b>0.45</b>	2.222	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
<b>Simu 2-2 changing beta*</b>					<b>To beta*: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.2	<b>0.010</b>	0.25	1.019	<b>0.6</b>								
0.2	<b>0.010</b>	0.25	1.247	<b>0.65</b>	1.667	2.660	2.164	(2.164)	2.236	(2.660)	(0.500)	5.260
0.2	<b>0.010</b>	0.25	1.542	<b>0.7</b>	2.077	3.068	2.573	(2.573)	2.642	(3.068)	(0.500)	6.058
0.2	<b>0.010</b>	0.25	1.940	<b>0.75</b>	2.636	3.625	3.132	(3.132)	3.197	(3.625)	(0.500)	7.138
0.2	<b>0.010</b>	0.25	2.505	<b>0.8</b>	3.444	4.429	3.938	(3.938)	4.001	(4.429)	(0.500)	8.680
0.2	<b>0.010</b>	0.25	3.373	<b>0.85</b>	4.714	5.690	5.203	(5.203)	5.263	(5.690)	(0.500)	11.051
0.2	<b>0.010</b>	0.25	4.874	<b>0.9</b>	7.000	7.955	7.479	(7.479)	7.536	(7.955)	(0.500)	15.128
0.2	<b>0.010</b>	0.25	8.097	<b>0.95</b>	12.333	13.214	12.776	(12.776)	12.827	(13.214)	(0.500)	23.439
0.2	<b>0.010</b>	0.25	15.599	<b>0.99</b>	32.333	32.881	32.609	(32.609)	32.640	(32.881)	(0.500)	45.054

**Note:** Elasticity values are only used for simulations. Within the endogenous system, all the parameters and variables are purely measured and with no help of elasticity value setting.

## Chapter 7

**Table E2** Elasticity values of parameters and variables w.r.t.  $\alpha$  and  $\beta^*$  in simulations (2)

$\delta\alpha_0$	$r^*$	$r_{REAL}^* - r_F^*$	$\alpha/\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$\Pi_{VA(speed)}$	$\Pi_{Width(speed)}$
<b>To alpha: Simu 1-1: changing alpha</b>				<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>								
0.347	1.063	1.000	1.000	0.072	0.000	0.057	(0.493)	(1.415)	(0.028)	0.027	0.028	0.041
0.496	1.121	1.000	1.000	0.127	0.000	0.104	(1.071)	(1.986)	(0.045)	0.049	0.045	0.071
0.615	1.185	1.000	1.000	0.190	0.000	0.161	(2.180)	(3.045)	(0.059)	0.076	0.059	0.106
0.717	1.257	1.000	1.000	0.262	0.000	0.229	(5.448)	(6.042)	(0.070)	0.110	0.070	0.145
0.809	1.340	1.000	1.000	0.344	0.000	0.315	70.494	166.488	(0.074)	0.153	0.074	0.190
0.896	1.436	1.000	1.000	0.439	0.000	0.423	4.731	3.838	(0.067)	0.207	0.067	0.241
0.983	1.547	1.000	1.000	0.551	0.000	0.562	1.464	0.467	(0.043)	0.279	0.043	0.300
1.072	1.679	1.000	1.000	0.683	0.000	0.748	(1.171)	(2.163)	0.010	0.375	(0.010)	0.370
<b>To beta*: Simu 1-2 changing beta*</b>				<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>								
(4.989)	(2.581)	(1.000)	(1.000)	(1.588)	(1.667)	(8.578)	(7.789)	(7.789)	(10.031)	(5.235)	10.031	0.000
(3.885)	(2.956)	(1.000)	(1.000)	(1.964)	(2.077)	(1.458)	(7.990)	(7.990)	(1.623)	(0.812)	1.623	0.000
(3.282)	(3.459)	(1.000)	(1.000)	(2.469)	(2.636)	0.611	(9.884)	(9.884)	0.678	0.339	(0.678)	0.000
(2.882)	(4.167)	(1.000)	(1.000)	(3.181)	(3.444)	1.962	(16.303)	(16.303)	2.198	1.100	(2.198)	0.000
(2.524)	(5.240)	(1.000)	(1.000)	(4.260)	(4.714)	3.373	(109.857)	(109.857)	3.861	1.937	(3.861)	0.000
(1.976)	(7.056)	(1.000)	(1.000)	(6.091)	(7.000)	5.404	16.791	16.791	6.452	3.254	(6.452)	0.000
(0.351)	(10.799)	(1.000)	(1.000)	(9.876)	(12.333)	9.307	1.792	1.792	12.251	6.303	(12.251)	0.000
8.316	(20.760)	(1.000)	(1.000)	(19.936)	(32.333)	18.759	#####	#####	33.816	19.697	(33.816)	0.000
<b>To alpha: Simu 2-1: changing alpha</b>				<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>								
0.200	1.057	1.000	1.000	0.064	0.000	0.059	(0.254)	(1.220)	(0.029)	0.026	0.029	0.041
0.314	1.109	1.000	1.000	0.115	0.000	0.108	(0.463)	(1.436)	(0.046)	0.048	0.046	0.071
0.417	1.168	1.000	1.000	0.172	0.000	0.166	(0.703)	(1.679)	(0.061)	0.076	0.061	0.106
0.514	1.235	1.000	1.000	0.238	0.000	0.236	(0.965)	(1.942)	(0.071)	0.110	0.071	0.145
0.607	1.311	1.000	1.000	0.315	0.000	0.323	(1.209)	(2.187)	(0.074)	0.153	0.074	0.190
0.699	1.401	1.000	1.000	0.404	0.000	0.431	(1.335)	(2.317)	(0.065)	0.208	0.065	0.241
0.793	1.507	1.000	1.000	0.510	0.000	0.571	(1.149)	(2.138)	(0.038)	0.281	0.038	0.300
0.890	1.632	1.000	1.000	0.636	0.000	0.756	(0.408)	(1.406)	0.022	0.381	(0.022)	0.370
<b>To beta*: Simu 2-2 changing beta*</b>				<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>								
(4.843)	(2.510)	(1.000)	(1.000)	(1.517)	(1.667)	(12.116)	(7.051)	(7.051)	(18.446)	(11.013)	18.446	0.000
(3.687)	(2.857)	(1.000)	(1.000)	(1.864)	(2.077)	(2.187)	(6.602)	(6.602)	(2.776)	(1.392)	2.776	0.000
(3.012)	(3.314)	(1.000)	(1.000)	(2.323)	(2.636)	0.195	(6.915)	(6.915)	0.243	0.121	(0.243)	0.000
(2.508)	(3.944)	(1.000)	(1.000)	(2.957)	(3.444)	1.581	(7.856)	(7.856)	1.999	1.001	(1.999)	0.000
(1.993)	(4.872)	(1.000)	(1.000)	(3.889)	(4.714)	2.888	(9.287)	(9.287)	3.799	1.906	(3.799)	0.000
(1.206)	(6.369)	(1.000)	(1.000)	(5.397)	(7.000)	4.587	(8.912)	(8.912)	6.528	3.293	(6.528)	0.000
0.685	(9.194)	(1.000)	(1.000)	(8.249)	(12.333)	7.410	5.661	5.661	12.575	6.480	(12.575)	0.000
7.883	(15.356)	(1.000)	(1.000)	(14.450)	(32.333)	12.297	28.429	28.429	34.524	20.280	(34.524)	0.000

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table E3** Elasticity values of parameters and variables w.r.t.  $\alpha$  and  $\beta^*$  in simulations (3)

i	n	$\alpha$	$\Omega^*$	$b^*$	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat. ( $\Omega^*$ )	$i_{VA(\Omega)+i_{Width(\Omega)}}$	$\Gamma^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/\Gamma^*_{HA}$
<b>Simu 3-1: changing alpha</b>					<b>To alpha: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.075	0.005	<b>0.05</b>	3.276	0.825								
0.075	0.005	<b>0.1</b>	3.148	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.075	0.005	<b>0.15</b>	3.016	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.075	0.005	<b>0.2</b>	2.879	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.075	0.005	<b>0.25</b>	2.739	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.075	0.005	<b>0.3</b>	2.595	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.075	0.005	<b>0.35</b>	2.446	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.075	0.005	<b>0.4</b>	2.293	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.075	0.005	<b>0.45</b>	2.135	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
<b>Simu 3-2 changing beta*</b>					<b>To beta*: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.075	0.005	0.25	0.996	<b>0.6</b>								
0.075	0.005	0.25	1.213	<b>0.65</b>	1.667	2.660	2.164	(2.164)	2.213	(2.660)	(0.500)	5.260
0.075	0.005	0.25	1.494	<b>0.7</b>	2.077	3.068	2.573	(2.573)	2.620	(3.068)	(0.500)	6.058
0.075	0.005	0.25	1.867	<b>0.75</b>	2.636	3.625	3.132	(3.132)	3.176	(3.625)	(0.500)	7.138
0.075	0.005	0.25	2.390	<b>0.8</b>	3.444	4.429	3.938	(3.938)	3.981	(4.429)	(0.500)	8.680
0.075	0.005	0.25	3.176	<b>0.85</b>	4.714	5.690	5.203	(5.203)	5.244	(5.690)	(0.500)	11.051
0.075	0.005	0.25	4.485	<b>0.9</b>	7.000	7.955	7.479	(7.479)	7.518	(7.955)	(0.500)	15.128
0.075	0.005	0.25	7.107	<b>0.95</b>	12.333	13.214	12.776	(12.776)	12.811	(13.214)	(0.500)	23.439
0.075	0.005	0.25	12.365	<b>0.99</b>	32.333	32.881	32.609	(32.609)	32.630	(32.881)	(0.500)	45.054
<b>Simu 4-1: changing alpha</b>					<b>To alpha: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.4	0.005	<b>0.05</b>	4.174	0.825								
0.4	0.005	<b>0.1</b>	3.968	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.4	0.005	<b>0.15</b>	3.760	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.4	0.005	<b>0.2</b>	3.551	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.4	0.005	<b>0.25</b>	3.340	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.4	0.005	<b>0.3</b>	3.128	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.4	0.005	<b>0.35</b>	2.914	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.4	0.005	<b>0.4</b>	2.699	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.4	0.005	<b>0.45</b>	2.483	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
<b>Simu 4-2 changing beta*</b>					<b>To beta*: Elasticity at the discrete time=(2-1)/((1+2)/2)</b>							
0.4	0.005	0.25	1.094	<b>0.6</b>								
0.4	0.005	0.25	1.350	<b>0.65</b>	1.667	2.660	2.164	(2.164)	2.213	(2.660)	(0.500)	5.260
0.4	0.005	0.25	1.689	<b>0.7</b>	2.077	3.068	2.573	(2.573)	2.620	(3.068)	(0.500)	6.058
0.4	0.005	0.25	2.158	<b>0.75</b>	2.636	3.625	3.132	(3.132)	3.176	(3.625)	(0.500)	7.138
0.4	0.005	0.25	2.852	<b>0.8</b>	3.444	4.429	3.938	(3.938)	3.981	(4.429)	(0.500)	8.680
0.4	0.005	0.25	3.981	<b>0.85</b>	4.714	5.690	5.203	(5.203)	5.244	(5.690)	(0.500)	11.051
0.4	0.005	0.25	6.143	<b>0.9</b>	7.000	7.955	7.479	(7.479)	7.518	(7.955)	(0.500)	15.128
0.4	0.005	0.25	11.950	<b>0.95</b>	12.333	13.214	12.776	(12.776)	12.811	(13.214)	(0.500)	23.439
0.4	0.005	0.25	38.224	<b>0.99</b>	32.333	32.881	32.609	(32.609)	32.630	(32.881)	(0.500)	45.054

## Chapter 7

**Table E4** Elasticity values of parameters and variables w.r.t.  $\alpha$  and  $\beta^*$  in simulations (4)

$\delta\alpha_0$	$r^*$	$r_{REAL}^* - r_F^*$	$\alpha/\beta^*$	$g_Y^*$	$g_A^*$	$1/\lambda^*$	$\delta_0 - \alpha$	$(\delta_0 - \alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$\Pi_{VA(speed)}$	$\Pi_{Width(speed)}$
<b>To alpha:</b>	<b>Simu 3-1: changing alpha</b>					<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>						
0.156	1.053	1.000	1.000	0.060	0.000	0.061	(0.210)	(1.183)	(0.030)	0.026	0.030	0.041
0.252	1.103	1.000	1.000	0.107	0.000	0.110	(0.374)	(1.353)	(0.048)	0.048	0.048	0.071
0.344	1.158	1.000	1.000	0.162	0.000	0.169	(0.553)	(1.535)	(0.063)	0.075	0.063	0.106
0.433	1.221	1.000	1.000	0.224	0.000	0.240	(0.736)	(1.720)	(0.073)	0.109	0.073	0.145
0.522	1.294	1.000	1.000	0.298	0.000	0.327	(0.897)	(1.883)	(0.076)	0.152	0.076	0.190
0.612	1.380	1.000	1.000	0.383	0.000	0.435	(0.982)	(1.970)	(0.066)	0.208	0.066	0.241
0.705	1.482	1.000	1.000	0.485	0.000	0.574	(0.899)	(1.891)	(0.037)	0.282	0.037	0.300
0.803	1.604	1.000	1.000	0.607	0.000	0.757	(0.530)	(1.527)	0.026	0.383	(0.026)	0.370
<b>To beta*:</b>	<b>Simu 3-2 changing beta*</b>					<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>						
(4.761)	(2.466)	(1.000)	(1.000)	(1.471)	(1.667)	(13.872)	(6.748)	(6.748)	(27.083)	#NUM!	27.083	0.000
(3.580)	(2.794)	(1.000)	(1.000)	(1.801)	(2.077)	(2.510)	(6.087)	(6.087)	(3.508)	(1.761)	3.508	0.000
(2.873)	(3.224)	(1.000)	(1.000)	(2.232)	(2.636)	(0.004)	(6.008)	(6.008)	(0.005)	(0.003)	0.005	0.000
(2.326)	(3.810)	(1.000)	(1.000)	(2.821)	(3.444)	1.380	(6.164)	(6.164)	1.895	0.948	(1.895)	0.000
(1.755)	(4.655)	(1.000)	(1.000)	(3.671)	(4.714)	2.615	(6.031)	(6.031)	3.774	1.893	(3.774)	0.000
(0.908)	(5.983)	(1.000)	(1.000)	(5.007)	(7.000)	4.126	(3.916)	(3.916)	6.579	3.319	(6.579)	0.000
0.965	(8.369)	(1.000)	(1.000)	(7.415)	(12.333)	6.423	4.163	4.163	12.746	6.574	(12.746)	0.000
7.321	(13.095)	(1.000)	(1.000)	(12.163)	(32.333)	9.726	20.091	20.091	34.809	20.520	(34.809)	0.000
<b>To alpha:</b>	<b>Simu 4-1: changing alpha</b>					<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>						
0.518	1.067	1.000	1.000	0.076	0.000	0.056	(1.310)	(2.016)	(0.027)	0.027	0.027	0.041
0.675	1.128	1.000	1.000	0.134	0.000	0.102	(10.913)	(8.293)	(0.043)	0.050	0.043	0.071
0.787	1.195	1.000	1.000	0.200	0.000	0.158	4.283	3.598	(0.057)	0.077	0.057	0.106
0.877	1.271	1.000	1.000	0.275	0.000	0.227	2.111	1.141	(0.068)	0.111	0.068	0.145
0.956	1.357	1.000	1.000	0.361	0.000	0.312	1.337	0.341	(0.072)	0.154	0.072	0.190
1.032	1.456	1.000	1.000	0.459	0.000	0.420	0.759	(0.242)	(0.066)	0.208	0.066	0.241
1.107	1.571	1.000	1.000	0.575	0.000	0.560	0.107	(0.893)	(0.043)	0.279	0.043	0.300
1.186	1.706	1.000	1.000	0.710	0.000	0.747	(0.865)	(1.859)	0.008	0.374	(0.008)	0.370
<b>To beta*:</b>	<b>Simu 4-2 changing beta*</b>					<b>Elasticity at the discrete time=(2-1)/((1+2)/2)</b>						
(5.089)	(2.619)	(1.000)	(1.000)	(1.626)	(1.667)	(7.323)	(8.294)	(8.294)	(7.855)	(4.030)	7.855	0.000
(4.026)	(3.011)	(1.000)	(1.000)	(2.019)	(2.077)	(1.146)	(9.098)	(9.098)	(1.207)	(0.604)	1.207	0.000
(3.482)	(3.539)	(1.000)	(1.000)	(2.550)	(2.636)	0.800	(13.086)	(13.086)	0.842	0.421	(0.842)	0.000
(3.178)	(4.293)	(1.000)	(1.000)	(3.307)	(3.444)	2.144	(39.503)	(39.503)	2.267	1.135	(2.267)	0.000
(2.986)	(5.453)	(1.000)	(1.000)	(4.476)	(4.714)	3.617	25.457	25.457	3.868	1.941	(3.868)	0.000
(2.757)	(7.474)	(1.000)	(1.000)	(6.514)	(7.000)	5.841	8.476	8.476	6.382	3.218	(6.382)	0.000
(1.820)	(11.874)	(1.000)	(1.000)	(10.969)	(12.333)	10.442	3.574	3.574	12.011	6.173	(12.011)	0.000
6.599	(25.398)	(1.000)	(1.000)	(24.664)	(32.333)	24.105	(17.769)	(17.769)	33.134	19.150	(33.134)	0.000

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

**Table F1** Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Pacific and non-European area, using KEWT 4.10 data-sets (1)

Frequency	close-to-disequilibrium (0 to 5 years of speed)				disequilibrium (minus or more than 1000 years)				Numbers (times)
	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	
Pacific countries									
1. the US	0	0	0	0	0	0	0	0	19
2. Canada	1	0	0	1	0	0	0	0	19
3. Australia	0	0	0	0	0	0	0	0	19
4. New Zealand	0	0	0	0	0	0	0	0	19
5. Mexico	0	0	0	0	2	0	0	2	19
6. China	13	4	5	4	0	0	0	0	19
7. India	5	2	3	0	0	0	0	0	19
8. Indonesia	4	2	0	2	0	0	0	0	19
9. Japan	0	0	0	0	1	0	0	1	19
10. Korea	1	0	1	0	0	0	0	0	19
11. Malaysia	1	0	0	1	0	0	0	0	19
12. Philippines	9	3	0	6	0	0	0	0	19
13. Singapore	3	0	3	0	0	0	0	0	19
14. Thailand	3	1	0	2	0	0	0	0	19
15. Vietnam	5	3	0	2	0	0	0	0	18
16. Sri Lanka	12	4	6	2	1	0	1	0	18
17. Brazil	13	4	5	4	3	0	3	0	19
total	70	23	23	24	7	0	4	3	321
Frequency (rate)	0.2181	0.0717	0.0717	0.0748	0.0218	0.0000	0.0125	0.0093	1.0000
total (excl.Brazil)	57	19	18	20	4	0	1	3	302
Freq.excl.Brazil	0.1887	0.0629	0.0596	0.0662	0.0132	0.0000	0.0033	0.0099	1.0000
Frequency	close-to-disequilibrium (0 to 5 years of speed)				disequilibrium (minus or more than 1000 years)				Numbers (times)
Other countries	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	
<i>Latin America, 5</i>									
16. Argentina	4	2	0	2	0	0	0	0	19
17. Brazil	13	4	5	4	3	0	3	0	19
18. Chile	8	3	2	3	0	0	0	0	19
19. Colombia	5	3	1	1	3	0	3	0	18
20. Peru	11	3	5	3	0	0	0	0	19
<i>Middle East, 5</i>									
21. Iran	11	4	4	3	2	2	0	0	18
22. Kazakhstan	1	0	0	1	0	0	0	0	13
23. Kuwait	1	0	0	1	8	0	6	2	18
24. Pakistan	8	1	4	3	2	1	1	0	19
25. Saudi Arabia	2	0	2	0	0	0	0	0	19
<i>Africa, 5</i>									
26. Egypt	5	1	2	2	1	1	0	0	18
27. Kenya	10	3	2	5	0	0	0	0	17
28. Nigeria	11	3	7	1	0	0	0	0	14
29. South Africa	8	2	2	4	0	0	0	0	19
30. Tanzania	7	3	1	3	0	0	0	0	16
total	105	32	37	36	19	4	13	2	265
Frequency (rate)	0.3962	0.1208	0.1396	0.1358	0.0717	0.0151	0.0491	0.0075	1.0000



## Chapter 7

**Table F2** Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Euro and others in Europe, using KEWT 4.10 data-sets (2)

Frequency	close-to-disequilibrium (0 to 5 years of speed)				disequilibrium (minus or more than 1000 years)				Numbers
countries	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
<i>12 Euro sub-area</i>	62	17	24	21	11	1	6	4	223
E1. Austria	3	0	3	0	0	0	0	0	19
E2. Belgium	5	2	2	1	1	0	0	1	19
E3. Finland	8	5	0	3	0	0	0	0	19
E4. France	0	0	0	0	0	0	0	0	19
E5. Germany	0	0	0	0	1	0	1	0	19
E6. Greece 299	17	2	7	8	1	0	1	0	19
E7. Ireland	9	2	5	2	0	0	0	0	19
E8. Italy	2	1	0	1	0	0	0	0	19
E9. Luxemburg	2	1	1	0	5	1	2	2	14
E10. Netherlands	6	3	2	1	0	0	0	0	19
E11. Portugal	5	0	2	3	0	0	0	0	19
E12. Spain	5	1	2	2	3	0	2	1	19
Frequency (rate)	0.2780	0.0762	0.1076	0.0942	0.0493	0.0045	0.0269	0.0179	1.0000
Frequency	close-to-disequilibrium (0 to 5 years of speed)				disequilibrium (minus or more than 1000 years)				Numbers
Non Euro sub-area	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
<i>5 Developed sub-area</i>	12	3	5	4	2	1	0	1	95
1. Denmark	4	1	2	1	0	0	0	0	19
2. Sweden	2	0	0	2	0	0	0	0	19
3. the U K	1	0	0	1	1	0	0	1	19
4. Norway	2	0	2	0	1	1	0	0	19
5. Switzerland	3	2	1	0	0	0	0	0	19
Frequency (rate)	0.1263	0.0316	0.0526	0.0421	0.0211	0.0105	0.0000	0.0105	1.0000
<i>11 Developing sub-area</i>	60	12	29	19	13	3	5	5	174
1. Bulgaria	4	1	1	2	4	1	2	1	14
2. Czech Republic	8	4	1	3	0	0	0	0	14
3. Hungary	8	1	5	2	0	0	0	0	19
4. Iceland	3	0	3	0	2	0	0	2	19
5. Latvia	2	0	1	1	2	1	1	0	14
6. Poland	3	1	0	2	0	0	0	0	19
7. Romania	5	0	2	3	2	0	2	0	14
8. Russia	0	0	0	0	0	0	0	0	14
9. Slovak	4	1	1	2	3	1	0	2	14
10E. Slovenia	8	2	4	2	0	0	0	0	14
11. Turkey	15	2	11	2	0	0	0	0	19
Frequency (rate)	0.3448	0.0690	0.1667	0.1092	0.0747	0.0172	0.0287	0.0287	1.0000
<i>16 Non Euro sub-area</i>	72	15	34	23	15	4	5	6	269
Frequency (rate)	0.2677	0.0558	0.1264	0.0855	0.0558	0.0149	0.0186	0.0223	1.0000



## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

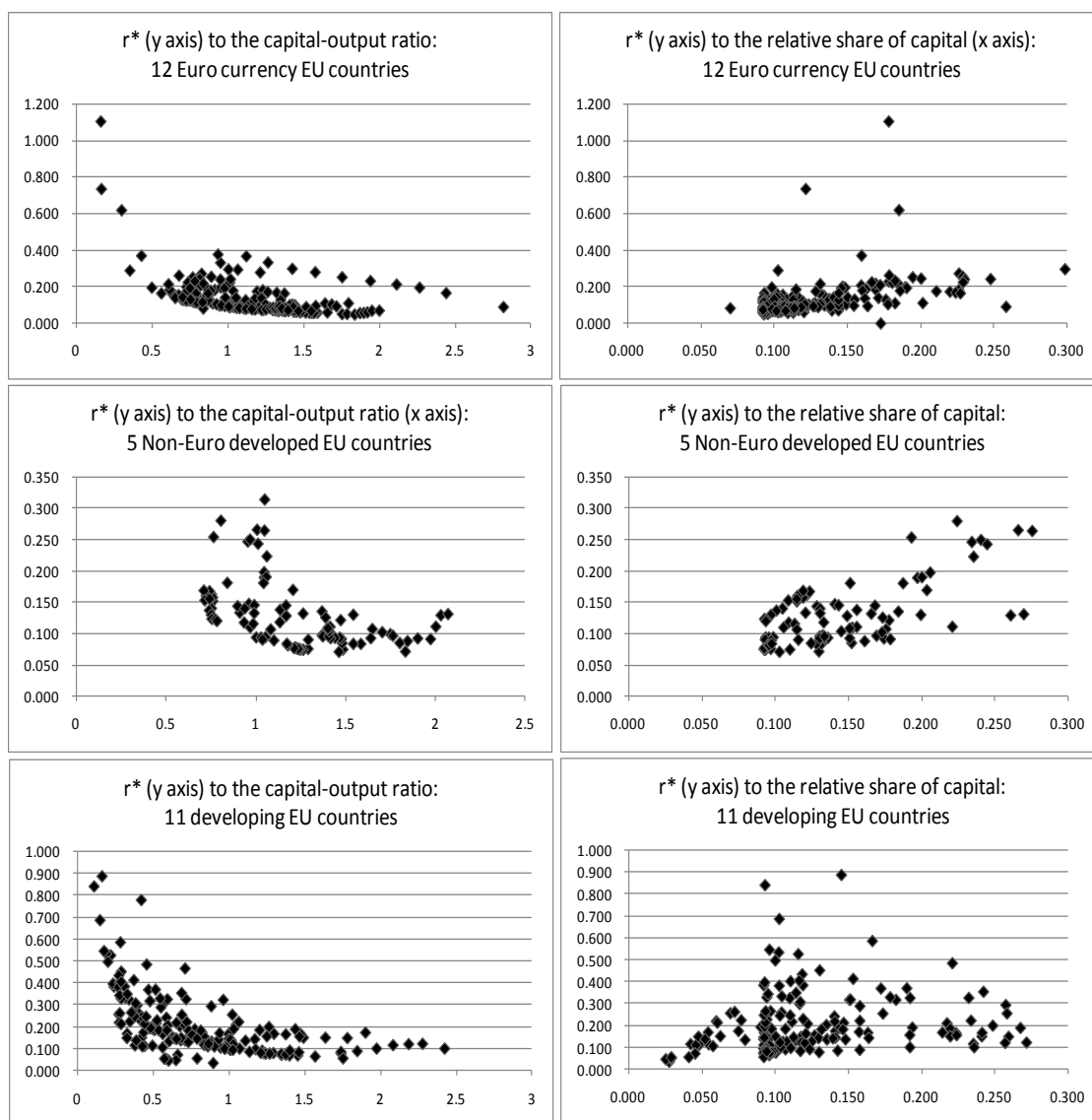
**Table F3** Endogenous real rate of return and endogenous inflation/deflation rate for  
the NAIRU by country 2008

	For the inflation rate		For the real rate of return		For endogenous unemployment		
<b>equilibrium</b>	$r^*$	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	$n_E$	$n$	$n_E-n$
17 pacific on ave	0.1166	0.1034	1.1277	0.0132	0.01095	0.01095	0.00000
the U S	0.0743	0.0524	1.4174	0.0219	0.00972	0.0097	0.00000
Canada	0.0487	0.0382	1.2736	0.0105	0.00941	0.0094	0.00000
Australia	0.0480	0.0393	1.2207	0.0087	0.01055	0.0106	0.00000
New Zealand	0.0487	0.0329	1.4782	0.0158	0.00955	0.0095	0.00000
Mexico	0.1379	0.1252	1.1011	0.0127	0.00995	0.0100	0.00000
China	0.1919	0.1841	1.0423	0.0078	0.00509	0.0051	0.00000
India	0.2461	0.2233	1.1023	0.0228	0.01437	0.0144	0.00000
Indonesia	0.2321	0.2125	1.0919	0.0195	0.01193	0.0119	0.00000
Japan	0.0325	0.0417	0.7795	(0.0092)	(0.00086)	(0.0009)	0.00000
Korea	0.0981	0.0928	1.0577	0.0054	0.00396	0.0040	0.00000
Malaysia	0.1533	0.1144	1.3397	0.0389	0.01656	0.0166	0.00000
Philippines	0.1171	0.0673	1.7407	0.0498	0.01837	0.0184	0.00000
Singapore	0.1308	0.0839	1.5580	0.0468	0.02895	0.0290	0.00000
Thailand	0.1498	0.1397	1.0721	0.0101	0.00612	0.0061	0.00000
Vietnam	0.1025	0.0929	1.1034	0.0096	0.01357	0.0136	0.00000
Sri Lanka	0.0800	0.0728	1.0981	0.0071	0.00914	0.0091	0.00000
Brazil	0.1032	0.0920	1.1215	0.0112	0.00973	0.0097	0.00000
	For the inflation rate		For the real rate of return		For endogenous unemployment		
<b>equilibrium</b>	$r^*$	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	$n_E$	$n$	$n_E-n$
13EMU on ave.	0.0783	0.0729	1.0744	0.0054	0.00121	0.00560	(0.00440)
Austria	0.0719	0.0662	1.0850	0.0056	0.00361	0.0036	0.00000
Belgium	0.0839	0.0750	1.1191	0.0089	0.00570	0.0057	0.00000
Finland	0.0884	0.0821	1.0777	0.0064	0.00379	0.0038	0.00000
France	0.0663	0.0591	1.1222	0.0072	0.00535	0.0053	0.00000
Germany	0.0676	0.0714	0.9470	(0.0038)	(0.00097)	(0.0010)	0.00000
Greece	0.1653	0.1581	1.0456	0.0072	0.00270	0.0027	0.00000
Ireland	0.0916	0.0707	1.2955	0.0209	0.01835	0.0183	0.00000
Italy	0.0850	0.0743	1.1434	0.0107	0.00489	0.0049	0.00000
Luxemburg	0.2972	0.2354	1.2629	0.0619	0.01028	0.0103	0.00000
Netherlands	0.1401	0.1279	1.0952	0.0122	0.00425	0.0043	0.00000
Portugal	0.1120	0.1025	1.0929	0.0095	0.00376	0.0038	0.00000
Slovenia	0.3208	0.4372	0.7339	(0.1164)	(0.05600)	0.0011	(0.05714)
Spain	0.0695	0.0584	1.1901	0.0111	0.00999	0.0100	0.00000
	For the inflation rate		For the real rate of return		For endogenous unemployment		
<b>equilibrium</b>	$r^*$	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	$n_E$	$n$	$n_E-n$
16 Europe on ave	0.1281	0.1260	1.0167	0.0021	0.00467	0.00476	(0.00009)
Bulgaria	0.0737	0.0770	0.9581	(0.0032)	(0.00654)	(0.0065)	0.00000
Czech Rep.	0.0974	0.0914	1.0657	0.0060	0.00487	0.0049	0.00000
Denmark	0.1690	0.1652	1.0227	0.0038	0.00183	0.0018	0.00000
Hungary	0.0991	0.1080	0.9173	(0.0089)	(0.00340)	(0.0020)	(0.00141)
Iceland	0.0822	0.0602	1.3662	0.0220	0.05263	0.0526	0.00000
Latvia	0.0614	0.0637	0.9639	(0.0023)	(0.00441)	(0.0044)	0.00000
Norway	0.3129	0.2739	1.1425	0.0390	0.01059	0.0106	0.00000
Poland	0.1068	0.1080	0.9889	(0.0012)	(0.00079)	(0.0008)	0.00000
Romania	0.0312	0.0322	0.9689	(0.0010)	(0.00420)	(0.0042)	0.00000
Russia	0.1438	0.1490	0.9653	(0.0052)	(0.00387)	(0.0039)	0.00000
Slovak	0.0803	0.0796	1.0092	0.0007	0.00070	0.0007	0.00000
Sweden	0.1277	0.1081	1.1807	0.0195	0.00546	0.0055	0.00000
Switzerland	0.1305	0.1182	1.1034	0.0122	0.00399	0.0040	0.00000
Turkey	0.1815	0.1569	1.1568	0.0246	0.01247	0.0125	0.00000
the U K	0.1251	0.0809	1.5453	0.0441	0.00542	0.0054	0.00000

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data  
for the real assets come from *International Financial Statistics Yearbook*, IMF.

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**Note to Table F3:** Shadowed cells show unstable results, partly due to a minus rate of change in population in equilibrium. Seventeen Pacific area countries 2008 do not show this instability except for Japan. A minus value of  $n_E - n$  shows unemployment even in equilibrium.



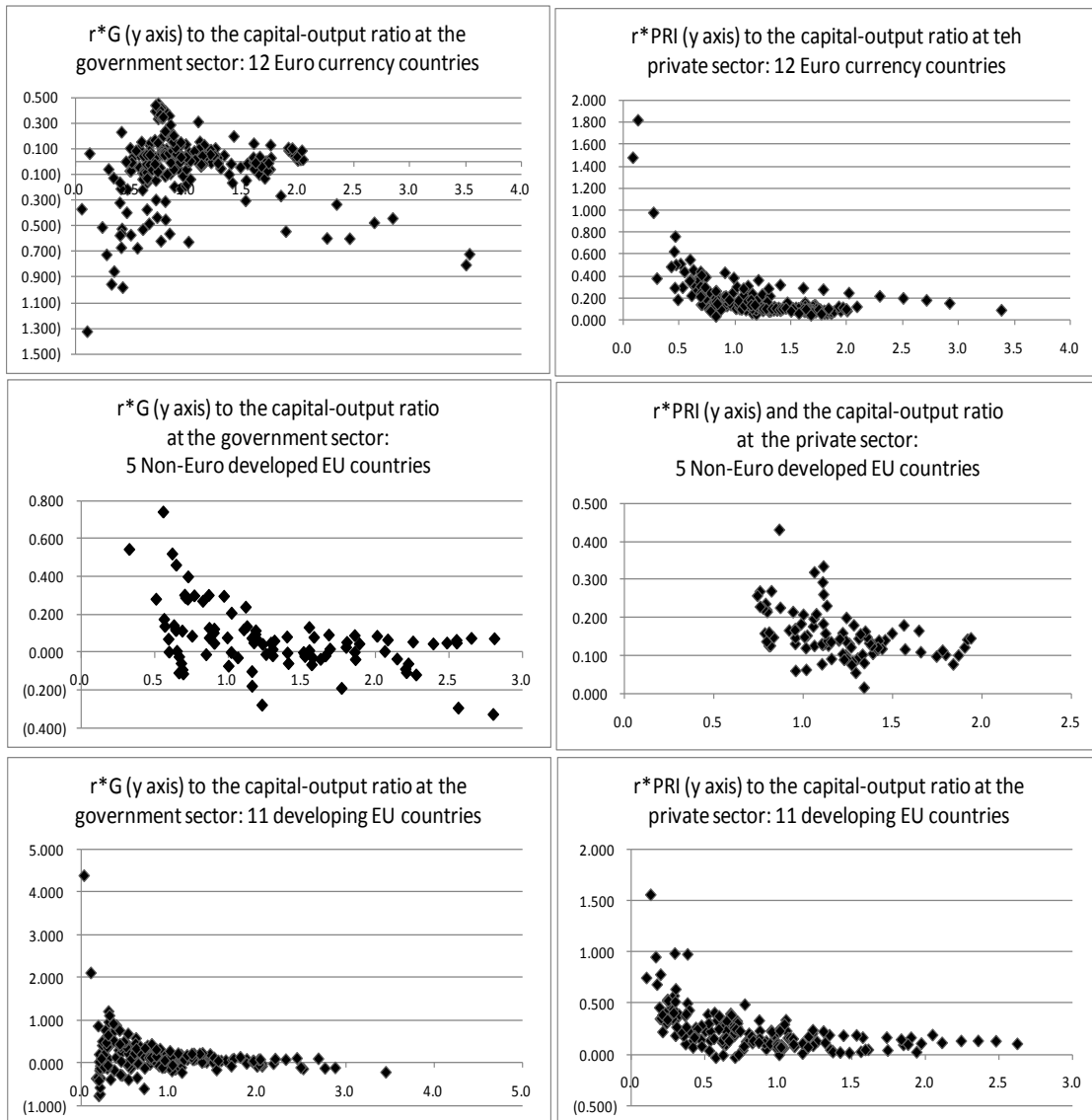
**Data source:** 13 Euro currency Sub-Area, 15 Non-Euro Sub-Area, and 31 other country Area outside Europe, using KEWT 4.10 by sector, 1990-2008, whose ten original data come from *International Financial Statistics Yearbook*, IMF (hereafter, the same).

**Note:** Policy-oriented core parameters are united by  $\alpha = r^* \cdot \Omega^*$ , and by sector.

**Figure P1** Relative share of capital as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

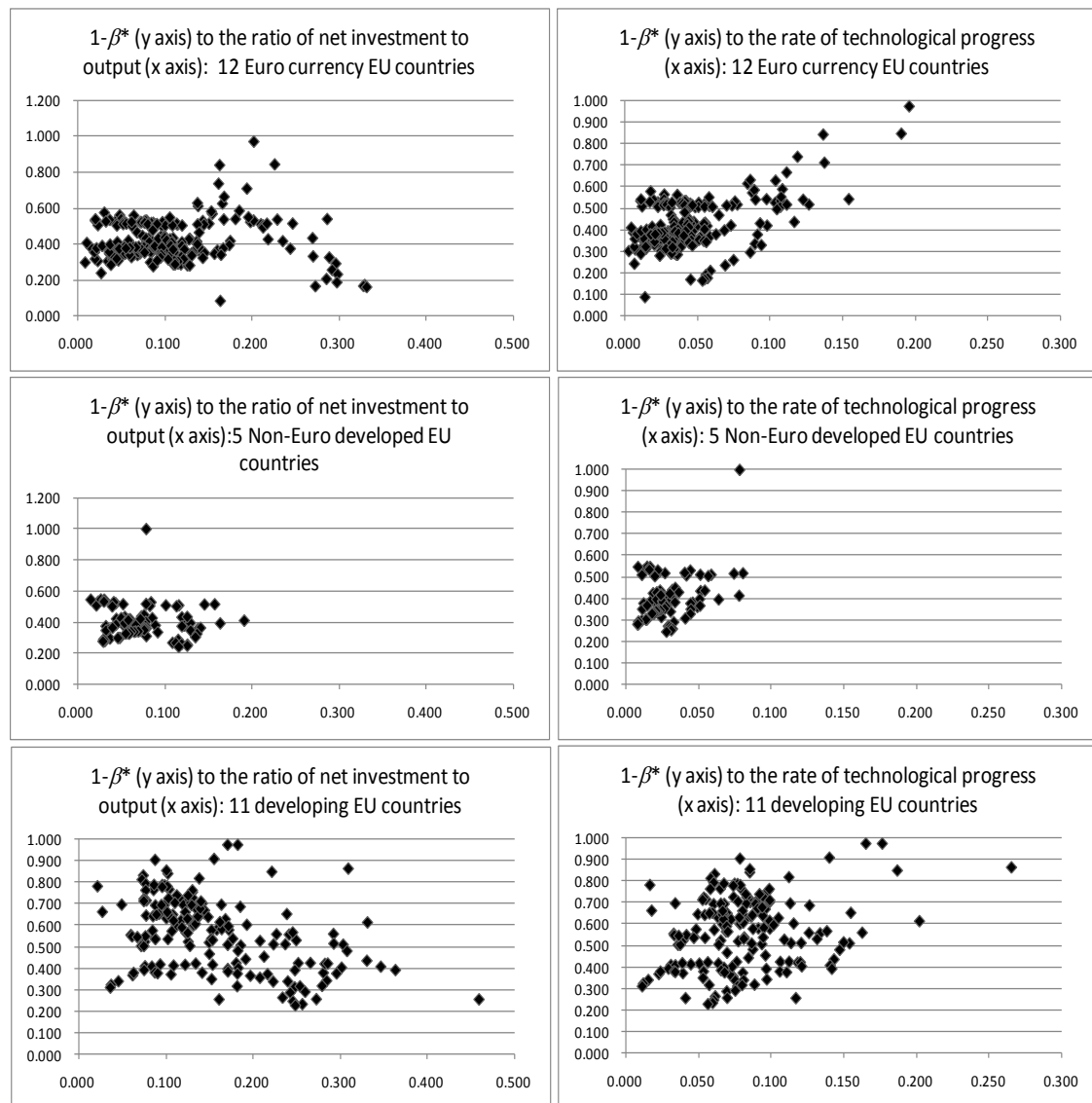
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**Note:** The purpose of these figures is to compare developing with developed countries in Europe. Five developed countries that do not use Euro currency are: Denmark, Norway, Sweden, Switzerland, the UK. Eleven developing countries in Europe are Bulgaria, Czech Rep., Hungary, Iceland, Latvia, Poland, Romania, Russia, Slovak, Slovenia, and Turkey, where a few countries still fall into disequilibrium a few times in 1990-2008. When 'deficit' is available by year, the author is able to increase the number of countries in Europe.

**Figure P2** Relative share of capital, by sector, as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe

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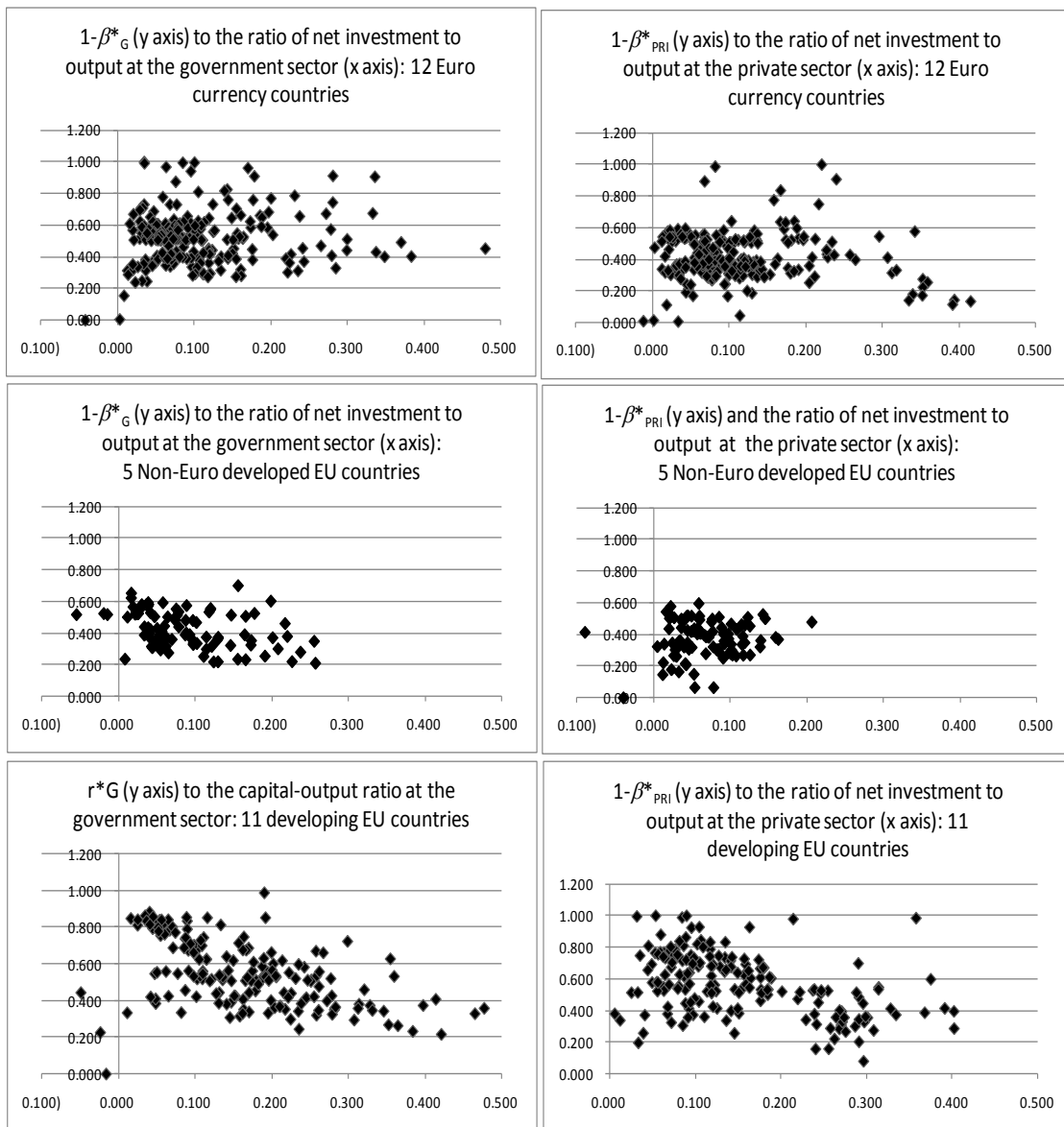


**Note:** Extreme values happen when an economy gets into disequilibrium once ten years or so.

**Figure P3** Endogenous rate of technological progress as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

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**Note:** The government sector is closely related to the private sector, although there are differences between two sectors.

**Figure P4** Endogenous rate of technological progress, by sector, as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe

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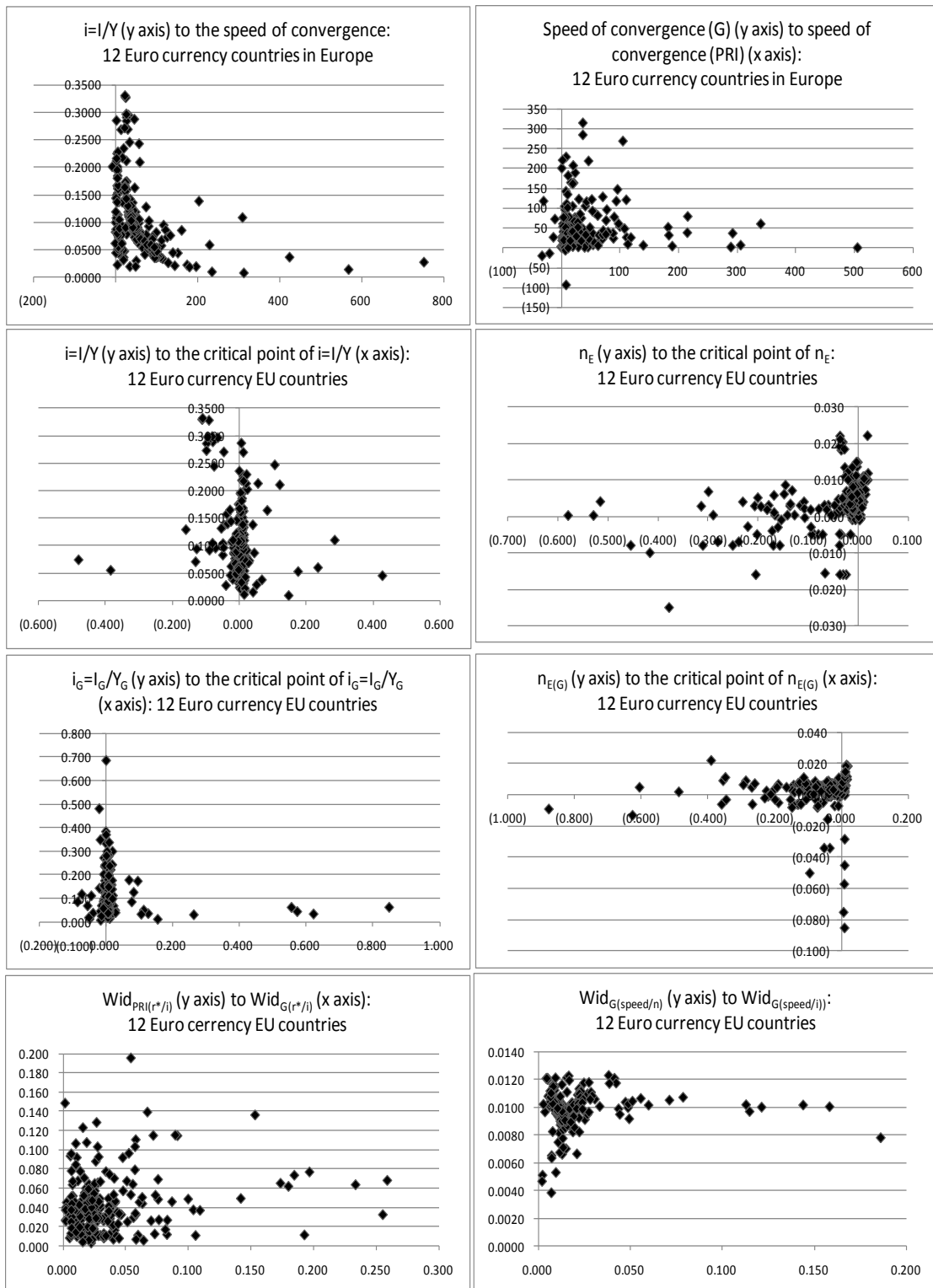
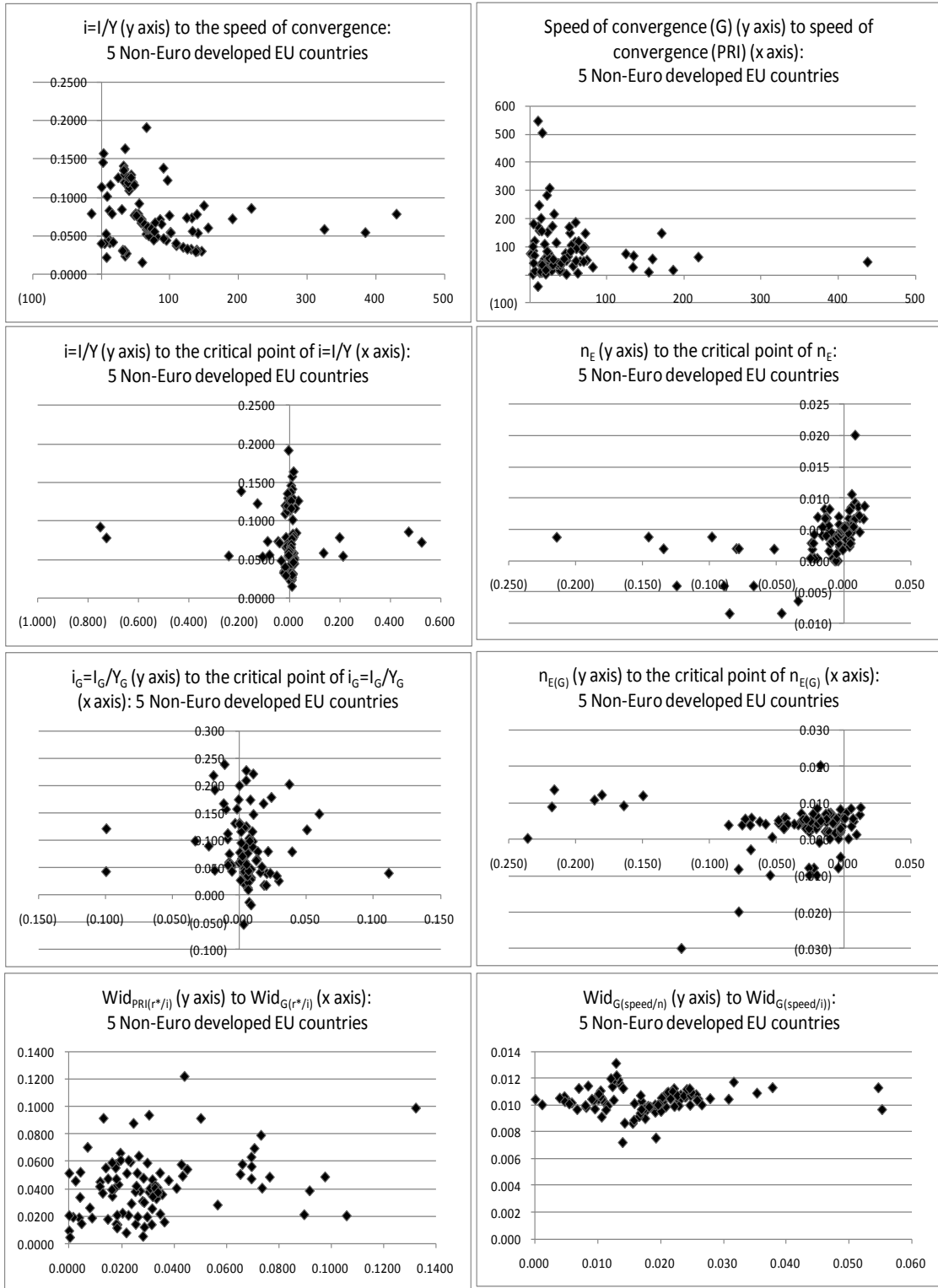


Figure P5 Mechanics in equilibrium: the 12 Euro currency countries

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

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**Figure P6** Mechanics in equilibrium: the 5 Non-Euro currency developed countries

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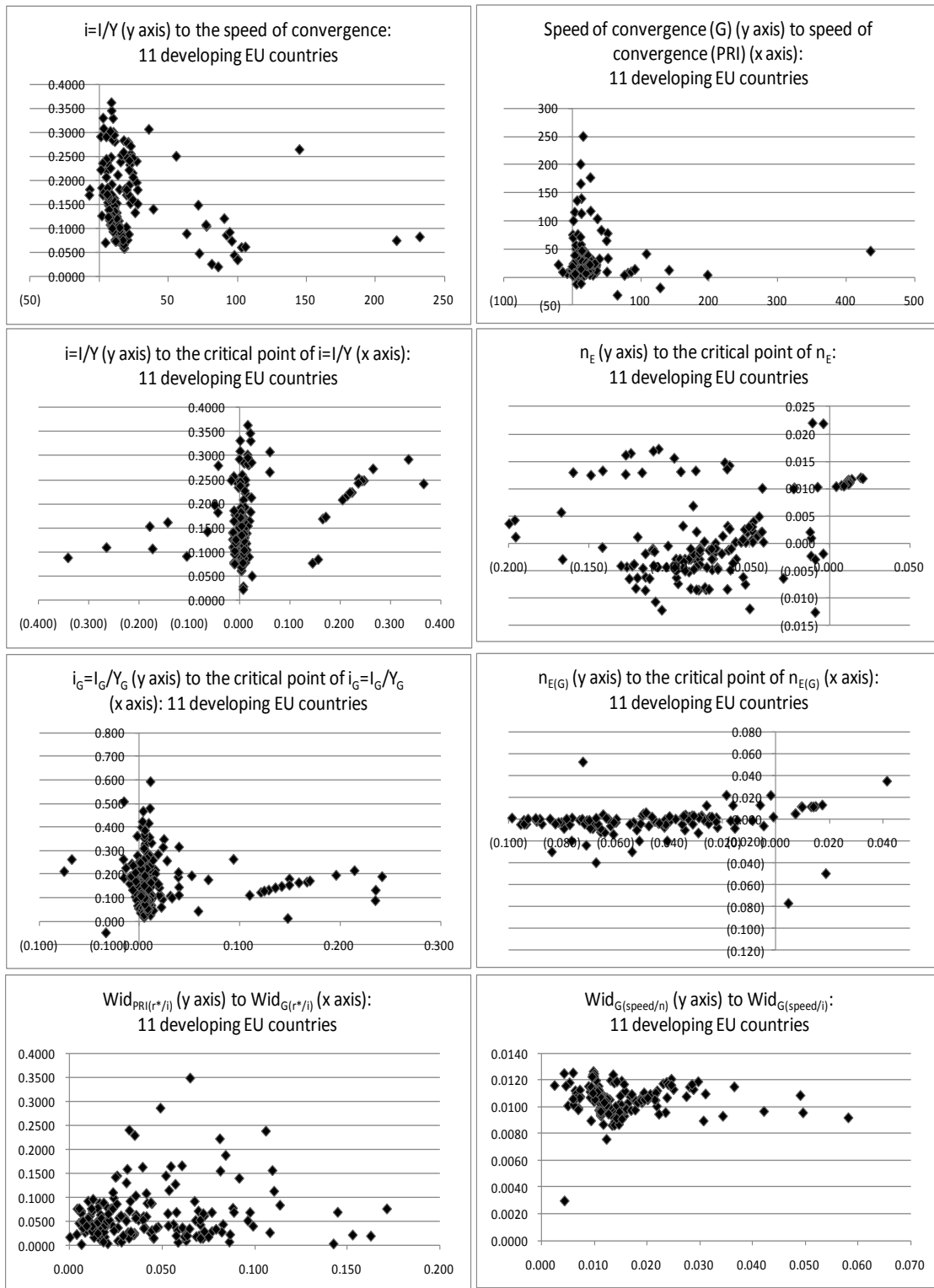


Figure P7 Mechanics in equilibrium: the 11 developing countries in Europe



## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

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