Financial Fragility and Banking Sector in a Macroeconomic Model with Minskyan Insights

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1. The motivation of the paper

- Over the last two decades there has been a growing literature that has relied on Minsky's framework in order to formalize the way that the **financial fragility of the economy** can be defined and emerge in the context of simple macroeconomic models.
- In this literature the financial fragility of the economy has been defined based mainly on **firms' financial posture**.
- Furthermore, the financial fragility has been portrayed to come out through the **increasing desired investment** of firms which leads to **over-indebtedness** and thereby to potential problems of illiquidity.

1. The motivation of the paper

- Lavoie (1986-87) has put forward a model that examines the interaction between growth and firms' fragility, the latter defined according to the **leverage ratio** of firms.
- Keen (1995) has constructed a model similar to Goodwin's frame whereby the financial fragility of firms is based on their **debt to capital ratio**.
- Bellofiore *et al.* (2009) have developed a framework that associates the financial exposition of firms with the leverage ratio and the **maturity of financial liabilities**.
- Foley (2003), Lima and Meirelles (2006, 2007) and Charles (2008) have put forward macroeconomic models in which the Minskyan categorization of firms into **hedge, speculative and ponzi** has been explicitly considered.

1. The motivation of the paper

- However, this literature does not incorporate the role of the banking sector in the analysis of the macroeconomy. In particular:

i. The definition of the economy's financial fragility does not take into account the **fragility of the banking sector** (a recent exception is Dos Santos and Macedo e Silva, 2009).

ii. The **active role of banks** in the provision of loans is neglected (see Dos Santos, 2005). As Dymski (2010) has pointed out, banks have a significant role to play in the behavior of the macroeconomy.

- In this paper we develop a macroeconomic model that defines the **financial fragility of the economy** based on the fragility of both firms and banks.

- The constructed model is used in order to examine how the interaction between the **banking sector** and the **real economy** can lead to **financial fragility**.

2. The structure of the presentation

- The structure of the model
- The definition of economy's financial fragility
- The dynamic behavior of the model
- The effects of a rise in responsiveness of credit rationing to banks' fragility
- Conclusion

3. The structure of the model

- **Households' consumption**: $C = c_1 W + c_2 i_{DB} DB$

  where c_1 is the propensity to consume out of wage income and c_2 is the propensity to consume out of interest income on deposits.

  - $W = \Omega \cdot Y$ is the wage income, Ω is the wage share and Y is the level of output.
  - $i_{DB} = d \cdot i$ is the interest on deposits, d is the mark-down on central banks' interest rate, i ,and DB is the amount of deposits.

- $\dot{DB} = i_{DB} DB + W - C$ captures the **change in deposits**.

3. The structure of the model

- **Firms' effective investment** function is formalized as (see Le Heron and Mouakil, 2008 for a similar approach):
$I = I^D - \dot{L}^{CR}$

- **Effective amount of new loans**: $\dot{L} = \dot{L}^D - \dot{L}^{CR}$

  - builds on the recent Post Keynesian literature on credit rationing (see, among others, Lavoie, 1996; Wolfson, 1996; Grabel, 1995; Parguez, 2001; Setterfield, 2004; Dow, 1998).

- **Desired amount of new loans** (see Minsky, 1995; Charles, 2008; Lima and Meirelles, 2007):
$\dot{L}^D = I^D - PF$

3. The structure of the model

- **Firms' desired investment** function:

$$I^D = a_0 + a_1 PF + a_2 Y$$

- α_0 captures the animal spirits of firms.
- PF are the net profits of the firms equal to: $PF = Y - W - i_L L$
- where $i_L = l \cdot i$ is the lending interest rate, l is the mark up on the central banks' interest rate, i, and L is the amount of loans.
- Y captures the effect of euphoric expectations which are assumed to increase as the level of output rises (see Fazzari *et al.,* 2008). In other words, it reveals firms' decreasing margins of safety in the upswing.

3. The structure of the model

- The **amount of new loans that are credit rationed** is given by:

$$\dot{L}^{CR} = b_0 - b_1 PF + b_2 F^B - b_3 Y$$

- *b0* reflects the **animal spirits of the banking sector.**
- PF is a proxy for **firms' creditworthiness.**

i. "the businessman answers the financier's question, how will you get the monies to meet the obligations to pay? by pointing to the prospective cash flows" (Minsky, 1991).

- $F^B = L - DB$ is equal to **banks' fragility**.

i. For a similar definition of fragility of banks see Dos Santos and Macedo e Silva (2009), Forman *et al.* (1984) and Cozzi and Toporowski (2006).

ii. The higher the fragility of banks, the higher is the amount of new loans that are credit rationed. For similar arguments see Wolfson (1995), Paula and Alves (2006) and Eatwell *et al.* (2008).

3. The structure of the model

- Y represents the effect of the **euphoric expectations of banks**.

i. This is based on the **Minskyan analysis**. Minsky (1986), Paula and Alves (2006), Grabel (1995), Palley (1994) and Alves *et al.* (2008) pinpoint that over the business cycle both bankers and their borrowing business customers have expectations that change. Our formalization implies that in the upswing banks have decreasing **margins of safety** (see e.g. Kregel, 1997).

ii. There is also the **competitive analysis** for the behavior of banks (Basu, 2003; Dymski and Pollin, 1992; Grabel, 1995; Paula and Alves, 2006).

4. The definition of economy's financial fragility

- First, we define **firms' fragility** according to the net profits of the firms relative to their effective investment. The more speculative the firms the more fragile they are.

- **Hedge firms**:

$$(1-\Omega)Y \geq I + i_L \cdot L \qquad \text{or} \qquad F^B\Big|_S^F < \frac{a_0 - b_0}{b_2} - \frac{1-(a_1+b_1)(1-\Omega)-a_2-b_3}{b_2}Y$$

- **Speculative firms**:

$$(1-\Omega)Y < I + i_L \cdot L \qquad \text{or} \qquad F^B\Big|_H^F \geq \frac{a_0 - b_0}{b_2} - \frac{1-(a_1+b_1)(1-\Omega)-a_2-b_3}{b_2}Y$$

- The **demarcation line** that distinguishes firms from hedge to speculative is equal to:

$$F^B\Big|_{H-S}^F = \frac{a_0 - b_0}{b_2} - \frac{1-(a_1+b_1)(1-\Omega)-a_2-b_3}{b_2}Y$$

4. The definition of economy's financial fragility

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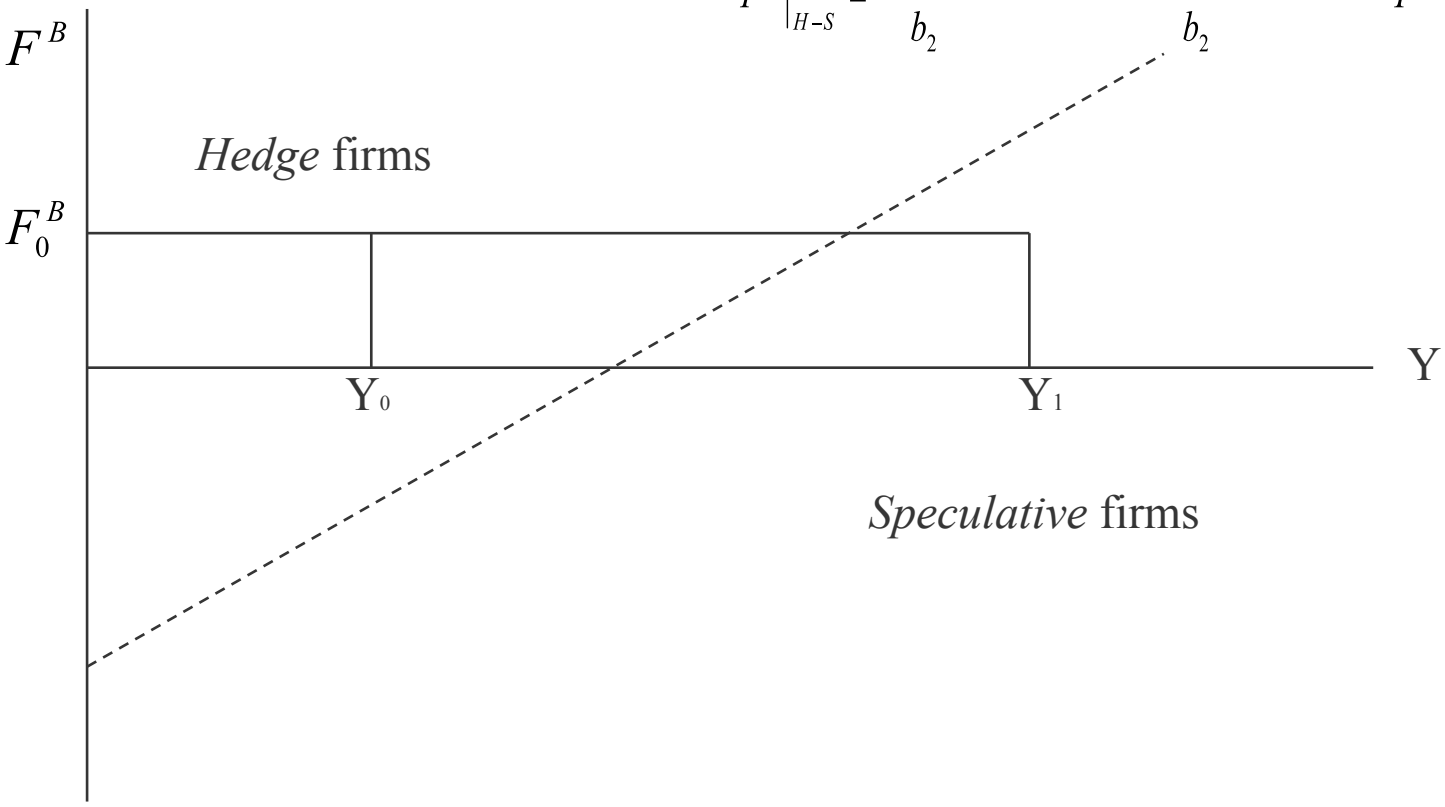


4. The definition of economy's financial fragility

- Second, we define **banks' fragility**. The more speculative banks are characterized the more fragile they are.

- **Hedge** banks:

  $L \leq DB$ or $F^B|_H^B \leq 0$

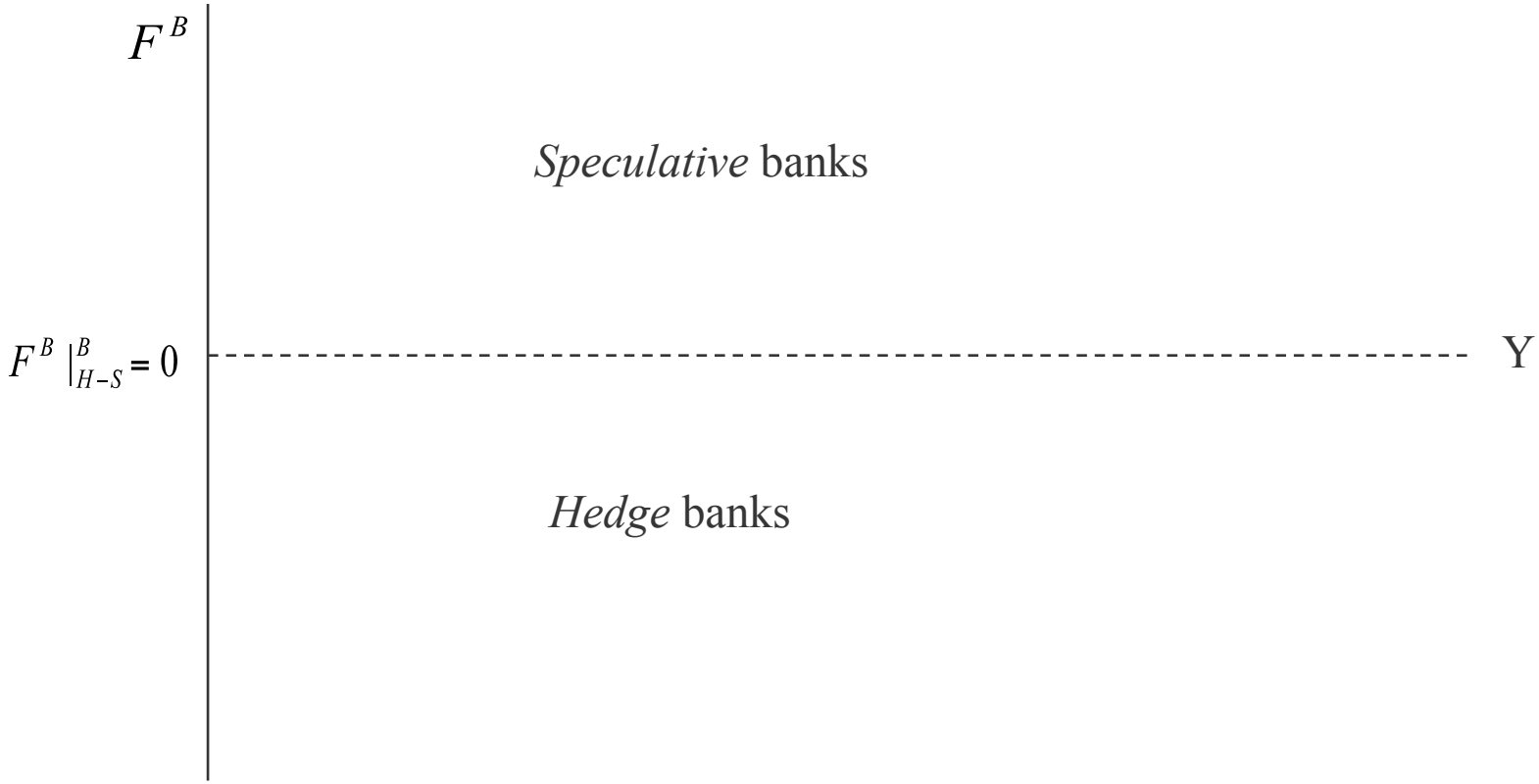
- **Speculative** banks:

  $L > DB$ or $F^B|_S^B > 0$

- The **demarcation line** that distinguishes banks from hedge to speculative is equal to:

  $F^B|_{H-S}^B = 0$

4. The definition of economy's financial fragility



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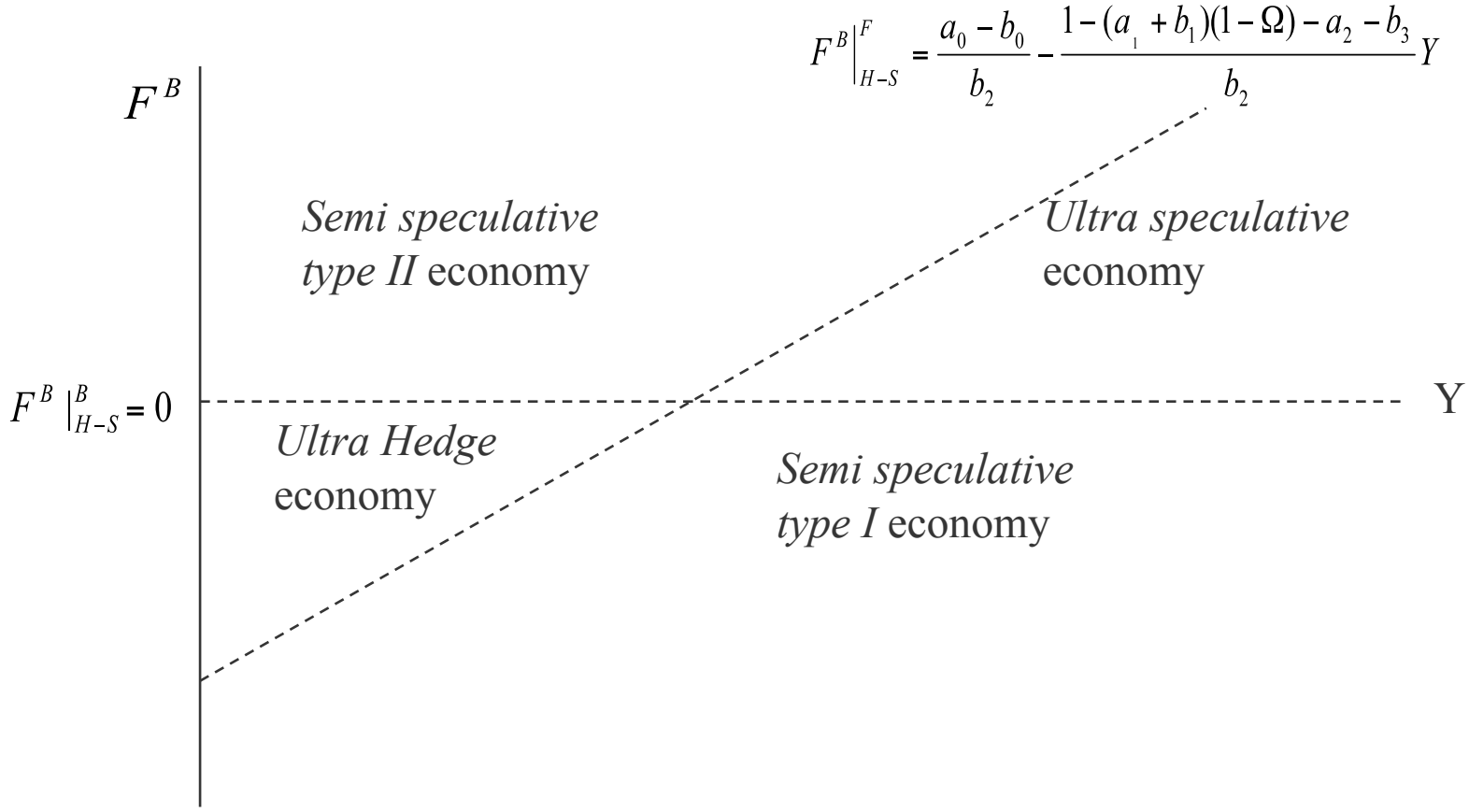


5. The dynamic behavior of the model

- We use phase-diagrammatic analysis in order to investigate the dynamic properties of the model.

- The **output isocline** is given by:

$$F^B\Big|_{\dot{Y}=0} = \frac{a_0 - b_0}{a_1 i_L + b_1 i_L + b_2} - \frac{1 - c_1\Omega - (a_1 + b_1)(1-\Omega) - a_2 - b_3}{a_1 i_L + b_1 i_L + b_2} Y$$

- The **banks' fragility isocline** is equal to:

$$F^B\Big|_{\dot{F}^B=0} = \frac{a_0 - b_0}{i_L - a_1 i_L - b_1 i_L - b_2} - \frac{1 - c_1\Omega - (a_1 + b_1)(1-\Omega) - a_2 - b_3}{i_L - a_1 i_L - b_1 i_L - b_2} Y$$

- The partial derivatives of the **Jacobian matrix** have as follows:

$$\Im_{11} = \partial \dot{F}^B / \partial F^B = i_L - a_1 i_L - b_1 i_L - b_2 < 0$$

$$\Im_{12} = \partial \dot{F}^B / \partial Y = -(1 - c_1\Omega - (a_1 + b_1)(1-\Omega) - a_2 - b_3) > 0$$

$$\Im_{21} = \partial \dot{Y} / \partial F^B = -e(a_1 i_L + b_1 i_L + b_2) < 0$$

$$\Im_{22} = \partial \dot{Y} / \partial Y = -e(1 - c_1\Omega - (a_1 + b_1)(1-\Omega) - a_2 - b_3) > 0$$

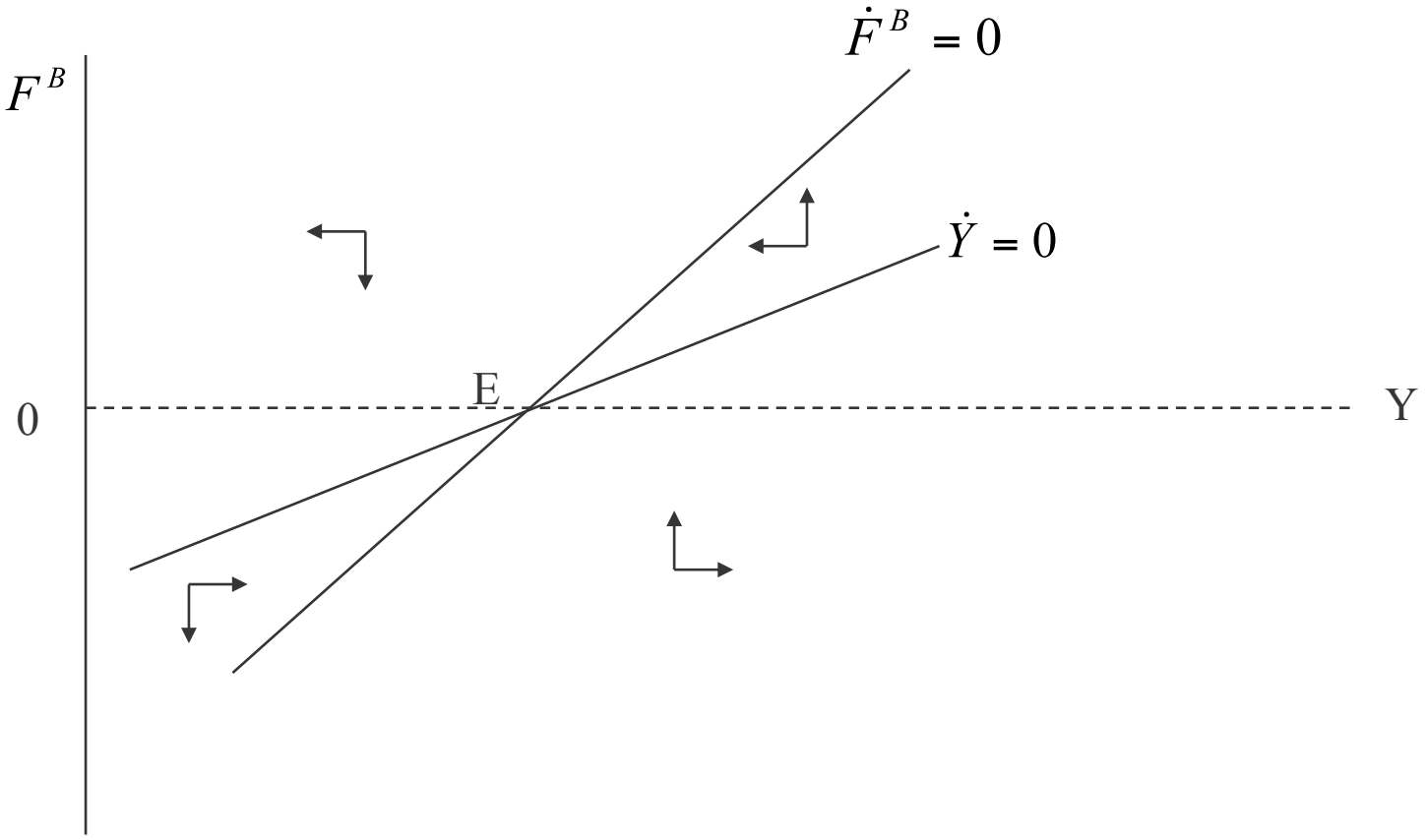
5. The dynamic behavior of the model

- Our analysis begins by assuming that the economy is initially at the **'ultra hedge' situation** (hedge firms, hedge banks) where both output and banks' fragility are low.
- Because of low debt firms' desired investment is increasing; simultaneously, low banks' fragility leads them to decrease the credit rationed loans contributing to the expansion of the economy.
- At some point banks' fragility starts increasing and the economy slides into the **'semi speculative type I' situation** (speculative firms, hedge banks).

5. The dynamic behavior of the model

- The expansion of the economy continues and is reinforced by the euphoric expectations of both firms and banks. The increasing banks' fragility turns the economy to the **'ultra speculative' situation** where both firms and banks are speculative.
- Gradually, the high level of banks' fragility starts having negative feedback effects on the output of the economy, since effective investment decreases as a result of higher credit rationing.
- The decrease in output leads the economy to the **'speculative type II' situation** (speculative banks, hedge firms). Furthermore, the fragility of banks starts decreasing again as a result of credit restriction.
- Eventually, the decreasing fragility of banks leads the economy to the 'ultra hedge' situation; then, **the stage is set for a new cycle.**

5. The dynamic behavior of the model



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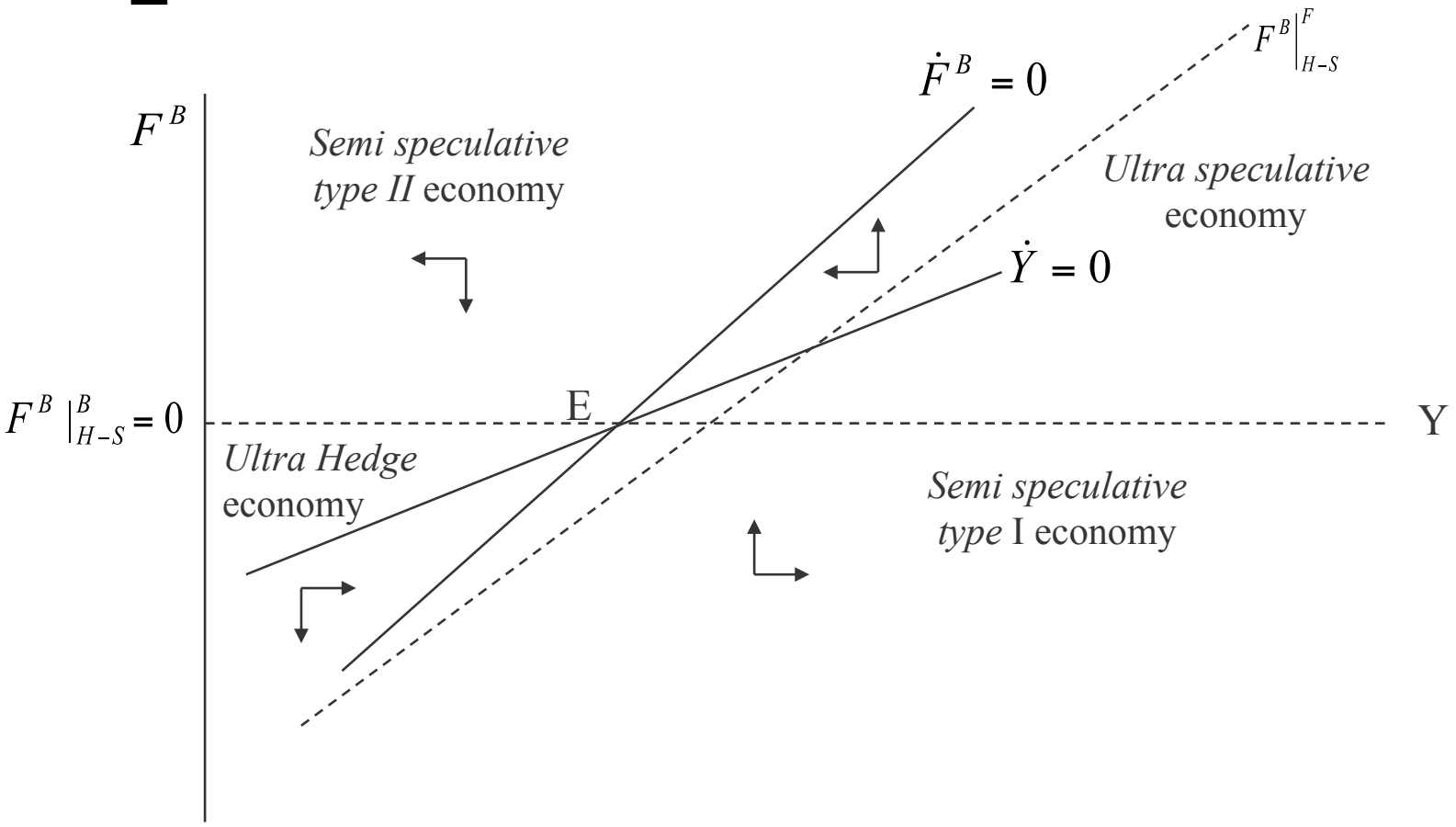
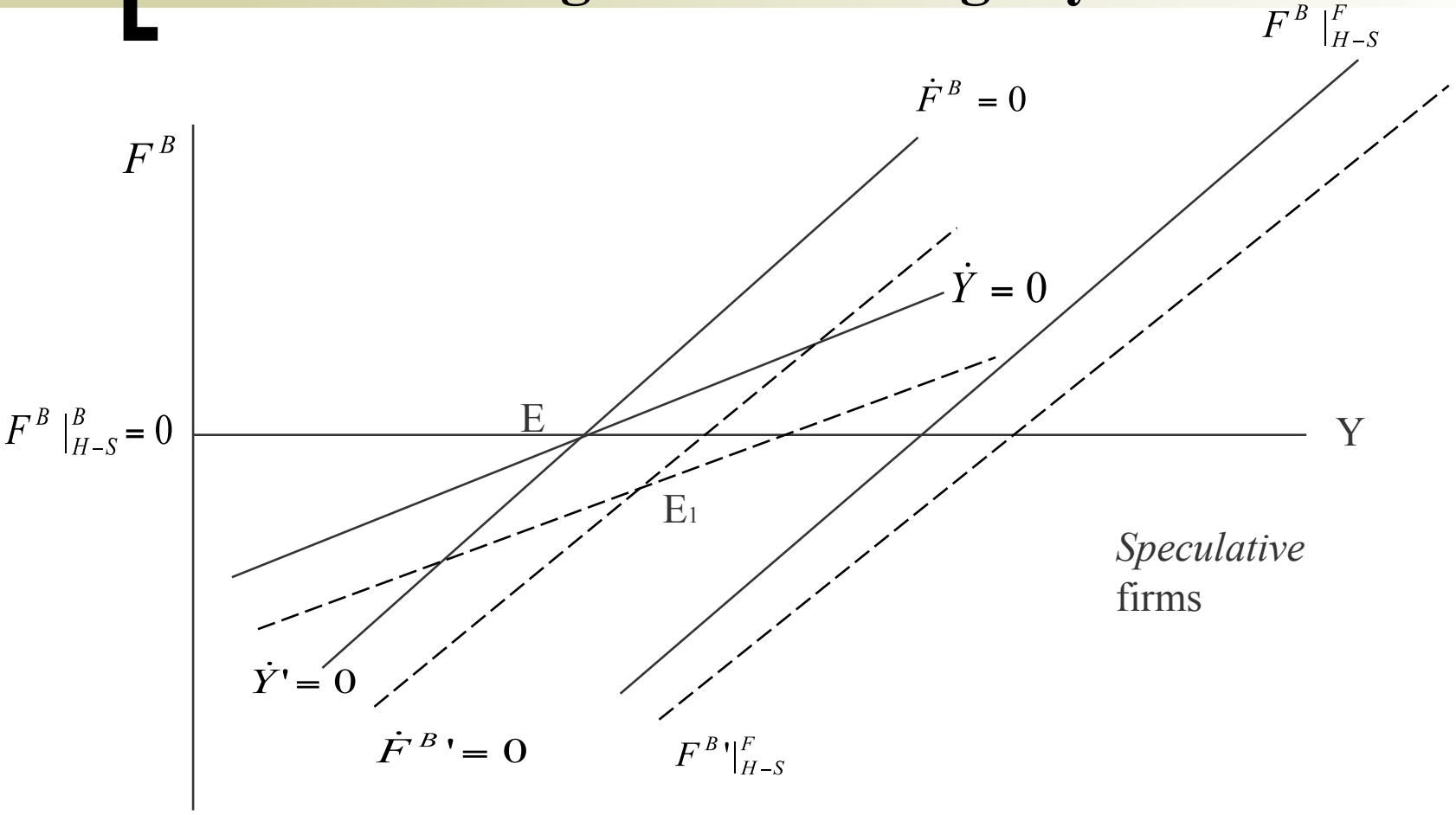


6. The effects of a rise in responsiveness of credit rationing to banks' fragility



7. Conclusion

- We developed a macroeconomic model with Minskyan insights and incorporated in this theoretical frame the active role of the **banking sector.**
- We categorized the **economy's financial fragility** according to the fragility of firms and the fragility of banks.
- According to our dynamic analysis it turns out that:

i. In the upswing firms turn from hedge to speculative as Minsky initially elaborated.

ii. The economy will reach the **ultra speculative area** under the condition that banks provide the increasing amount of debt that is demanded by firms. The role of euphoric expectations is decisive in this regard.

iii. The **economy follows a cyclical behavior** and is likely to **eventually reach stability** under some specific conditions.