Macroeconomics

Lecture 5.

Short-run macroeconomic dynamics: the selected models of business cycles

What are business cycles? Perhaps, you know something from the introductory level…

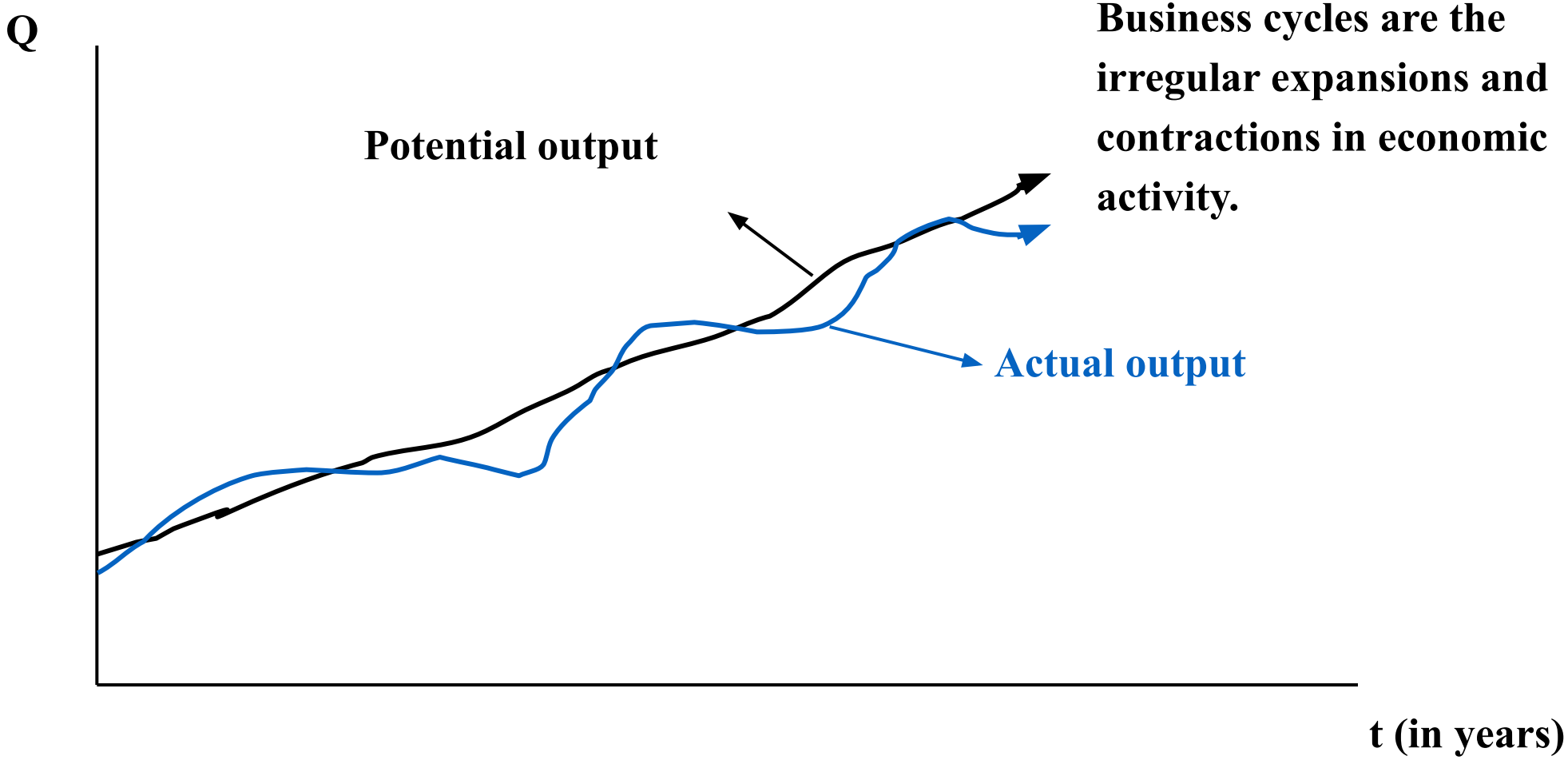
- The ***business cycles*** occur when economic activity speeds up or slows down.
- The business cycles are swings in total national output, income and employment, usually lasting for a period of 8 to 10 years, marked by widespread expansion or contraction in many sectors of the economy.

Phases of business cycles

In other words, Business Cycles are alternating periods of economic expansion and economic recession.

- The expansion phase
  - Production, employment and income are increasing.
- The business cycle peak
- The recession phase
  - Production, employment and income are declining.
- The business cycle trough

Business cycles graphically…



Business cycles and unemployment dynamics

Recessions cause the unemployment rate to increase. We should remember about frictional, structural and *cyclical unemployment*.

By the way, the rate of unemployment continues to be high *after* the recession is over, because:

- Discouraged workers re-enter the labour force.
- Some workers have lost their skills.
- Firms continue to operate below capacity after the recession is over and may not re-hire workers for some time.

The most important recent recessions

1974/75: Oil price shock caused by OPEC.

1982/83: High real wages and inflation.

2008/09: World financial crisis – “The Great Recession”.

2020/21: Coronavirus pandemic – “The Great Lockdown”.

How to explain business cycles?

?

The multiplier-accelerator model as the oldest formalized model of cycle

- Initial points

1. The model is a synthesis of the "Keynesian multiplier" and the "accelerator" theory of investment
2. The accelerator model is based on the truism that, if technology (and thus the *capital/output ratio)* is held constant, an increase in output can only be achieved though an increase in the capital stock.

What is the accelerator?

- Firms need a given quantity of capital to produce the current level of output. If the level of output changes, they will need more capital. How much more?
- *Change in capital = accelerator × change in output*
- But firms can only increase their capital stock by (positive) net investment. How much?
- *Net investment = accelerator × change in output*
- It is also true that:
- *Accelerator = Change in Capital/Change in Output*

About constancy of the capital-output ratio

- If we do not allow for productivity boosting technical change, then the capital output ratio is held constant.
- If fact, this is what we are assuming—no technical change.

Example of the accelerator principle

- We assume that v = 3. That is, it takes 3 dollars worth of capital to manufacture $1 worth of shoes or something else.
- Hence if the demand for shoes increased by say, $10, there would be a need for $30 in additional capital—or equivalently, $30 in net investment.

Formalizing the model (Part 1)

If the economy is in equilibrium,

then output supplied (Y) is equal to aggregate demand (AD). Assuming a closed economy without government, we have:

$$Y_t = C_t + I_t$$

Formalizing the model (Part 2)

- The consumption function is given by:

$$C_t = \overline{C} + cY_{t-1}$$

- We assume that investment in the current period (I_t) is equal to some fraction (v) of *change* in output in the previous period (or lagged output):

$$I_t = \nu(Y_{t-1} - Y_{t-2})$$

Combining these equations, we will receive:

$$Y_t = \overline{C} + (c + v)Y_{t-1} - vY_{t-2}$$

- To simplify, we ignore the constant $\overline{C}$
- To get a standardized form, let A = *c* + v. Also, Let B = v. Thus we can write:

$$Y_t - A_{t-1} + B_{t-2} = 0$$

- Note for the mathematically inclined: the last equation is a 2nd order (homogenous) difference equation.

Some essential ideas

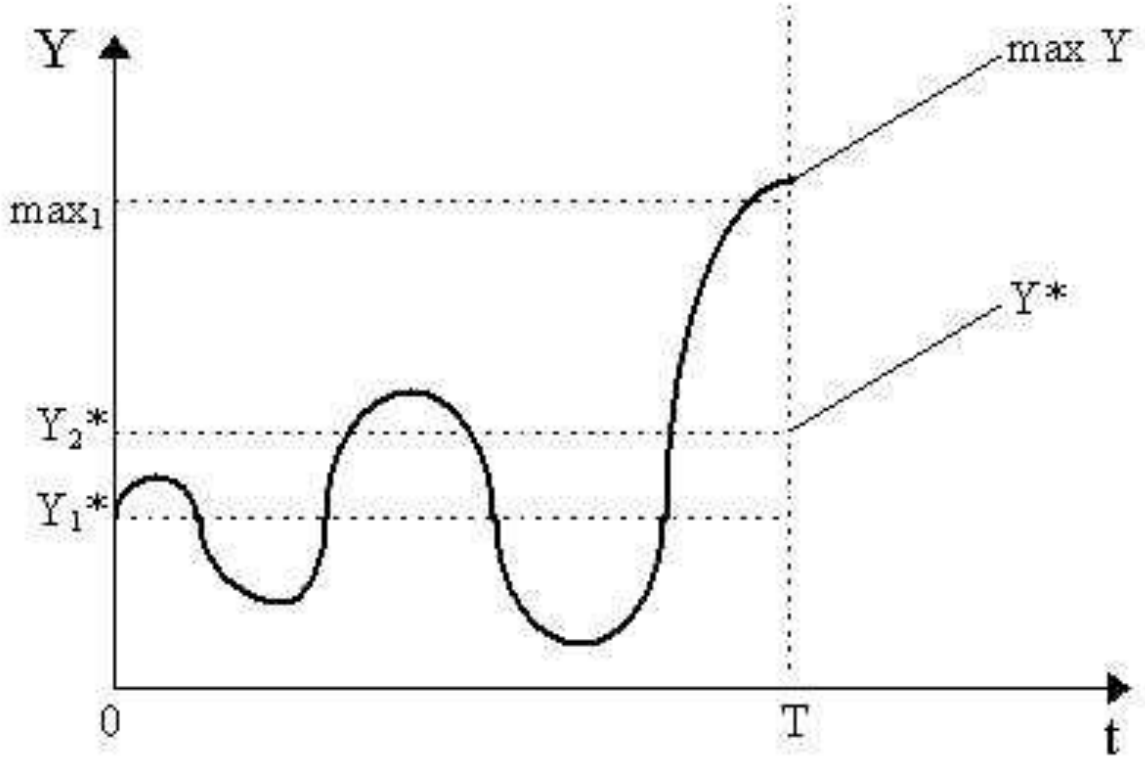
- Change in investment affects output/income.
- Change in output/income affects (with delay) investment.
- Higher *c* and v will lead to more unstable changes in the macroeconomy.

Some conclusions (derived from the fundamental mathematical principles)

1. There will be cyclical fluctuations in the time path of national income (Y_t) if $A^2 < 4B$.
2. If $B = 1$ (and presuming that $A^2 < 4B$), then cycles are *constant* in amplitude.
3. If $B < 1$ (and presuming that $A^2 < 4B$), then cycles are *damped*—that is, amplitude is a decreasing function of time.
4. If $B > 1$ (and presuming that $A^2 < 4B$), then cycles are *explosive*—that is, amplitude is a increasing function of time.
5. There will be no cyclical fluctuations if $A^2 > 4B$.

Explosive oscillations

- $B > 1$ and $A^2 > 4B$



Limitations of the multiplier-accelerator model

- This model is based on a crude theory of investment. There is no role for "expected profits" or "animal spirits." Furthermore, all relationships are linear. There are no any determinants of investment except national income.
- The time lag between a change in output and a change in (net) investment can be significant—the investment process (planning, finance, procurement, manufacturing, installation, training) is often lengthy.
- *For the economy as a whole*, there is a limit to disinvestment (negative net investment). At the aggregate level, the limit to capital reduction in a given period is the wear and tear due to depreciation. Furthermore, there is a limit to increase in output. The more sophisticated version of the model takes it into account.

New Keynesian approach

- New Keynesian economists (Mankiw, Stiglitz, Akerlof and others) believe that short-run fluctuations in output and employment represent deviations from the “natural levels” (“potential GDP”, “full employment”), and that these deviations occur because wages and prices are sticky.
- If aggregate demand changes under the regime of the strickiness of wages and prices, GDP and employment will fluctuate
- New Keynesian research attempts to explain the stickiness of wages and prices by examining the microeconomics of price/wage adjustment.

Top reasons for sticky prices – Results from surveys of managers (in the U.S.) (Mankiw, 2007)

- Coordination failure: firms hold back on price changes, waiting for others to go first
- Firms delay raising prices until costs rise
- Firms prefer to vary other product attributes, such as quality, service, or delivery lags
- Implicit contracts: firms tacitly agree to stabilize prices, perhaps out of 'fairness' to customers
- Explicit contracts that fix nominal prices (and wages)
- Menu costs

The Real Business Cycle model

- All prices are flexible, even in short run:
  - thus, money is “neutral” (that is, changes in money supply do not affect real GDP and other real variables), even in short run.
- Fluctuations in output, employment, and other variables are the optimal responses to exogenous changes in the economic environment.
- Productivity shocks are the primary cause of economic fluctuations (Kydland, 1982; Long, 1983; Prescott, 1989).

Intertemporal substitution of labor

- In the RBC model, workers are willing to reallocate labor over time in response to changes in the reward to working now versus later.
- The intertemporal relative wage equals:

$((1 + r)*w_1)/w_2$

where w_1 is the real wage rate in period 1 (the present) and w_2 is the real wage rate in period 2 (the future).

The mechanism of cycles in the RBC model

- In the RBC model,
  - productivity shocks cause fluctuations in the intertemporal relative wage
  - workers respond by adjusting labor supply
  - this causes employment and output to fluctuate
- Critics argue that
  - labor supply is not very sensitive to the intertemporal real wage
  - high unemployment observed in recessions is mainly involuntary

Are prices/wages flexible?

- The RBC model assumes that wages and prices are completely flexible, so markets always clear.
- Proponents of the RBC model argue that the degree of price stickiness occurring in the real world is not important for understanding economic fluctuations. They also assume flexible prices to be consistent with microeconomic theory.
- Critics believe that wage and price stickiness explains involuntary unemployment (see above New Keynesian approach)

The financial fragility hypothesis (aka the financial instability hypothesis)

- ***Financial fragility hypothesis*** – developed by Hyman Minsky (1919-1996) – states that over a period of good times, the financial structures of a dynamic capitalist economy endogenously evolve from being ***robust*** to being ***fragile***, and that once there is a "sufficient amount" of financially fragile firms, the economy becomes susceptible to debt deflations and crises.
- It is very important how firms-borrowers finance their investment in fixed capital!

The classification of borrowers (and regimes of financing)

- Minsky identified three types of borrowers that contribute to the accumulation of debt:

  1) The ***"hedge borrower"*** can make debt payments (covering interest and principal) from current cash flows from investments.

  2) For the ***"speculative borrower"***, the cash flow from investments can service the debt, i.e., cover the interest due, but the borrower must regularly roll over, or re-borrow, the principal.

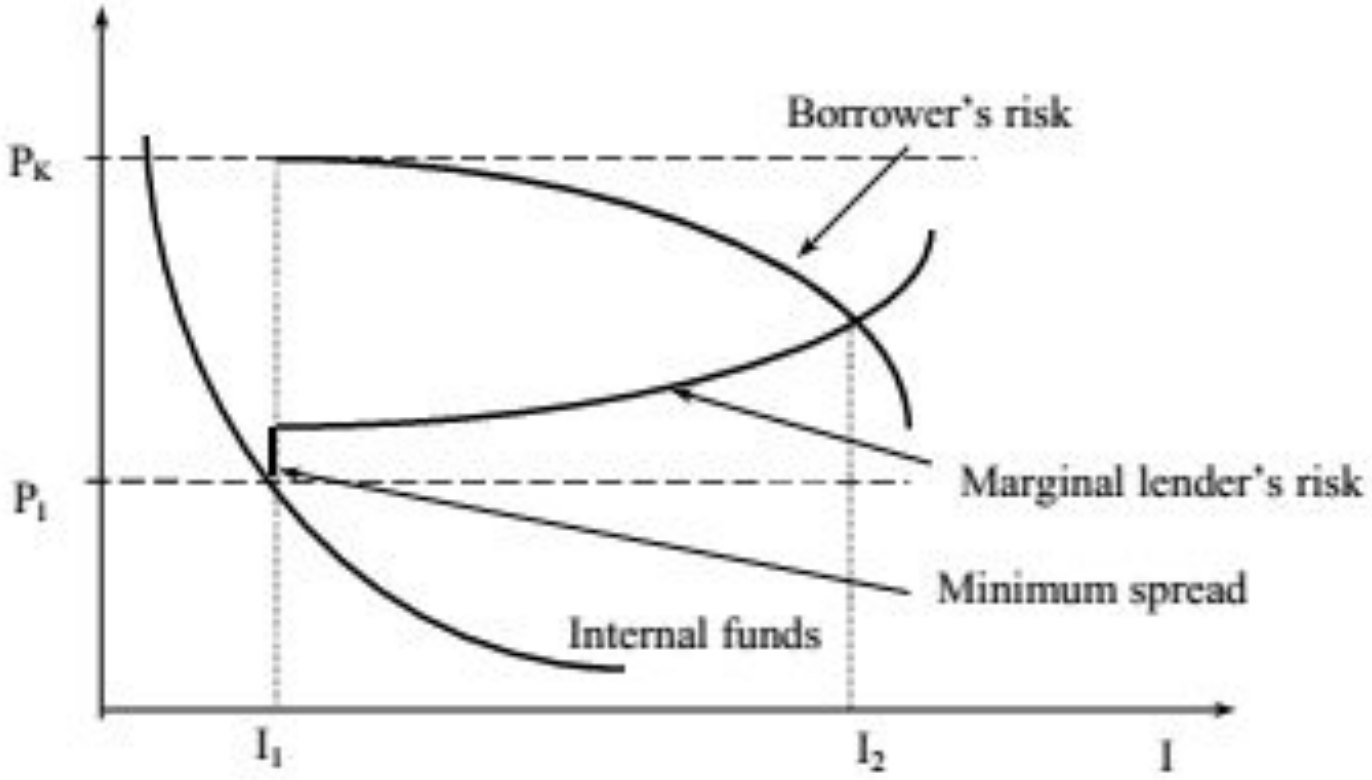
  3) The ***"Ponzi borrower"*** borrows based on the belief that the appreciation of the value of the asset will be sufficient to refinance the debt but could not make sufficient payments on interest or principal with the cash flow from investments.

Reasons for the name “Ponzi finance” or “Ponzi regime”

- Named after Charles Ponzi (1882-1949), an Italian citizen who launched the following scheme during 1918-1920 in the USA: *“pay early investors returns from the investments of later investors.”*

- He was sentenced in 1920 and spent 12 years in jail. Died in Rio da Janeiro.

The theory of firm's investment decision graphically



Some explanations

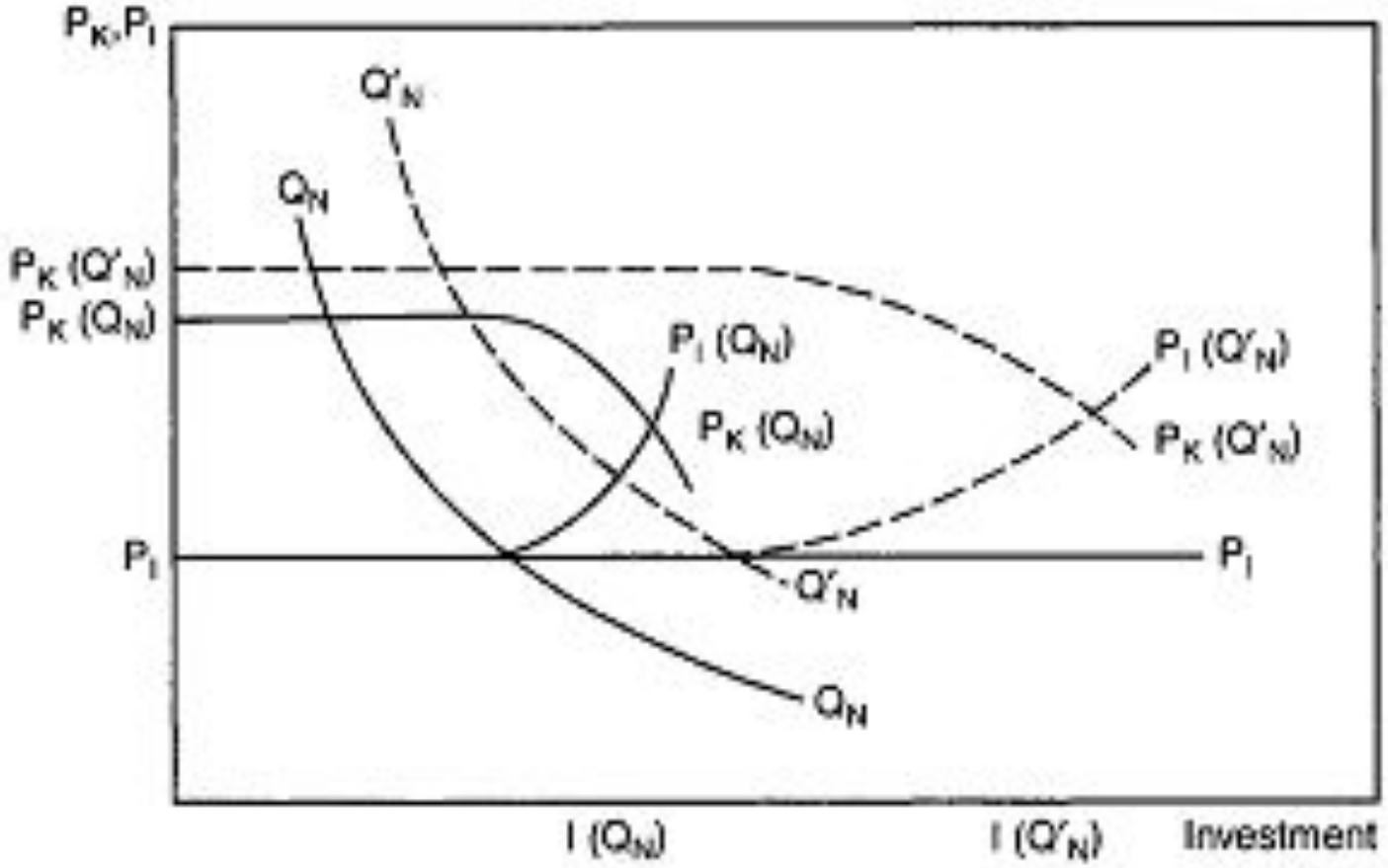
- I is investment
- P_K is the demand price of investment (willingness to pay some amount of money for capital equipment by the firm); it is adjusted for the borrower's risk (fear to not to repay debt)
- P_I is the supply price of investment (actual price of capital equipment for the firm); it is adjusted for the lender's risk (fear of not to receive back money lent)

- Investment will take place if the demand price exceeds the supply price

More explanations

- As business expansion takes place, all relevant curves shift to the right.
- Both total investment and debt-financed investment increase
- The economy becomes more financially fragile: both the debt-to-equity ratio and the debt-to-asset ratio increase.

The business expansion based on the accumulation of financial fragility graphically



The stages of business cycles according to the financial fragility hypothesis

- Hedge regime/stage [$CF = D(r + b)$ or $CF > D(r + b)$]

- Speculative regime/stage [$Db > CF > rD$]

- Ponzi regime/stage [$Db > rD > CF$]

Where CF = cash flow, D = debt, r = interest rate; b = share of principal that should be payed.

The hedge phase

- Conservative estimates of cash flows when making financial decisions; business plans provide more than enough cash generation to pay off cash commitments.
- Debt tends to be conservative and at long term fixed interest rates
- This is a phase dominated by borrowers, (mostly companies) who can fulfill their debt payments (interests and principals) to creditors (mostly banks) from their cash flows.

The speculative phase

- Estimates of cash flows are more aggressive - expected cash inflows provide just enough to cover to make interest payments on debts with principal *rolled over*.
- Debt becomes shorter term and therefore needs regular refinancing; borrowers become exposed to short term changes in lender's willingness to extend loans
- The 'speculative phase' is dominated by borrowers, (including governments and households) that are capable of servicing their interests on their debts from their incoming revenues.

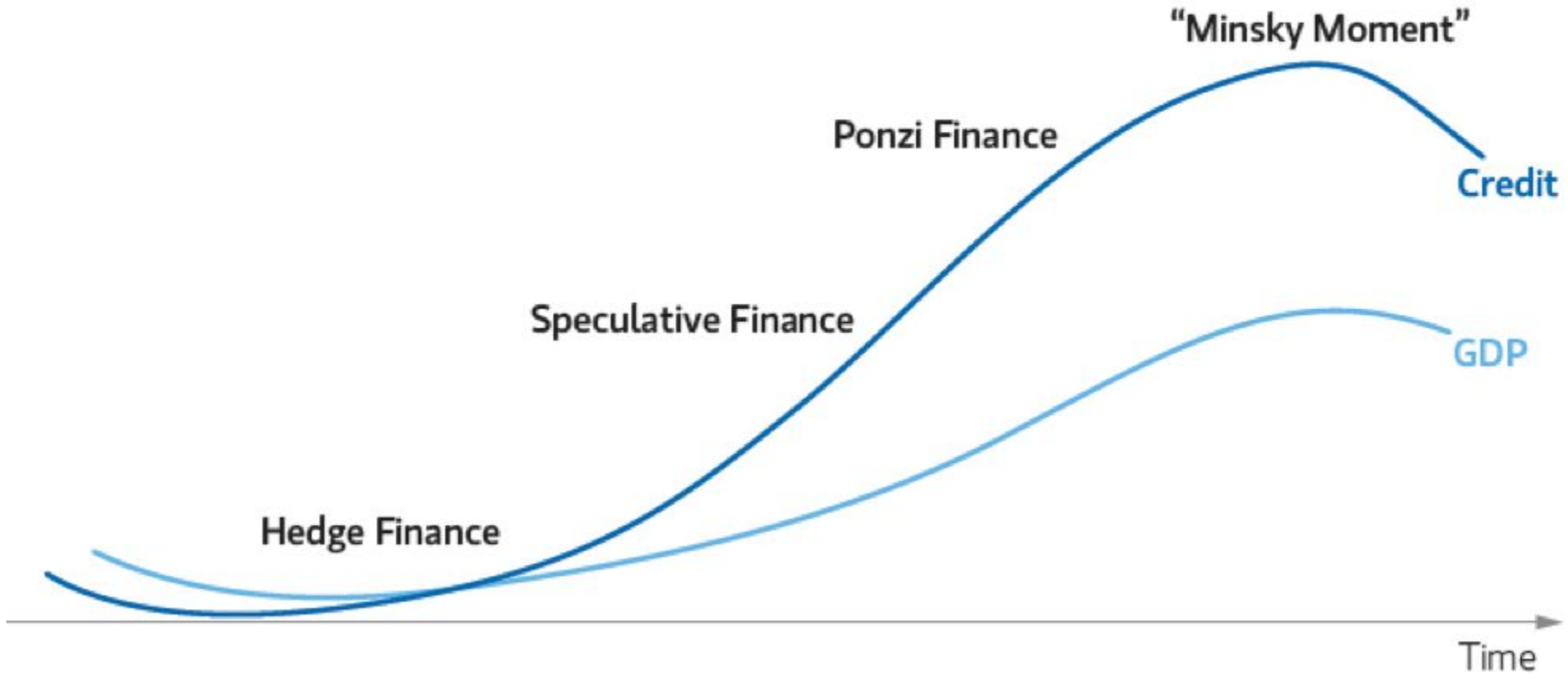
The “Ponzi” stage

- Estimates of cash generation not expected to cover cash commitments.
- Debt is short term and rolled over
- The majority of borrowers in the system are unable to pay even the interests on their debts (let alone the principals) from their revenues.

The Minsky moment and financial crisis

- If the use of Ponzi finance is general enough in the financial system, then the inevitable disillusionment of the Ponzi borrower can cause the system to seize up.
- When the speculative borrower can no longer refinance (roll over) the principal even if able to cover interest payments, such agent can go bankrupt too.
- Collapse of the speculative borrowers can then bring down even hedge borrowers, who are unable to find loans despite the apparent soundness of the underlying investments.
- At this stage, debt payments can only be settled by liquidating the real assets of borrowers - the moment of deleveraging and default. This situation is now called *"Minsky's Moment"*

Some picture…



Quote from paper by Roncaglia (2013)

The result is an endogenous dynamics with cumulative changes of internal funds and a pro-cyclical evaluation of risk. A change in one direction tends to be cumulative. For example, a sustained positive rate of growth generates higher profits, higher internal funds, improved expectations and a less conservative evaluation of risk. All these changes lead to increased investments, hence increased profits, and so on.

Such Minskyan endogenous dynamics implies a continuous revision of expectations, which become more and more optimistic as the economy continues to grow. Risk assessments also become progressively more and more optimistic: speculative positions may be reinterpreted as covered positions. Thus financial fragility grows, both for financial and non-financial firms, families and the government.

Minsky about the policy

- Minsky observes that the government intervention (proper fiscal policy measures) are necessary but not sufficient to deal with such a financial crisis.
- They have to supplemented with strong regulatory and superviory measures on the financial system.

More about the “proper” fiscal policy

- Fiscal policy may have a discretionary component, such as the introduction of new taxes in a boom or new spending in a downturn.

- However the discretionary action usually comes with a long lag, when it comes at all: The goal was to present a structure of capitalism that would be more prosperous and stable.

- Minsky stressed that "the budget structure must have the built-in capacity" to produce sizable deficits when the economy plunges, and to run surpluses during inflationary booms. (suggestion on *automatic stabilizers*)

The fiscal policy may not be enough

- Governments alone may not be enough to stabilize the economy.
- In a recession, if a big firm or bank defaults on its debt, it can also bring down others in the economy due to the interlocking nature of their balance sheets. This could cause a "*snowball effect*" on the economy.
- An additional constraining institution is needed to prevent debt deflation from occurring.

Paradox of tranquility

Government intervention is needed to stabilize the economy...

If policies are successful, the economy booms. Expectations about the future returns become increasingly optimistic. As mentioned before, riskier behavior is awarded.

This leads to fragility in the economy.

What about the monetary policy?

- Monetary policy can constrain undue expansion and inflation operates by way of disrupting financing markets and asset values.

- Monetary policy to induce expansion operates by interest rates and the availability of credit, which do not yield increased investment if current and anticipated profits are low.

More about the monetary policy

- The Central Bank will generally be taking up the role of the lender of last resort. The Central Bank will lend to financial institutions. By lending to them, especially to the big financial institutions, the Central Bank prevents big financial institutions from defaulting.
- One problem with being the lender of last resort is that if banks know that the central banks will always step in if the borrower defaults, banks will have nothing to worry about. Risky behavior is rewarded.
- There is, therefore, a need to supervise the private banks to decrease the number of bad loans they approve.

Results of the active government intervention for the U.S. economy (Tymoigne, 2008)

	Number of contractions	Average Frequency	Average Length	Average Decline in real GNP
1900-1946	12	3.9 years	18.1 months	-6.7%
1947-2007	10	6.1 years	10.4 months	-1.5%

Sources: NBER, BEA, Gordon (1990).

Note: The average decline in real GNP includes all quarters with a negative growth rate, even if there is no contraction at that time.

Stability is destabilizing!

- Profit-seeking firms have incentives to leverage and borrow more against equity as long as the economy appears to be stable.
- Therefore, ***"stability is destabilizing."*** People take on more and more risk.
- Capitalist economy based on fractional reserve banking system is inherently unstable!

Let me give examples of three empirical studies of the financial fragility's evolution in different countries

- Beshenov, S., and Rozmainsky, I. V. (2015). Hyman Minsky's Financial Instability Hypothesis and the Greek Debt Crisis. *Russian Journal of Economics* 1(4): 419–438.
- Nishi, H (2019). An empirical contribution to Minsky's financial fragility: Evidence from non-financial sectors in Japan. *Cambridge Journal of Economics* 43(3): 585–622.
- Rozmainsky, I. V. and Selitsky, M. S. (2021). The financial instability hypothesis and the case of private non-financial firms in South Korea. *AlterEconomics* 18(3): 417–432. (In Russian).

Empirical analysis of the Greek companies' financing regimes on the base of the financial fragility hypothesis from (Beshenov and Rozmainsky, 2015)

- We used the financial statements for 36 companies from 2001 to 2014.
- The annual statements for Greek companies were taken from the Bloomberg terminal.
- 36 companies were sampled based on the ASE General Index.
- ASE = the Athens Stock Exchange.

Some details about this analysis and this index

- The ASE General Index includes 60 of the largest Greek companies, weighted in terms of capitalization.
- Why 36 instead of 60? Because selected companies satisfied with the following criteria:
- The company belongs to the real sector
- We managed to find most of the information about the company for the analysis (over 80%).
- The company had not been taken over by or merged with another company during the period in question. Bankrupt companies were also included in the sample.

The Indicator used for the Greek companies' classification

$$\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expense}}$$

Explanation of the Indicator

- EBIT = earnings before interest and taxes
- Interest Coverage Ratio (ICR) = interest payable on the company's borrowings
- ICR lets a financial statement analyst determine the company's ability to meet its obligations to repay loans.
- According to practical experts, a company that is financially stable and robust, will have a ICR over 3 (Damodaran, 2011).

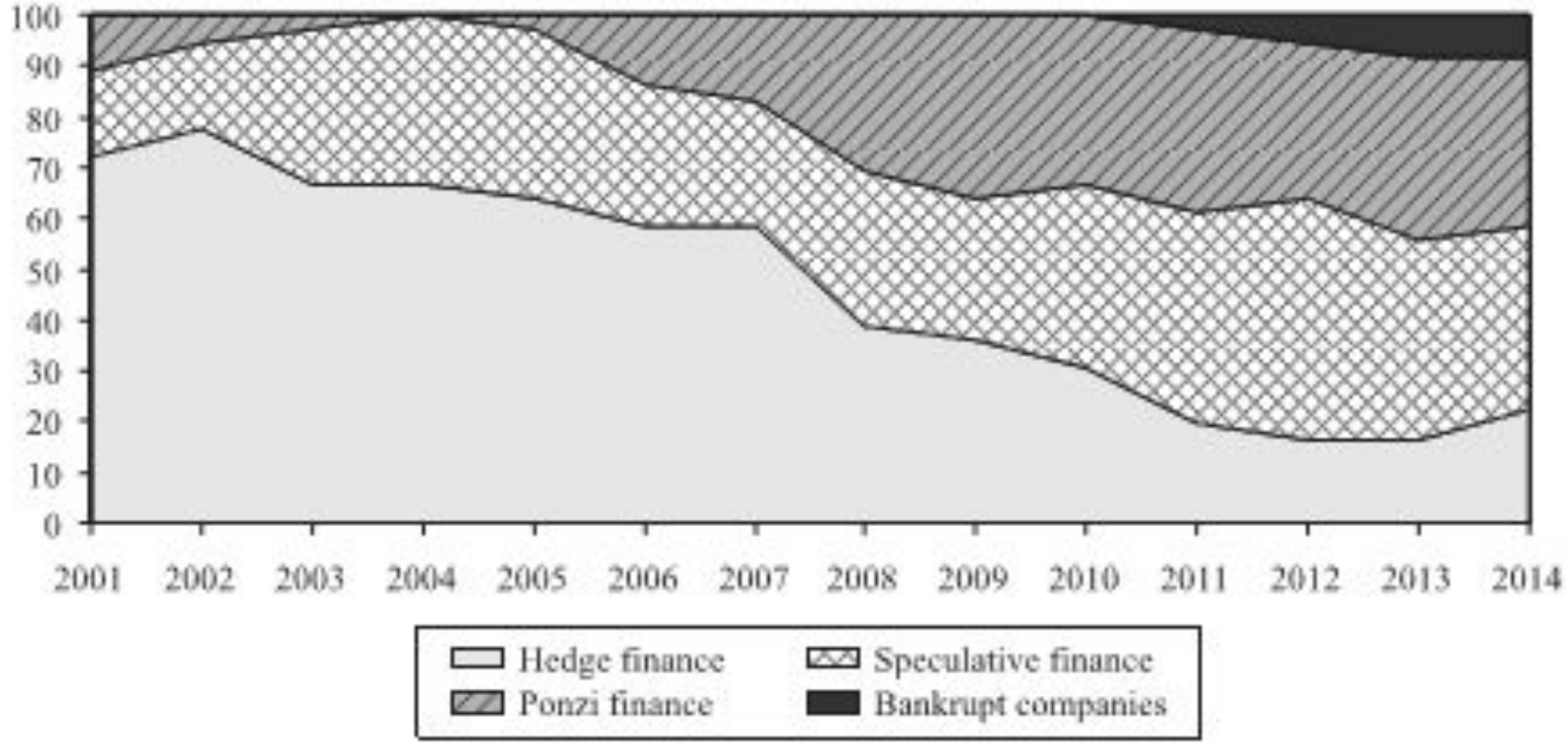
The Principles of The Greek companies' classification

- ICR>=3 treated as a financially "healthy" company or as a company using ***Hedge Finance***
- 3>=ICR>0 treated as a company exposed to financial shocks and has a potential for fulfilling (incompletely) financial obligations or as a company using ***Speculative Finance***
- ICR=<0 treated as a company moving to bankruptcy and has no potential for fulfilling financial obligations or as a company using ***Ponzi Finance***
- *At the present moment there are more sophisticated approaches to classify firms (see one example below)*

The dynamics of 36 Greek companies during the period in question

- After 2001 the number of companies with speculative and Ponzi finance increased.
- By the end of 2008, the share of companies with fragile financing rose to 61% of the total number of analyzed companies (22 out of 36).
- By 2013, financially stable companies accounted for 17% of the sample, which is the evidence of the deep recession.
- 3 companies were officially declared bankrupt.

The essential diagram (2001-2014)



Some Conclusions

- Experience of the Greek economy is consistent with the FIH.
- In the 2000s, the private business accumulated financial fragility inside the Greek economy
- The crash of the Greek economy in 2015 can be treated as an effect of accumulation of financial fragility

Analysis of the financial fragility's evolution in Japan (Nishi, 2019)

- Nishi analyzed firms of different sizes and different sectors
- Nishi offered another index for measuring financial fragility on the base of the next idea:

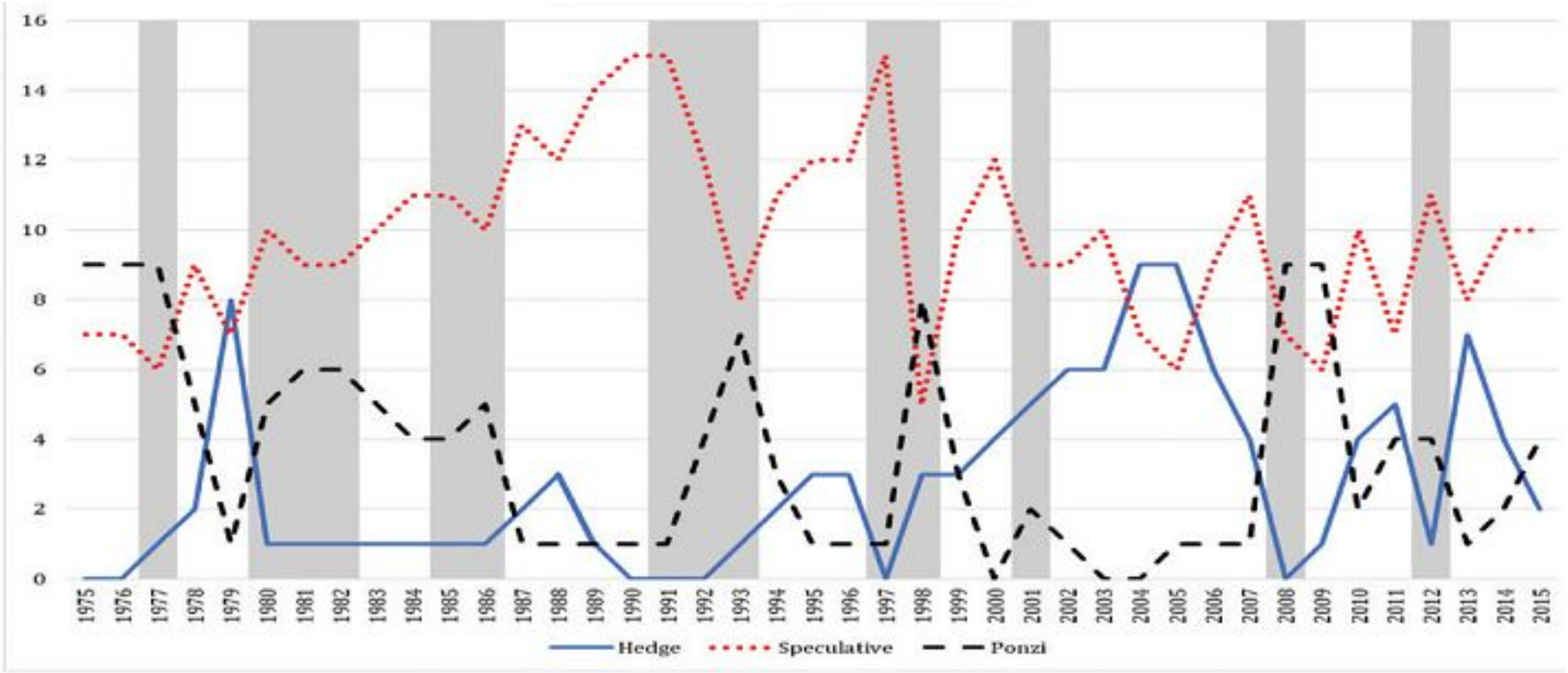
$$\text{Profits} + \text{Borrowings} = \text{New investments} + \text{Debt service payments} + \text{Dividend payments},$$

More about Nishi (2019)

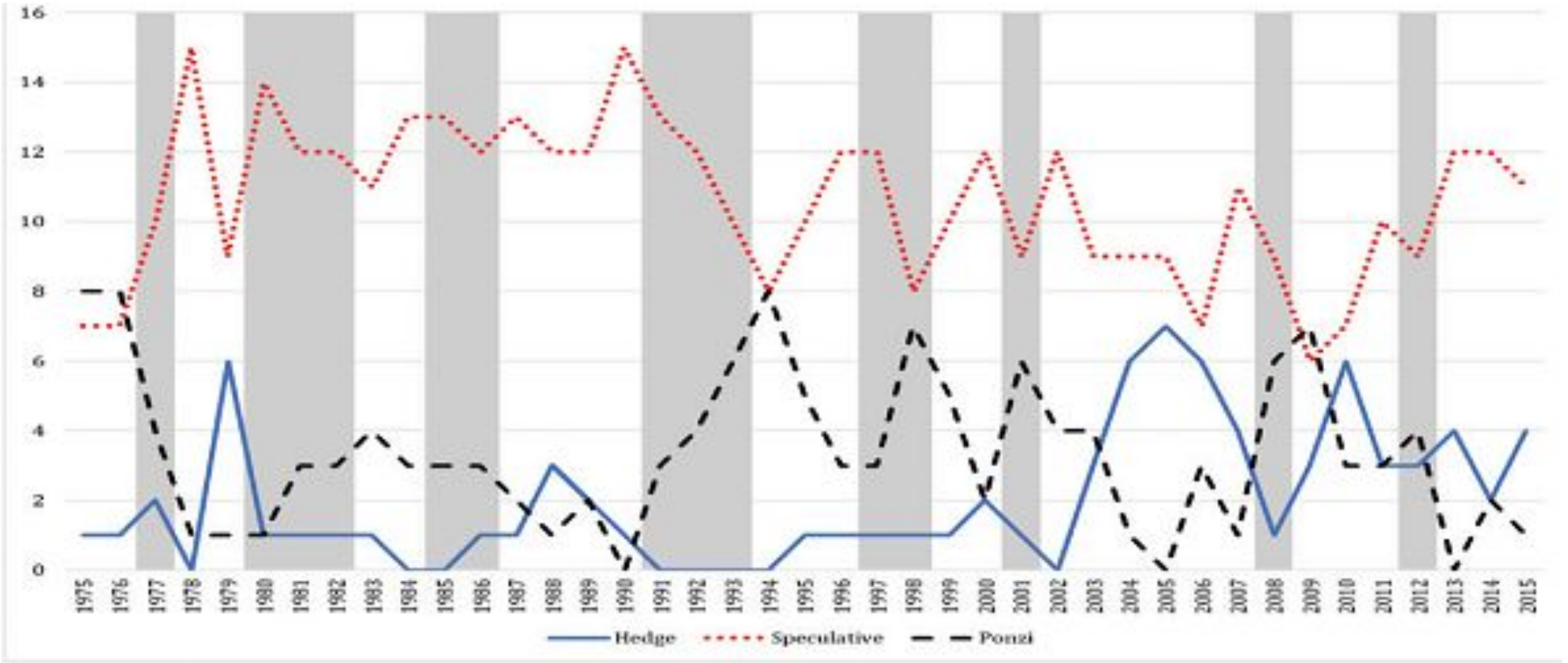
- So, Nishi used alternative criterion for classifying regimes of financing by firms – Financial Fragility Index (FFI).
- Here r – profit per capital, g – investment per capital, i_D – debt service per capital, d – dividend payments per capital.

- *Hedge*: The economic unit is a hedge unit if $r - g - i_D - d \geq 0$.
- *Speculative*: The economic unit is a speculative unit if $r - g - i_D - d < 0$ and $r - i_D - d \geq 0$.
- *Ponzi*: The economic unit is a Ponzi unit if $r - g - i_D - d < 0$ and $r - i_D - d < 0$.

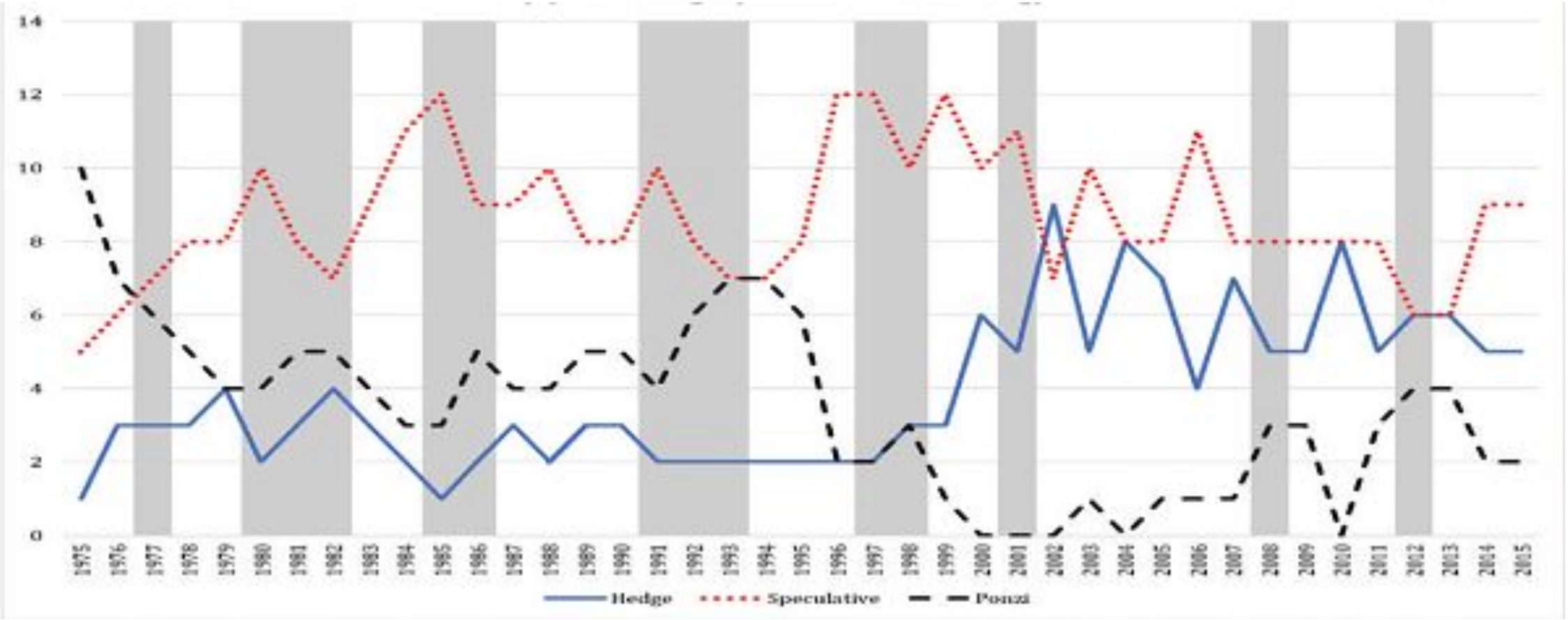
Evolution of financial fragility for Large Manufacturing Japanese firms (1975-2015)



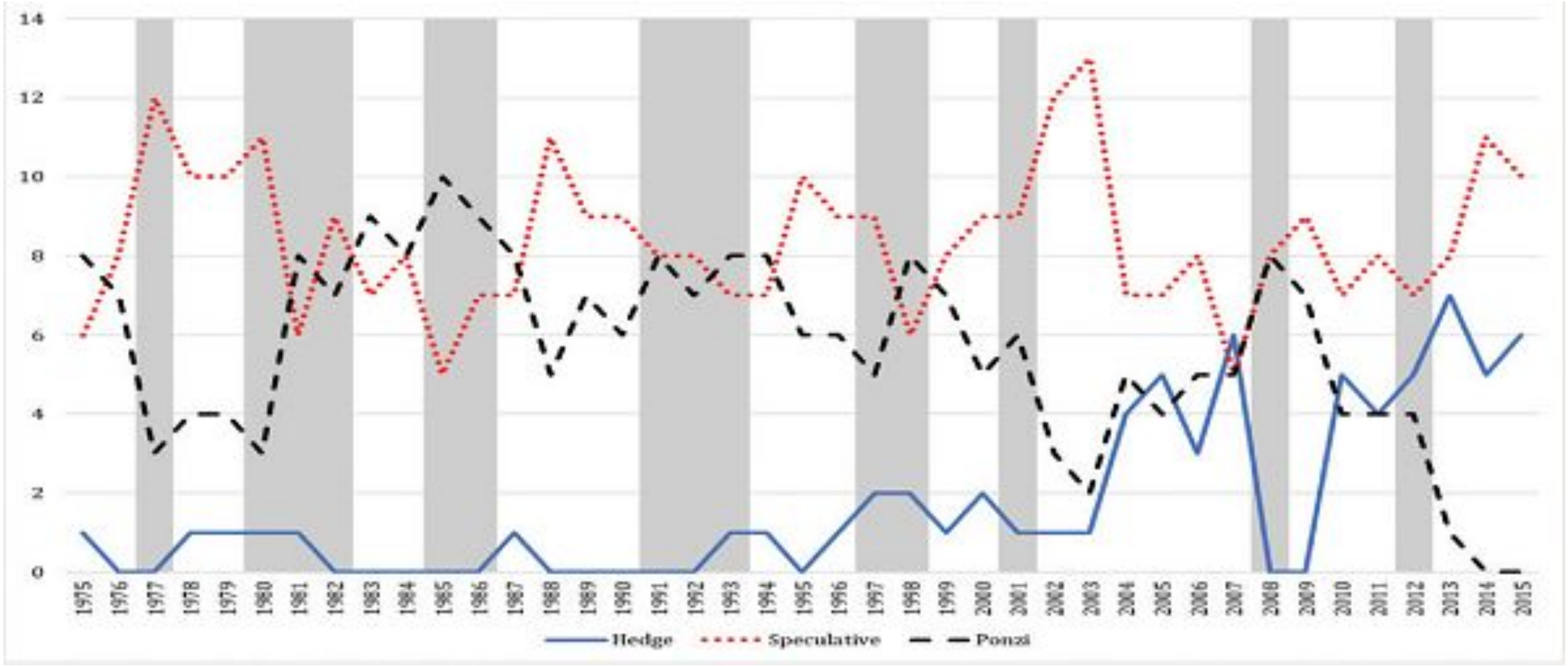
Evolution of financial fragility for Small Manufacturing Japanese firms (1975-2015)



Evolution of financial fragility for Large Non-Manufacturing Japanese firms (1975-2015)



Evolution of financial fragility for Small Non-Manufacturing Japanese firms (1975-2015)



Some conclusions from Nishi (2019)

1. Ponzi finance becomes popular before and during the recessions.
2. See this quotation

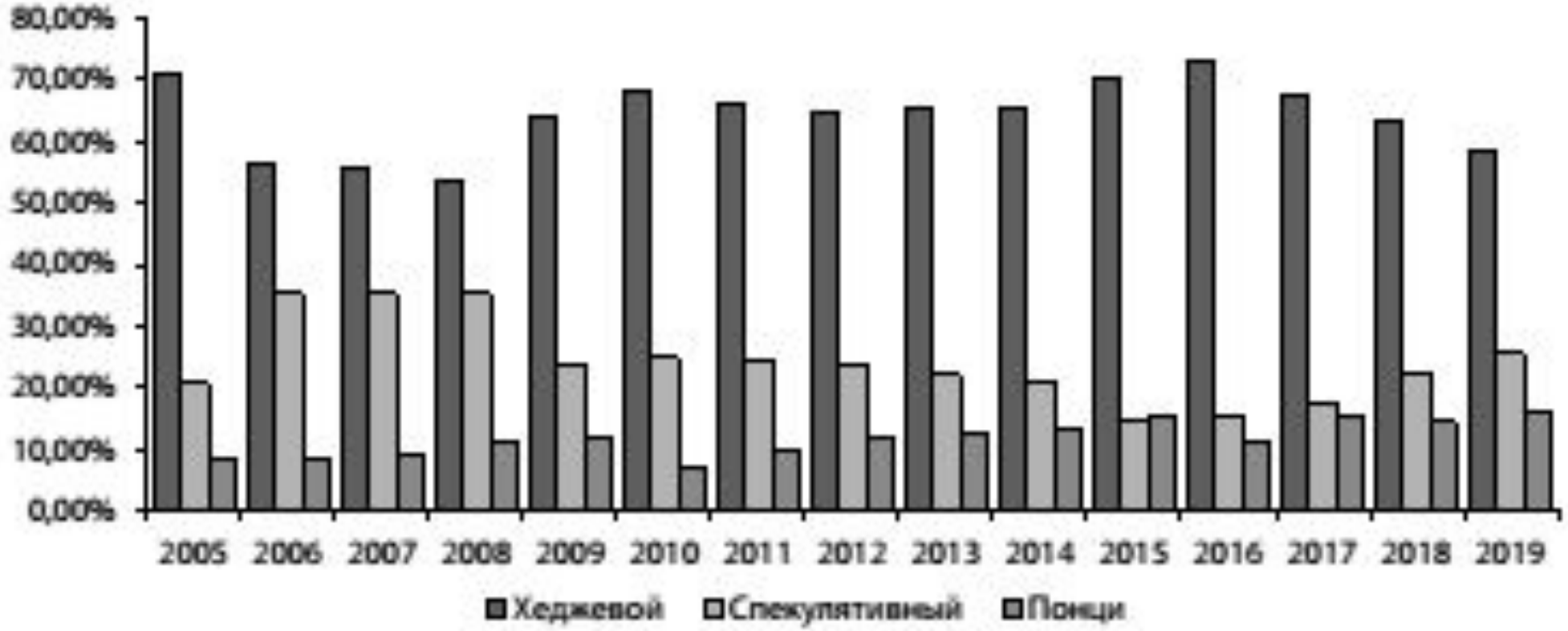
> The empirical analysis yielded several findings. During the period 1975–2015, the speculative finance position was the most dominant and persistent in the Japanese economy, regardless of the industry sector or company size. In terms of hedge and Ponzi finance, small firms are more financially fragile, use Ponzi finance more frequently than medium and large sectors do, in most cases, and use hedge finance less frequently than the two larger sectors do. By industry sector, the non-manufacturing sector is, in general, more financially fragile than the manufacturing sector, which uses hedge finance more frequently than the non-manufacturing sector in most cases. By contrast, the non-manufacturing sector uses Ponzi finance more frequently than the manufacturing sector does.

The example of latest research – for the South Korean private nonfinancial firms (Rozmainsky, Selitsky, 2021)

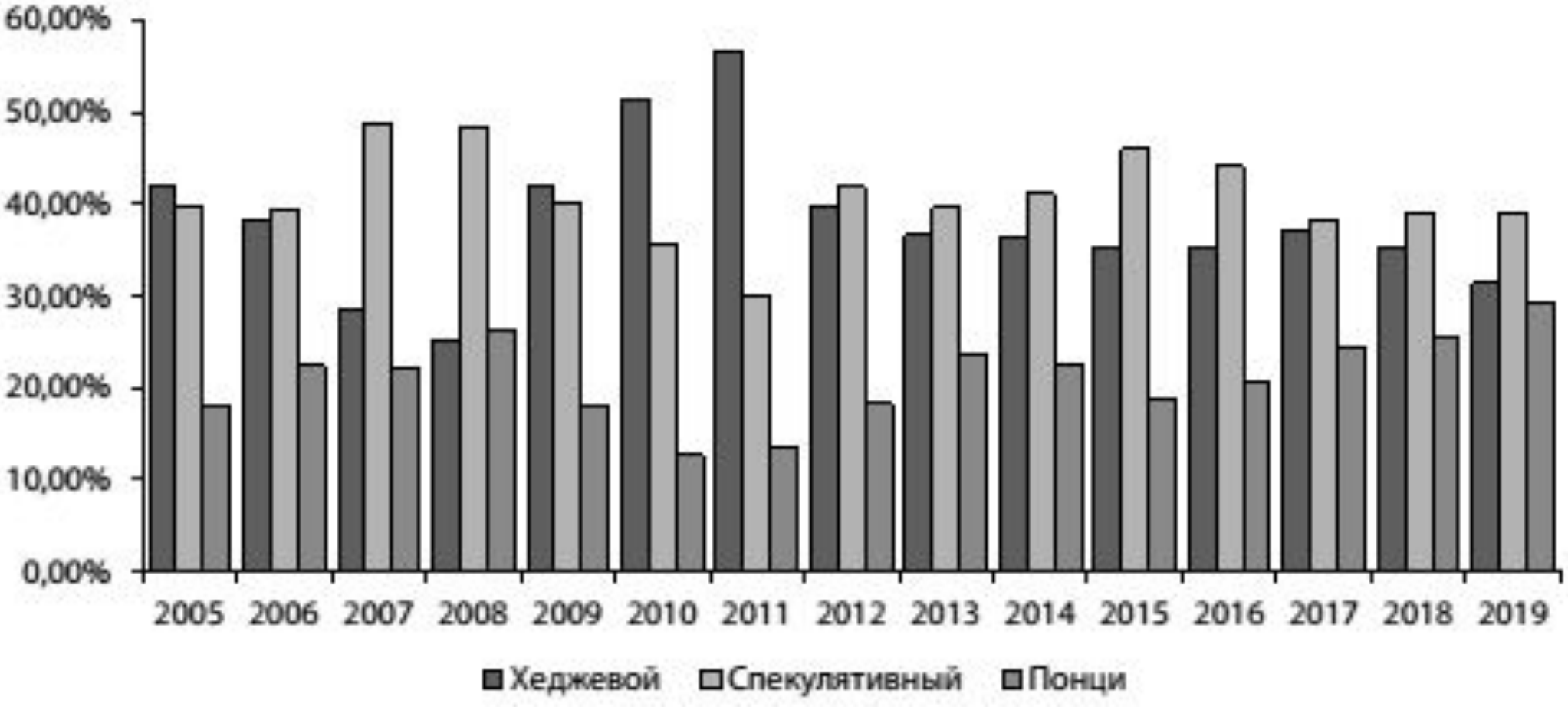
- The authors also analyzed firms of different sectors
- The authors used different criteria for estimating of the financial fragility's evolution.
- Some conclusions – see quotation:

The paper brought to light two time periods when the sector of private non-financial firms in South Korea became more financially fragile. The first period is the few years before and during the Great Recession. The second period is the few years preceding 2019, the last year of the analyzed period. The conclusion is made that by the beginning of the COVID-19 pandemic, the South Korean economy was vulnerable to crisis shocks.

Dynamics of different regimes of financing by the leading 102 South Korean firms according to the ICR (2005–2019)



Dynamics of different regimes of financing by the leading 102 South Korean firms according to the FFI (2005–2019)



Additional Reading

Бобрышова А. С., Розмаинский И. В.

Эмпирический анализ финансовой хрупкости общественного сектора в Южной Корее // AlterEconomics, 2022, 19 (3)