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The Role of Profit Expectations in Investment and Business Cycles:
A Panel Data Analysis of Japanese Listed Companies

Hiroyuki Uni

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Affiliation: Professor, Otemon Gakuin University

E-mail: uni_hiroyuki@yahoo.co.jp

Abstract

This paper investigates the relationship between investment and profits in business cycles by panel data analysis, using the consolidated financial data of the listed nonfinancial companies in Japan from 1991 to 2019. The estimated investment function of the Japanese manufacturing companies clearly shows that investment significantly depends on expected (future) profit rates forecasted by linear extrapolations. It can be inferred that the estimated coefficients of the profit rates in the investment function reflect not only the strength of the effect of the profit rates on the investment, but also the length of lead or lag between the cyclical fluctuation of profit and that of investment. As the length is not clear in the raw data of estimated coefficients, this paper propose a new method to clarify that length of lead and lag by assuming that the cyclical fluctuation of profit can be expressed as sine waves. Thus, using panel data analysis and avoiding the aggregation process used by Mitchell, we can measure the amplitude and the timing of cyclical fluctuations in profit and investment.

Moreover, this paper examines differences between the decision of real investment and that of financial investment using the same data set. This involves estimating a real investment function and a financial investment function, both of which include the real profit rates and the financial profit rates as explanatory variables. The results show that real investment in the manufacturing companies depends mainly on expected (future) real profit rates forecasted by linear extrapolations, whereas financial investment mainly depends on realized (past) financial profit rates.

Thus, although decisions of real investment are forward-looking behavior, decisions of financial investment are backward-looking behavior. The reason seems to be as follows. Real investment is investment in these manufacturing companies' core business, about which managers have a lot of knowledge and information that can be used to form an expectation of future profitability. However, financial investment in nonfinancial companies is investment in peripheral or emerging business carried by affiliated companies, about which managers have insufficient knowledge and information, especially in the case of overseas affiliates; so, these investments are decided mainly by reference to realized past profit rates. Moreover, because financial investment is not forward looking, it is less likely than real investment to be adjusted in a timely manner and more likely to result in over-investment or under-investment. Consequently, fluctuations of financial profits in nonfinancial companies are larger than fluctuations of real profits.

Keywords: Business Cycle, Expectation, Investment Function, Forward-looking Behavior, Financialization

I Introduction

Many economic theorists argue that investment is affected by expected profits, which would suggest that investment fluctuations are a leading indicator of business cycle conditions. However, using a method developed by Wesley C. Mitchell, a pioneer in business cycle analyses, it has often found that changes in investment lag behind changes in profits. Moreover, many estimations of the macro investment function that are based on aggregated time-series data often use past profits, not expected future profits, as explanatory variables.

An investment decision by an individual manager is usually made after considering various types of available information and giving greater weight to expected profits of his/her own company than to aggregated macro profits. But Mitchell's method for measuring amplitudes and timings of fluctuations in economic variables involved collecting and aggregating various micro data, dividing one cycle of the aggregate variable into nine stages, and calculating a deviation rate of the value of each stage from the average level. Information about the relationship between profits and investment of each individual company is almost entirely lost in the data aggregation process, which may lead to the aforementioned gaps between theory and empirical results.

Fortunately, recent developments in panel data analysis and accumulation of micro data make it possible to analyze the relationship between profits and investment without the data aggregation process, thereby helping to eliminate such gaps. This helps us in advancing both microeconomics and macroeconomics. Moreover, such developments should be interesting particularly for institutionalists and post-Keynesians because both attach the greatest importance to investigations of how expected profits affect business decisions and to examinations of the macroeconomic consequences of such decisions, by analyses of real-world data.

The structure of this paper is as follows: Section II explains viewpoints and methods used in this paper. Section III investigates the relationship between investment and profits in business cycles by panel data analysis, using the consolidated financial data of the listed nonfinancial companies in Japan from 1991 to 2019. The estimated investment function of the Japanese manufacturing companies clearly shows that investment significantly depends on expected (future) profit rates forecasted by linear extrapolations. It can be inferred that the estimated coefficients of the profit rates in the investment function reflect not only the strength of the effect of the profit rates on the investment, but also the length of lead or lag between the cyclical fluctuation of profit and that of investment. As the length is not clear in the raw data of estimated coefficients, I propose a new method to clarify that length of lead and lag by assuming that the cyclical fluctuation of profit can be expressed as sine waves. Thus, using panel data analysis and avoiding the aggregation process used by Mitchell, we can measure the amplitude and the

timing of cyclical fluctuations in profit and investment.

Section IV examine differences between the decision of real investment and that of financial investment using the same data set. This involves estimating a real investment function and a financial investment function, both of which include the real profit rates and the financial profit rates as explanatory variables. The results show that real investment in the manufacturing companies depends mainly on expected (future) real profit rates forecasted by linear extrapolations, whereas financial investment mainly depends on realized (past) financial profit rates.

Section V summarizes the results obtained in this paper and explain meanings of the results and implications for post-Keynesian institutionalism.

II Viewpoints and Methods

Backward- or forward-looking expectations?

Sherman (1991) proposed eight basic hypotheses which form the framework for testing and analysis in this book. The first two are as follows: 1. Investment is the key variable explaining cyclical ups and downs: 2. Investment is determined by expected profits (Sherman 1991, p. 72). Usually, the expected profit is the future profit forecasted by investors or managers. However, the explanatory variables used by Sherman in estimating a macroeconomic investment function are the amount of past profits or the past profit rates. If the estimated coefficients of these explanatory variables are positive and significant, he considered that the above hypothesis was verified. In this way, Sherman mentioned this discrepancy between the theoretical hypothesis and the empirical econometric test in the following excuse: “In an econometric test, expected profit rates and available funds may be represented by previous profit rates and previous total profits, with a long time lag” (ibid., p. 136)¹.

This excuse can be justified by assuming that “adaptive expectations” are used as a method of forecasting future profit rates. The adaptive expectation is a process for forecasting by partially correcting the forecasted value made in the previous period in consideration of the gap between this value and the actual value. As shown in Appendix 2, in the adaptive expectation, the forecasted future value is a weighted average of a series of past actual values. Although the adaptive expectations hypothesis justifies Sherman’s above excuse, it has a decisive defect that a change in the expected value lags behind a change in the actual value because adaptive expectations are fundamentally backward-looking². For example, when an investment is made

¹ Similar opinion is found in Sherman and Evans (1988, p. 162).

² See Makridakis, et al. (1998) for details, especially Figure. 4-7 (p. 152). In order to reduce this lag, the double exponential smoothing methods that combine level forecasting and trend forecasting have been

on the basis of an expected profit rate predicted by adaptive expectation, the change in investment lags behind the change in the profit rate. This result is contrary to the well-known fact that investment is generally a leading index in the business cycle³.

In order to explain the fact that the investment cycle precedes the profit rate cycle, the expected profit rate must be forecasted by a forward-looking model rather than a backward-looking model like adaptive expectations. However, the forward-looking model featured in economic theory is solely the rational expectations hypothesis⁴. According to this hypothesis, “the agents in the model use the model and all available information to forecast and therefore do not make systematic errors” (Carlin and Soskice 2015, p. 123). However, as pointed out by Carlin and Soskice (2015), forecasted values by the rational expectations hypothesis do not fit with the real-world data of investment (p. 30). Taking into account the limit of availability of information and the limit of information processing ability, I examine linear extrapolations as more realistic forward-looking expectations model than the rational expectations hypothesis⁵. In this paper, by estimating the investment function whose explanatory variables are the profit rates at the two points of time,⁶ we can determine which of the three expectations models: linear extrapolations, adaptive expectations and rational expectations, has the highest explanatory power.

Macro data or micro data?

A purpose of W. C. Mitchell’s study of the business cycle was to empirically clarify the diversity and the relationship of the amplitude and the timing of cyclical fluctuations of various economic indicators. He developed the method for collecting and aggregating various data, dividing one cycle of the aggregate variable into nine stages, calculating the deviation rate of

developed.

³ The economic index related to investment is the leading index because capital investment is made in advance based on future expectations because a certain period for the construction of equipment is required. (Mitchell 1951, p. 140)

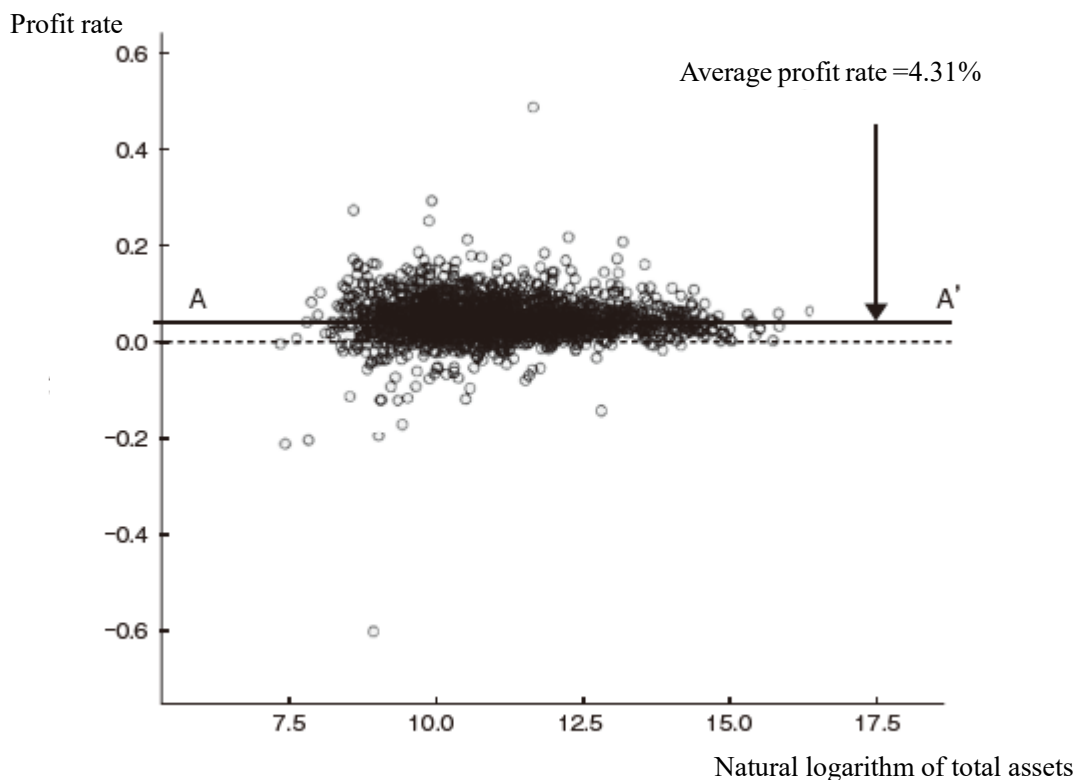
⁴ For example, Carlin and Soskice (2015) is a macroeconomics textbook that emphasizes forward-looking behavior of households, companies, central banks, etc. However, only the rational expectations model is explained as a forward-looking model.

⁵ Linear extrapolations can be understood as forecasting methods using the results of regression with time trend as the only explanatory variable. According to the classification of forecasting methods by Makridakis, et al. (1998), linear extrapolations would belong to “local regression methods” within “explanatory methods”, whereas adaptive expectations belong to “exponential smoothing methods” within “time series forecasting methods”. “Unlike explanatory forecasting, time series forecasting treats the system as a black box and makes no attempt to discover the factors affecting its behavior” (ibid., pp. 10-11). Linear extrapolations are forecasting methods based on past data, but they are forward-looking rather than backward-looking. As will be explained later, this can be understood by that changes in the expected value by linear extrapolations precede changes in the actual value.

⁶ As will be explained in Appendix 3, any cyclical movement of expected profit rate can be compounded from two cyclical movements with different initial phases. Therefore, the third one becomes redundant, which is also supported by empirical results in this paper.

the value of each stage from the average level, and measuring the amplitude and the timing of cyclical fluctuations of each variable.⁷ Sherman (1991) is the highest achievement of the business cycle study based on Mitchell's method. However, with this method, a lot of information is lost in the aggregation process and it cannot sufficiently clarify the relationship between various variables such as investment and profits at the individual company level. For deciding the amount of investment, an individual company mainly refers to the expected profit rate of the company itself, not to the macro expected profit rate (that is, the average value in the entire economy).⁸ And the profit rate of individual companies varies widely.

Figure 1. Distribution of all listed companies in 1996 Japan



Sources: Made by the author using the data of Toyo Keizai Inc. “Financial Data Digest,” 2003 edition. See Appendix 1 for details.

⁷ See Burns and Mitchell (1947) for details. A comprehensible explanation of this method can be found in Sherman and Evans (1988).

⁸ Curtin (2019) mentioned as follows in a study about consumer expectations. “Rather than basing their expectations on public information, consumers typically used private information about the prices and employment conditions that they actually faced. Indeed, economic theory holds that consumers should base their decisions on the conditions that they actually face rather than the national average. When aggregated properly, of course, the conditions faced by each consumer should equal the national averages, although with much wider true dispersion than suggested by the sole “representative agent” models commonly used in economics” (p.24).

Figure 1 is a scatter plot of all the 2047 listed companies (825 manufacturing companies + 1222 non-manufacturing companies)⁹ in 1996 Japan on a plane where the vertical axis shows the profit rate and the horizontal axis shows the scale of company measured by its total assets. The height of the horizontal solid line AA' in this figure indicates the average value of the profit rates. It is clear that, on the left side where the firm size is relatively small, the vertical variation is large.

On the other hand, studies on the relationship between corporate growth and profits has been accumulated under a completely different interest from the business cycle study. One of the triggers was Penrose (1959), who pointed out the increase in the cost of corporate growth and the existence of management limits, and Marris (1964), who theoretically showed the possibility of a trade-off between growth and profits. In the line of these studies, there are many studies that attempted to statistically clarify the relationship between corporate growth and profits by using micro data, such as financial data of listed companies, instead of aggregate data of macro economies. One of the focuses of their analysis is whether the profit rate has a positive or negative effect on the company growth rate, and vice versa. As relatively long-term financial data became available and panel data analysis became easy to use in statistical software, recent studies often use panel data analysis, such as fixed-effect estimation. The recent development of panel data analysis and accumulation of micro data may contribute to overcoming the above-mentioned shortcomings in Mitchell's method.

Are cycles important?

Armstrong (2002) criticizes Mitchell et al.'s business cycle studies as follows. "Dewey and Dakin (1947) believed that economic forecasting should be done only through mechanical extrapolation of the observed cycles. They were unable to validate their claim. Burns and Mitchell (1946) followed the same philosophy in applying cycles to economics. Their work was extended in later years, but with little success" (p. 233). According to Armstrong (2002), a defect in Mitchell's method is as follows: "Small errors in estimating the length of a cycle can lead to large errors in long-range forecasting if the forecasted cycle gets out of phase with the actual cycle. The forecasts might also err on the amplitude of the cycle. As a result, using cycles can be risky" (p. 233). However, he states that it is useful to consider cycles in the following cases. "If you are very sure about the length of a cycle and fairly sure of the amplitude, use the information" (p. 233).

As will be described later, in Japan from 1991 to 2019, which is the period of analysis in this paper, five business cycles with a cycle length of about five years are observed. Therefore, it is effective to use the viewpoint of cycles. In this paper, the business cycle is explicitly considered

⁹ These samples include companies that was not listed continuously from 1991-2001.

when interpreting the results of panel data analysis and setting the estimation period. The problem of forward-looking or backward-looking can also be considered as a problem of cyclical timing (lead or lag) that Mitchell focused on. Furthermore, by assuming that the profit rate cycle can be represented by a sine wave, I will propose a new method for measuring the strength of the effect of the expected profit rate on investment and the lengths of the leads and lags, based on micro data.

III The Role of Profit Expectations in Investment

Profit rates and investment in Japan

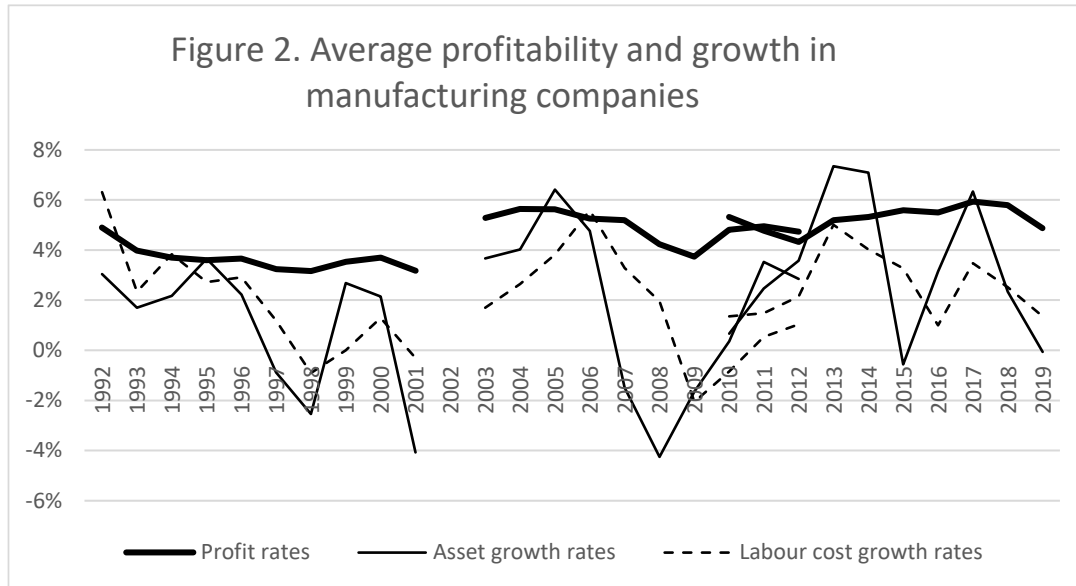
Figure 2 shows average profit rates, average asset growth rates and average labor cost growth rates in manufacturing companies that were listed on the Japanese stock markets continuously (781 companies from 1991 to 2001, 1056 companies from 2002 to 2012 and 1082 companies from 2009 to 2019¹⁰). For these three variables, approximately five cyclical fluctuations are observed within this period. The first cycle has a trough in October 1993, a peak in May 1997 and the next trough in January 1999, according to the Cabinet Office's "Business-Cycle Dating".¹¹ A domestic trigger for this cycle was financial crises such as bankruptcies of Yamaichi Securities Co., Ltd. and the Hokkaido Takushoku Bank in 1997-98, as a result of postponement of disposal of non-performing loans brought about by the bursting of the bubble economy. Another trigger was the Asian currency crisis in 1997-98. The second cycle has a trough in January 1999, a peak in November 2000 and the next trough in January 2002. A trigger for this second cycle was the burst of the Internet bubble. The third cycle has a trough in January 2002, a peak in February 2008 and the next trough in March 2009. A trigger for this third cycle was the global financial crisis. The fourth cycle has a trough in March 2009, a peak in March 2012 and the next trough in November 2012. A trigger for this fourth cycle was the disruption of the supply chain and the lack of power supply due to the 2011 Great East Japan Earthquake and the Fukushima Daiichi Nuclear Power Plant accident. The fifth cycle has a trough in November 2012, a peak in October 2018 and the next trough in May 2020. A trigger for this fifth cycle was intensification of the U.S.-China trade war.

Figure 2 shows that the amplitude of the cyclical fluctuation of the profit rate is smaller than that of the asset growth rate and the labor cost growth rate. In other words, the average profit

¹⁰ Although omitted here, I made a figure that show average profit rates, average asset growth rates and average labor cost growth rates of non-manufacturing companies (378 companies in 1991–2001, 879 companies in 2002–2012 and 1112 companies in 2009–2019). Similar characteristics to the above-mentioned manufacturing companies can be observed in the non-manufacturing companies.

¹¹ Cabinet Office "Business-Cycle Dating" July 19, 2022. <https://www.esri.cao.go.jp/en/stat/di/rdates.html>

rate had been relatively stable at around 5%, while the average asset growth rate and the average labor cost growth rate fell to negative in some troughs. As the primary goal of capitalist companies is the pursuit of profit, it is natural that employment, wages and investment tend to be sacrificed in order to secure profits.



Sources: Made by the author using the data of Toyo Keizai Inc. “Financial Data Digest,” 2003, 2013 and 2020 editions. See Appendix 1 for details.

Panel data analysis using micro data

Based on the observations of the above average values in Figure 2, many listed companies in Japan seem to have adjusted investment in response to cyclical changes in the profit rates. However, when managers adjust the amount of investment, what they mainly refer to is not the average profit rate of the entire economy, but the expected future profit rate of their own company. Therefore, from the observation of the average values, it cannot be clarified how much the profit rate affected on the investment, and with how long of a lead or lag the investment fluctuated with respect to the profit rate cycle.

The panel data analysis using micro data enables an approach to addressing these issues. As an estimated equation, the following fixed-effect model is mainly used:

$$g_{it} = ar_{it} + br_{it-1} + c + d_1D_1 + d_2D_2 + d_3D_3 + \dots + u_{it} \quad (1)$$

where g refers to the asset growth rate as a dependent variable, r to profit rate as the explanatory variable, and D to the dummy variables for each firm i in time period t (the current year), and $t-1$ (the previous year). In such a fixed-effect model, the characteristics possessed by each firm not explained by the explanatory variable are assumed to be constant over time

but varies between firms.¹²

First, a panel data analysis using the above equation was performed for 806 manufacturing companies listed continuously from 1991 to 2001¹³. The result is shown in the column (1) in Table 1, where the asset growth rate is a dependent variable, and the current profit rate and the one-period lag profit rate are explanatory variables. In the result shown in column (1), the estimated coefficient of the current profit rate is positive (1.291) and that of the one-period lag profit rate is negative (−0.577), both of which are statistically significant at the 0.1% significance level. The column (2) shows the result for 1085 manufacturing companies listed continuously from 2002 to 2012, and the column (3) shows the result for 1082 manufacturing companies listed continuously from 2011 to 2019. In both cases, signs and magnitudes and significance levels of estimated coefficients are almost same as those in the column (1).

On the other hand, in the result for non-manufacturing companies shown in the columns (4), (5) and (6), the estimated coefficients of the one-period lag profit rate is not significant except for column (6), and adjusted R-squared values are low. Since the non-manufacturing industry is an aggregate of industries with quite different characteristics, further subdivided research seems to be necessary.

Table 1. Results of estimation of investment function.

Explained variable	Manufacturing			Non-manufacturing		
	Asset growth rate t			Asset growth rate t		
	(1)	(2)	(3)	(4)	(5)	(6)
Period	1993–2001	2004–2012	2011–2019	1993–2001	2004–2012	2011–2019
Profit rate t (a)	1.291*** (29.26)	1.256*** (45.12)	1.213*** (40.75)	1.198*** (11.16)	1.176*** (26.32)	1.150*** (30.73)
Profit rate $t-1$ (b)	−0.577*** (−12.59)	−0.498*** (−17.78)	−0.599*** (−20.30)	0.099 (0.94)	−0.063 (−1.42)	−0.403*** (−11.13)
Constant (c)	−0.020*** (−8.79)	−0.025*** (−16.68)	0.003 (1.64)	−0.038*** (−9.18)	−0.039*** (−14.10)	0.023 (0.92)
N. observations	7254	9765	9738	3465	8001	10008
within R ²	0.1174	0.1652	0.1632	0.0576	0.1069	0.0992
between R ²	0.3843	0.4128	0.2164	0.2099	0.2614	0.2471
overall R ²	0.1631	0.2051	0.1646	0.0795	0.1195	0.1226
Method	Fixed effects	Random effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects

Notes: The table shows the results of the panel data regressions using the equation (1). Figures are estimated coefficients, and t-statistics are shown in parentheses below estimated coefficients. R² refers to the adjusted R-squared value. N. observations refers to the number of observations used. In addition to the fixed-effects

¹² I estimated an equation adding a 2-period lag variable as the third explanatory variable, but the estimated coefficient of the 2-period lag variable was not statistically significant.

¹³ The number of the samples in Figure 1 was 781 manufacturing companies because some samples without data of labor costs were excluded.

model, I estimated random-effects model and pooling regression model, and adopted the most desirable result based on the results of F test, Hausman test and Breusch and Pagan test.

* Significance levels at 5% level.

** Significance levels at 1% level.

*** Significance levels at 0.1% level.

Profit expectation by linear extrapolations

The first point in the above results of panel data analysis is how to interpret the negative estimated coefficient of the one-period lag profit rate in the columns (1), (2), (3) and (6) of Table 1¹⁴. The second point is that the magnitudes of the estimated coefficients seem to reflect the strength of the effect of the profit rate on the investment at the individual company level. Moreover, they seem to reflect the length of lead (or lag) of the asset growth rate cycle, with respect to the profit rate cycle. That is, they seem to reflect the length of forward-looking span (or backward-looking span) in profit expectation. However, the quantitative meanings are unclear in the raw data of these estimated coefficients. By assuming that the profit rate cycle can be expressed as a sine wave, I propose a new method to clarify the above-mentioned the strength and the length of lead or lag of the effect of the profit rate on investment. Details of this method are explained in Appendix 3.

Regarding the above first point, although most of the previous studies on European or the U. S. companies detected positive effects (Cowling 2004, Goddard et al. 2004, Coad 2007, Coad 2010, Coad et al. 2011, Jang and Park 2011), the result of Lee (2014)'s panel data analysis using the financial data of 606 listed companies in Korea from 1999-2008 showed that the one-period lag ratio of net income to sales and this two-period lag ratio have a negative effect on the current sales growth rate¹⁵. Lee tentatively interpreted this result based on the hypothesis of "growth and profit trade-off" by Penrose (1959) as follows:

Here, we focus on the possibility that empirical results may be different across countries, depending on the institutional circumstances specific to a country. The finding of the negative

¹⁴ In a panel data analysis of consumers' inflation expectation, Curtin (2010) also found the negative estimated coefficient of the one-period lag variables. However, he rejected this fact because "exactly the opposite of what the adaptive hypothesis would predict" (p. 54).

¹⁵ As explanatory variables, in addition to the ratio of net income to sales, he adopted year dummies, the ratio of debt to assets and the natural logarithm of total assets. Moreover, although the sales growth rate may be relatively close to the asset growth rate, the ratio of net income to sales and the profit rate differ in various extents by industry. To avoid this problem, Lee used as an explanatory variable the gap between the median value of the ratio of net income to sales in each industry and the value of each company. However, even with such procedure, the problem of deviation of the ratio of net income to sales from the profit rate would remain. None of the previous studies surveyed by Lee (2014) have adopted the profit rate and the asset growth rate as variables, and it seems that they have similar problems. Also, most of these previous studies have the same defect as Lee (2014) that they do not take the business cycle into account.

effect may reflect the national context of weak investor protection and institutional environment in Korea. Furthermore, since the financial crisis in 1997, the Korean government has actively undertaken policy reforms to restructure its economy, driving thereby corporate downsizing of private sector companies. The reforms force profit-oriented firms to forgo growth opportunities; consequently, the firms may refuse to increase their capacity through additional investments and tend to take a short-term view to maintain profitability. (Lee 2014, p. 10)

Unlike such interpretation based on the hypothesis of “growth and profit trade-off”, I interpret the negative estimated coefficient of the one-period lag profit rate in Table 1 based on profit expectation by linear extrapolations as follows.

The right side of the estimated equation (1) can be modified as follows.

$$\begin{aligned}
 g_{it} &= ar_{it} + br_{it-1} + c + d_1D_1 + d_2D_2 + d_3D_3 + \cdots + u_{it} \\
 &= (a+b)r_{it} + (-b)(r_{it} - r_{it-1}) + c + d_1D_1 + d_2D_2 + d_3D_3 + \cdots + u_{it} \\
 &= (a+b) \left[r_{it} + \frac{(-b)}{a+b} (r_{it} - r_{it-1}) \right] + c + d_1D_1 + d_2D_2 + d_3D_3 + \cdots + u_{it} \quad (2)
 \end{aligned}$$

If the estimated coefficient (b) of the one-period lag profit rate is negative, and if the value $a+b$ is positive, $(-b)/(a+b)$ is a positive value. Then, the equation in the brackets

$\left[r_{it} + \frac{(-b)}{a+b} (r_{it} - r_{it-1}) \right]$ shows a linear extrapolation of a future profit rate. The linear extrapolation is such a simple method of expectation as adding $\frac{-b}{a+b} (r_{it} - r_{it-1})$ to the current profit rate, where $(r_{it} - r_{it-1})$ is the difference between the current profit rate and the previous year profit rate, and $(-b)/(a+b)$ is positive adjustment parameter.

Regarding the above second point, we can clarify the strength and the length of lead (or lag) of the effect of the profit rate on investment, by the method described in detail in Appendix 3. This length of lead (or lag) means the length of forward-looking span (or backward-looking span) in profit expectation.

The relative amplitude and the length of lead of investment cycle with respect to profit rate cycle are shown in Table 2, which are calculated based on the estimated coefficients in Table 1. When the length of lead is a positive value, it means that investment is determined by forward-looking expectation of the future profit. And when it is a negative value, investment is determined by backward-looking expectation. Although the amplitude is similar, the length of lead is different between manufacturing companies and non-manufacturing companies in Table 2. The investment cycle in manufacturing companies has about 0.3–0.4 years (approximately four months) lead with respect to the profit rate cycle. The timing of investment measured in this analysis is when it is recorded as an asset in the financial statements. Naturally, investment

decisions are made prior to capitalization. Expressing this interval as T, the investment decision is made based on the expected future profit rate T plus approximately four months ahead. That is, the investment decision is a forward-looking behavior. This result is consistent with the well-known fact that economic indicators related to investment are leading indicators in the business cycle.

Regarding non-manufacturing companies, the length of lead shown in Table 2 is shorter than that of manufacturing companies. This fact that the non-manufacturing industry's investment cycle lags several months behind the manufacturing industry's investment cycle can be confirmed in "Capital Investment Trend Survey" conducted by the Nihon Keizai Shimbun twice a year.

Table 2. Relative amplitude and length of lead of investment cycle

Period	Relative Amplitude			Length of lead (unit: year)		
	1993–2001	2004–2012	2011–2019	1993–2001	2004–2012	2011–2019
Manufacturing	1.24	1.20	1.18	0.36	0.32	0.40
Non-manufacturing			1.09			0.28

Notes: The amplitude and the initial phase of profit rate cycle are set 1 and 0 respectively. Blank cells indicate that the values are not computed because the estimated coefficients are not significant.

Sources: Calculated by the author from the data in Table 1 using the method explained in Appendix 3.

Rational expectation?

If assuming that the investment cycle precedes the profit rate cycle, and if assuming rational expectations hypothesis, regression analysis using lead variables, rather than lag variables, as explanatory variables would be more effective. Therefore, I replaced the one-period lag profit rate in Equation (1) by the one-period lead profit rate. The estimated results using this replaced equation are shown in Table 3. As shown in column (1), the estimated coefficient of the one-period lead profit rate is not significant in 1992–2000, whereas the estimated coefficient of the one-period lag profit rate was significant in the result shown column (1) in Table 1. Moreover, adjusted R-squared values in Table 3 are lower than those in columns (1), (2) and (3) in Table 1. These results suggest that the rational expectation hypothesis has lower explanatory power with regard to forward-looking profit expectation behavior of managers than the linear extrapolations.

Table 3. Results of estimation of investment function using a lead variable (manufacturing companies).

Explained variable Period	Asset growth rate t		
	1992–2000	2003–2011	2010–2018
Profit rate t (a)	0.976*** (22.01)	0.861*** (27.79)	0.858*** (28.13)
Profit rate $t+1$ (b)	0.054 (1.27)	0.415*** (13.36)	0.254*** (8.25)
Constant (c)	−0.031*** (−14.10)	−0.054*** (−27.71)	−0.023*** (−11.4)
N. observations	7254	9765	9738
within R ²	0.0854	0.1579	0.1229
between R ²	0.3939	0.3629	0.2103
overall R ²	0.1381	0.1732	0.1035
Method	Fixed effects	Fixed effects	Fixed effects

Notes: See Table 1.

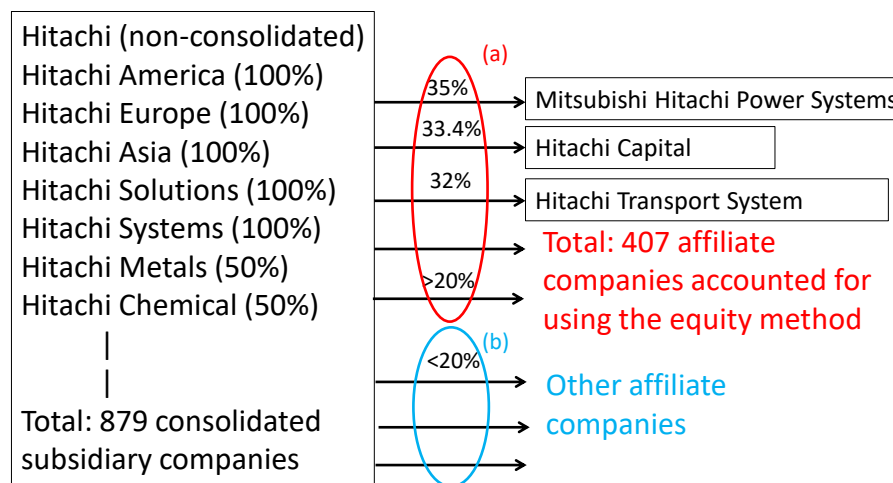
IV Differences in Expectation between Real Investment and Financial Investment

A typical financial structure of a non-financial company

In order to explain the financial structure of globalized and financialized companies, the classification of real and financial assets, and the classification of real and financial profits, which will be used below, I illustrate the organization and the composition of assets and profits of typical corporate groups using Hitachi's consolidated financial statements in March, 2018.

As shown in Figure 3, Hitachi is a huge corporate group with 879 consolidated subsidiaries. The number of employees in non-consolidated Hitachi is 34,925, but that in consolidated Hitachi is 307,275. Therefore, about 90% of employees work at consolidated subsidiaries. Among consolidated subsidiaries, there are regional headquarters such as Hitachi America, Hitachi Europe and Hitachi Asia, of which non-consolidated Hitachi has 100% of stocks. Companies, of which non-consolidated Hitachi has 50% or more of stocks, are consolidated. Consolidated subsidiaries are formally established as separate organizations in line with the globalization and diversification of corporate management, but in reality, it is appropriate to think that the consolidated Hitachi is a single operating unit. From this perspective, the consolidated financial statements are prepared to capture the business activities of the entire corporate group.

Figure 3. The structure of Hitachi group in March 2018

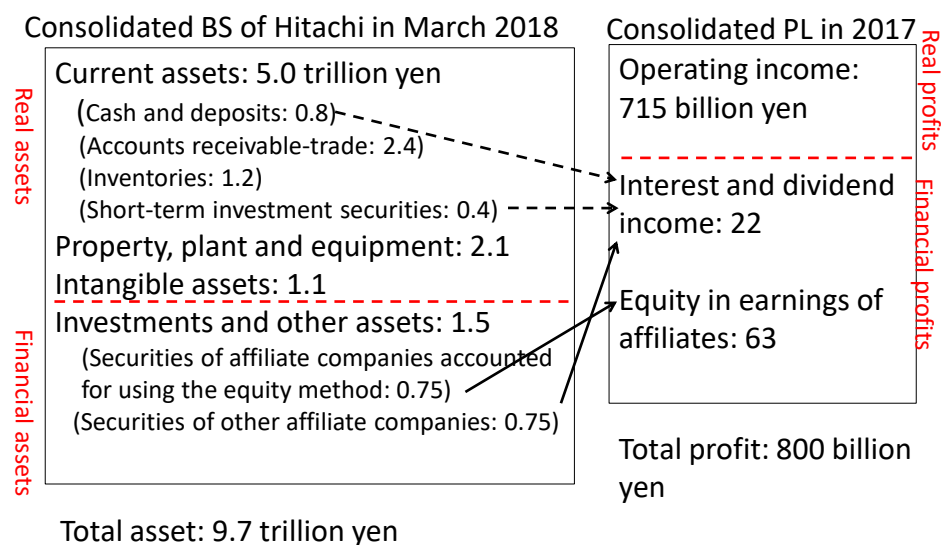


Notes: Both investment (a) and (b) are counted in “investments and other assets” in the BS. Income from the investment (a) is “equity in earnings of affiliates” and income from the investment (b) is “interest and dividend income” in the PL.

Sources: Made by the author from the consolidated financial statements of Hitachi in March 2018.

Hitachi also makes a lot of investments in companies other than consolidated subsidiaries. These are recorded in “investments and other assets” in the consolidated balance sheets. As shown in Figure 4, it reaches about 1.5 trillion yen, a half of which are “securities of affiliate companies accounted for using the equity method” and the other half are “securities of other affiliate companies.” The latter is a financial asset in which Hitachi cannot significantly influence the management policy of the investee company (Hitachi’s income based on these financial assets is recorded as “interest and dividend income”). The former is an investment in which Hitachi cannot control the investee company, but can have a significant influence on the decision of the management policy of the investee company (generally judged based on a stake of 20% or more of stocks). This former investee company is called “equity method affiliated companies.” Hitachi has 407 equity-method affiliated companies. Although detailed explanations are omitted, profits of equity method affiliated companies are recorded in Hitachi’s consolidated financial statements in the following manner. For example, in the case of an equity method affiliated company whose 35% of stocks Hitachi holds, 35% of the current net profits is recorded as “equity in earnings of affiliates” in Hitachi’s consolidated statement of income. It will contribute to increasing Hitachi’s current net profits.

Figure 4. Divisions of real and financial assets and profits



Sources: See Figure 2.

In this paper, the sum of “equity in earnings of affiliates” and “interest and dividend income” is called “financial profits.”¹⁶ “Operating income” is called “real profits.”¹⁷

It seems that the classification between real profits and financial profits as described above is accurate, but there are some inaccuracies left in the classification between real assets and financial assets adopted in this paper. As shown in Figure 4, there are two types of assets that bring financial profits: deposits and short-term securities held in “current assets” and “investments and other assets”. However, the database used in this analysis does not distinguish between cash and deposits, and about half of the samples lack data of short-term securities. For this reason, in this paper, deposits and short-term securities within “current assets” are not regarded as financial assets, and only “investments and other assets” are regarded as financial

¹⁶ There are remarkable differences between the changes in the number of consolidated subsidiaries and that in the number of equity method affiliated companies analyzed in this paper. The number of consolidated subsidiaries has increased almost consistently due to the establishment of overseas subsidiaries or the separation of non-core businesses. The banking crisis in Japan and the Asian currency crisis in 1998, and the global financial crisis in 2008 had little effect on the increasing trend of consolidated subsidiaries. However, the number of equity method affiliated companies began to decline when these financial crises occurred, and continued to decline for several years. This may be because, unlike consolidated subsidiaries, equity method affiliated companies can be relatively easily separated by selling their shares. In this respect, investment in an equity method affiliated companies has a character close to that of financial assets in a pure sense, so in this paper we regard it as financial assets and consider “equity in earnings of affiliates” as financial profits. Orhangazi (2008) also regards equity in earnings of affiliates as financial profits.

¹⁷ Therefore, the real profit in this paper does not include depreciation costs. Although some claim that depreciation costs have a character as profits, in many sample companies, the data of “operating income before depreciation” are missing. In addition, in consideration of the fact that the rate of over-depreciation varies considerably by company, depreciation costs are not included in profits in this paper.

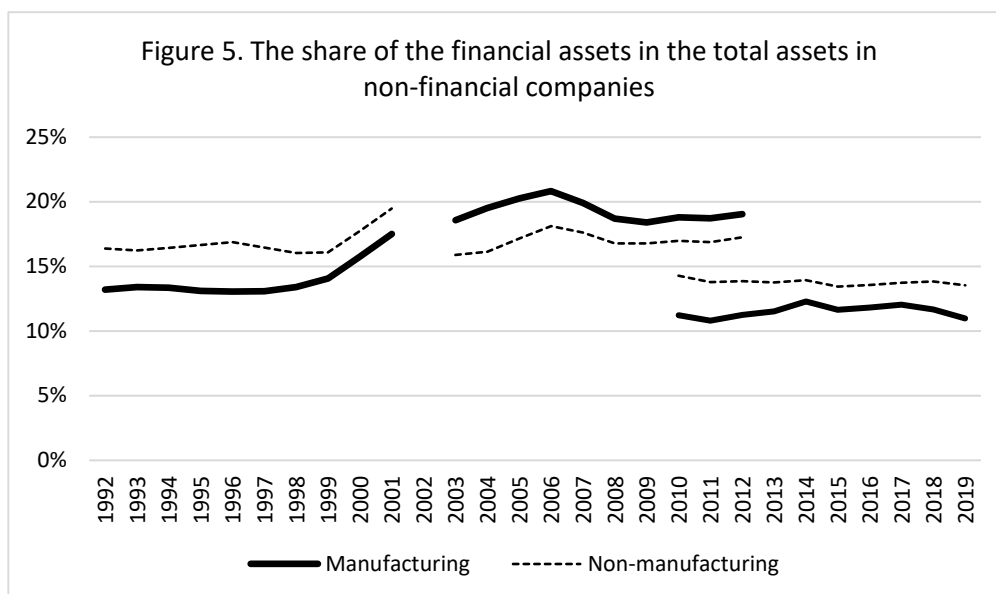
assets. That is, in Figure 4, the relationship between assets and profits indicated by dotted arrows is omitted, and only the relationship indicated by solid arrows is analyzed. However, the effect of this omission seems to be small for the following reasons. First, under the low interest policy in Japan, deposits hardly create interests. Second, in the samples with the data of “short-term securities”, their amount is about one tenth of the amount of “investments and other assets,” so even if they are omitted, the amount of financial assets is undervalued by about 10%, and the financial profit rate is only overvalued by about 10%. In the following analysis, “financial assets” are defined as “investment and other assets,” and “financial profit rates” = (financial profit) / (financial assets). Further, assets other than “investment and other assets” are defined as “real assets”, and “real profit rates” = (real profits) / (real assets).¹⁸

Financialization in non-financial companies

Figure 5 shows the share of the financial assets in the total assets in non-financial companies that were listed on the Japanese stock markets continuously from 1991 to 2001, from 2002 to 2012 and from 2010 to 2019.¹⁹ There is a large discontinuity in this figure because the number of samples has increased significantly, reflecting the increase in listing on the stock markets. Ignoring this discontinuity, both in the manufacturing and in the non-manufacturing companies, the share of financial assets rose by about 7 percentage points from 1999 to 2006, and fell by about 2 percentage points from 2007 to 2009. In other periods, it was almost constant. Therefore, as the share of financial assets has risen by about 5 percentage points in total, it can be judged that financialization of non-financial companies occurred in Japan.

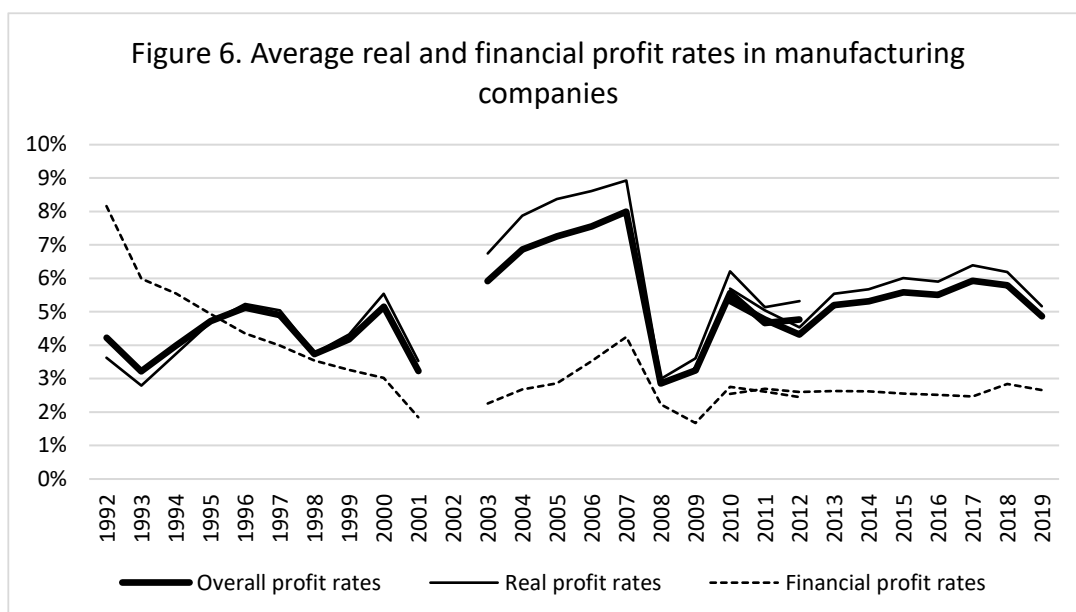
¹⁸ See Appendix 1 for details.

¹⁹ The share of financial assets in each company was calculated, and based on that, a simple average was calculated for all manufacturing companies and all non-manufacturing companies.

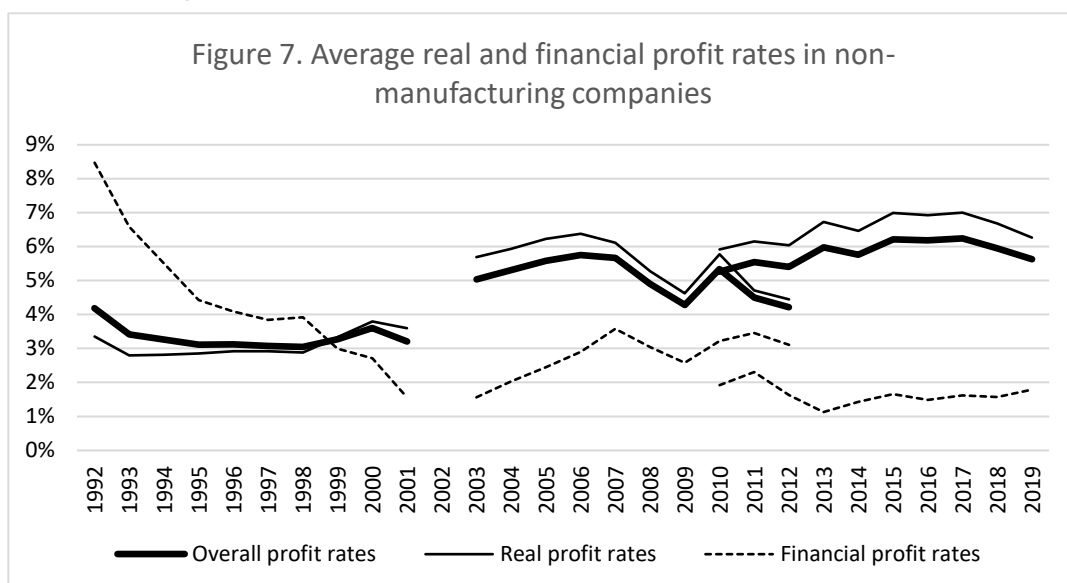


Sources: Made by the author using the data of Toyo Keizai Inc. “Financial Data Digest,” 2003, 2013 and 2020 editions. See Appendix 1 for details.

Figures 6 and 7 show the average values of the overall profit rates, the real profit rates and financial profit rates in the manufacturing companies and the non-manufacturing companies, respectively. These profit rates fluctuate by several percentage points corresponding to the business cycle. The amplitude of fluctuation is larger in the manufacturing companies than in the non-manufacturing companies. In addition to such fluctuations corresponding to the business cycle, the financial profit rates declined continuously in the 1990s after the collapse of the financial asset bubble. This can be seen as a process in which the bubble disappears. Then, in the 2000s, the financial profit rates entered the recovery process. However, the global financial crisis interrupted this recovery for several years. Comparing the level of the financial profit rates with the level of the real profit rates, the former was higher than the latter in the first half of the 1990s and was lower in the latter half. The former continued to be less than the latter in the 2000s and the 2010s.



Sources: See Figure 5.



Sources: See Figure 5.

Panel data analysis of real and financial investment

By the analysis of the aggregated data as described above, we can guess how much financialization as the increase in the aggregated share of financial assets affects the aggregated overall profit rates. For example, in the situation where the aggregated real profit rates are significantly higher than the aggregated financial profit rates, as in the 2000s, an increase in the aggregated share of financial assets would have the effect of lowering the aggregated overall profit rates. However, such inference based on the aggregated average values is almost useless if we take into account investment decisions in individual companies. This is because there are

considerable differences in the share of financial assets, the real profit rates and the financial profit rates by companies. When individual managers decide how much to invest in real assets and in financial assets, they take into account mainly the expected future profit rates of their own company. Therefore, in order to clarify the impact of financialization on investment decisions, it is an effective method to model the decision process of real investment and financial investment in individual companies and to estimate the model using micro data.

As mentioned above, when it is assumed that investment decisions are made based on the expected future profit rates, the minimum required data are the profit rates at two points of time. Therefore, the following simple fixed-effect model can be considered as an estimated equation for the investment function. Equations (3) and (4) are the estimated equations of the real investment function and that of the financial investment function, respectively.

$$g_{it}^r = c + a_1 r_{it}^r + a_2 r_{it-1}^r + b_1 r_{it}^f + b_2 r_{it-1}^f + d_1 D_1 + d_2 D_2 + d_3 D_3 + \cdots + u_{it} \quad (3)$$

$$g_{it}^f = c + a_1 r_{it}^r + a_2 r_{it-1}^r + b_1 r_{it}^f + b_2 r_{it-1}^f + d_1 D_1 + d_2 D_2 + d_3 D_3 + \cdots + u_{it} \quad (4)$$

Where g_{it}^r and g_{it}^f refer to the real asset growth rate and the financial asset growth rate, respectively, and r_{it}^r and r_{it}^f to the real profit rate and the financial profit rate, respectively, and D to the dummy variables for each firm i in time period t (the current year), and $t-1$ (the previous year). In such a fixed-effect model, the characteristics possessed by each firm not explained by the explanatory variable are assumed to be constant over time but varies between firms.²⁰

The results of estimation are shown in Table 4. Equations (3) and (4) formulate a simple model that uniformly explain the investment behavior at individual companies. They include only real profit rates and financial profit rates at two points of time as explanatory variables. In order to explain 100% of differences in asset growth rates by company and by year, political and economic variables that affect at the macroeconomic level and at the industry level should be added as explanatory variables. Moreover, it is necessary to add political and economic variables at the company level other than profit rates. These variables include various institutional variables. However, since all of these variables is omitted in Equations (3) and (4), the coefficients of determination (R-squared values) shown in Table 4 are low. However, the relationship between the asset growth rates and the profit rates is a core relationship corresponding to the skeleton of capitalist firms, which is reflected in the high significance of the estimated coefficients of the profit rates in many estimations.

²⁰ I estimated an equation adding a 2-period lag variable as the third explanatory variable, but the estimated coefficient of 2-period lag variable was not statistically significant.

Table 4a. Results of estimation of real and financial investment function (manufacturing companies).

Period	1993–2001		2004–2012		2011–2019	
Explained variable	(1) Real asset growth rate t	(2) Financial asset growth rate t	(3) Real asset growth rate t	(4) Financial asset growth rate t	(5) Real asset growth rate t	(6) Financial asset growth rate t
Real profit rate t (a1)	1.198*** (31.02)	0.655*** (6.15)	1.135*** (43.45)	0.791*** (12.31)	1.158*** (40.46)	0.428*** (6.88)
Real profit rate $t-1$ (a2)	-0.552*** (-13.76)	0.223** (2.01)	-0.499*** (-18.85)	-0.152** (-2.34)	-0.587*** (-20.69)	-0.83 (-1.33)
Financial profit rate t (b1)	0.146*** (5.41)	-0.776*** (-10.39)	0.137*** (4.11)	-0.292*** (-3.55)	0.065 (1.68)	-0.073 (-0.85)
Financial profit rate $t-1$ (b2)	-0.100*** (-4.40)	0.791*** (12.64)	-0.121*** (-3.62)	0.446*** (5.41)	-0.104* (-2.51)	0.579*** (6.45)
Constant (c)	-0.022*** (-12.94)	-0.011*** (-2.40)	-0.019*** (-11.94)	-0.045*** (-11.39)	0.005* (2.02)	-0.002 (-0.59)
N	7254	7254	9765	9765	9738	9738
R ²	0.1470	0.0401	0.1914	0.0273	0.1624	0.0146
Method	Pooling	Pooling	Pooling	Pooling	Fixed Effects	Pooling

Notes: See Table1.

Table 4b. Results of estimation of real and financial investment function (non-manufacturing companies).

Period	1993–2001		2004–2012		2011–2019	
Explained variable	(1) Real asset growth rate t	(2) Financial asset growth rate t	(3) Real asset growth rate t	(4) Financial asset growth rate t	(5) Real asset growth rate t	(6) Financial asset growth rate t
Real profit rate t (a1)	1.005*** (9.71)	0.356* (1.95)	0.842*** (22.02)	0.620*** (10.41)	1.023*** (29.14)	0.620*** (10.57)
Real profit rate $t-1$ (a2)	0.156 (1.50)	0.376** (2.09)	0.021 (0.54)	-0.073 (-1.23)	-0.423*** (-12.50)	-0.049 (-0.84)
Financial profit rate t (b1)	0.309*** (4.17)	-0.046 (-0.34)	-0.007 (-0.33)	-0.189*** (-5.53)	0.094*** (5.97)	-0.072* (-2.48)
Financial profit rate $t-1$ (b2)	-0.153** (-2.37)	0.320*** (2.74)	-0.017 (-0.81)	0.239*** (6.49)	-0.118*** (-7.74)	0.074** (2.75)
Constant (c)	-0.043*** (-8.75)	-0.015** (-2.25)	-0.029*** (-10.37)	-0.033*** (-9.13)	0.008** (3.05)	0.003 (0.87)
N	3465	3465	8001	8001	10008	10008
R ²	0.0709	0.0160	0.0962	0.0353	0.1124	0.0307
Method	Fixed Effects	Pooling	Fixed Effects	Pooling	Fixed Effects	Pooling

Notes: See Table1.

Real investment by forward-looking real profit expectations

First, in the results of the real investment function of manufacturing companies shown in the columns (1), (3) and (5) in Table 4a, the estimated coefficients for almost all explanatory variables are significant. In addition, judging from the magnitude of the estimated coefficients, the current and previous real profit rates rather than the financial profit rates have a large impact on the real investment. Furthermore, the coefficient of the current real profit rate is positive and the coefficient of the previous real profit rate is negative. This can be interpreted that decisions for the real investment are made mainly based on the future real profit rate expected by linear extrapolations, as explained Section II. That is, the decisions for the real investment are made by forward-looking real profit expectations.

Regarding the results of the real investment function of non-manufacturing companies, in the column (5) in Table 4b, the estimated coefficients for explanatory variables indicate a similar pattern to that of manufacturing companies explained above.

Financial investment by backward-looking financial profit expectations

Next, in the results of the financial investment functions of manufacturing companies shown in the columns (2), (4) and (6) in Table 4a, again, the estimated coefficients for almost all explanatory variables are significant. Judging from the magnitude of the estimated coefficients, the current and previous financial profit rates have a large impact on the financial investment, along with the impact of the current and previous real profit rates. However, contrary to the results of the real investment function, the coefficient of the current financial profit rate is negative, and the coefficient of the previous financial profit rate is positive. This indicates that financial investment is made with reference to the financial profit rate of one or two years ago, according to the method of measurement described in Appendix 3. Even if taking into account the interval between investment decisions and capitalization, this fact means that decisions for financial investment is made with reference to the past financial profit rate. That is, the decisions for the financial investment are made by backward-looking financial profit expectations.

Regarding the results of the financial investment function of non-manufacturing companies, in the column (4) in Table 4b, the estimated coefficients for explanatory variables indicate a similar pattern to that of manufacturing companies explained above.

Rational expectations?

If the decisions for the investment are made by forward-looking profit expectations, and if assuming rational expectations hypothesis, regression analysis using lead variables, rather than

lag variables, as explanatory variables would be more effective. Therefore, I replaced the one-period lag profit rate in Equation (3) and (4) by the one-period lead profit rate. The estimated results using this replaced equation are shown in Table 5. As shown in column (1), the estimated coefficient of the one-period lead real profit rate is not significant in 1992–2000, whereas the estimated coefficient of the one-period lag real profit rate was significant in the result shown column (1) in Table 4. Moreover, adjusted R-squared values in Table 5 are lower than those in the columns (1), (2) and (3) in Table 4. These results suggest that the rational expectation hypothesis has lower explanatory power with regard to forward-looking profit expectation behavior of managers than the linear extrapolations.

In the results of the real investment functions shown in column (1), (3) and (5) in Table 5, the estimated coefficients of the one-period lead variables are positive and significant except for two cases (Real profit rate $t+1$ in the column (1) and Financial profit rate $t+1$ in the column (5)). These four positive and significant coefficients of the lead variables indicate that decisions for the real investment are forward-looking behavior. However, in the results of the financial investment functions shown in the columns (2), (4) and (6) in Table 5, the estimated coefficients of the one-period lead variables are negative and significant except for two cases (Real profit rate $t+1$ in the columns (4) and (6)). These four negative and significant coefficients of the lead variables indicate that decisions for the financial investment are not forward-looking behavior.

Table 5. Results of estimation of real and financial investment function using a lead variable (manufacturing companies).

Period	1992-2000		2003-2011		2010-2018	
	(1)	(2)	(3)	(4)	(5)	(6)
Explained variable	Real asset growth rate t	Financial asset growth rate t	Real asset growth rate t	Financial asset growth rate t	Real asset growth rate t	Financial asset growth rate t
Real profit rate t	0.796*** (20.41)	1.190*** (11.23)	0.767*** (26.10)	0.260*** (3.91)	0.820*** (27.87)	0.314*** (5.09)
Real profit rate $t+1$	0.018 (0.48)	-0.535*** (-5.24)	0.301*** (10.37)	0.715*** (10.91)	0.237*** (7.97)	0.098 (1.59)
Financial profit rate t	-0.081*** (-3.66)	0.630*** (10.51)	-0.004 (-0.10)	0.156* (1.86)	-0.037 (-0.85)	0.095*** (12.37)
Financial profit rate $t+1$	0.108*** (4.09)	-0.824*** (-11.52)	0.163*** (4.23)	-0.443*** (-5.27)	0.009 (0.23)	-1.078*** (-12.77)
Constant	-0.025*** (-15.28)	0.016*** (3.51)	-0.050*** (-21.62)	-0.048*** (-12.02)	-0.023*** (-9.4)	0.010** (2.71)
N	7254	7254	9765	9765	9738	9738
R ²	0.1281	0.0368	0.1507	0.0419	0.0980	0.0272
Method	Pooling	Pooling	Fixed effects	Pooling	Fixed effects	Pooling

Notes: See Table1.

Destabilization of investment by financialization

Thus, the decision of real investment is made mainly based on the forecast of future real profit rates, and the decision of financial investment is made mainly based on the past financial profit rates. At first glance, it seems to be strange, but it is a natural result if taking into account limitations and incompleteness of the knowledge and information.

Real investment is investment to core business of consolidated companies, about which the managers have a lot of knowledge and information. They can use them in expectation of future profitability of this core business. However, financial investment by nonfinancial companies is investment to peripheral or emerging business carried by affiliate companies, about which the managers as investors cannot access sufficient knowledge and information, especially in the case of oversea affiliated companies. Therefore, if taking into account such limitations and incompleteness of the knowledge and information, it is quite difficult to forecast the future financial profitability of the financial investment. As a result, decisions for financial investment are made by referring to the financial profit rates realized in the past, rather than forecasting future financial profit rates. The above estimated results of the investment function of the manufacturing industry in Tables 4a clearly show such asymmetry of information between in the decisions for real investment and in the decisions for financial investment.

As shown in Figures 6 and 7, both the real profit rates and the financial profit rates fluctuate cyclically. According to the results in Table 4a, the real investment cycle precedes the real profit rate cycle, and the financial investment cycle lags the financial profit rate cycle. The deviation of the circulation (difference in initial phase) can be measured by the method shown in Appendix 3 and is shown in Table 6. For example, in 1993–2001, the real investment cycle preceded the real profit rate cycle by 0.38 years, while the financial investment cycle lags the financial profit rate cycle by 1.74 years.

Let us consider the implications of this result, taking into account changes in profitability in the business cycle. Although the real investment may result in over- or under-investment due to a forecasting error in the real profit expectations, the timing gap between the profit rate cycle and investment cycle is small. That is, the timeliness of adjustment of real investment are high. On the other hand, the timeliness of adjustment of financial investment is low. For example, even if the financial profit rate begins to fall, financial investment will continue to increase for a year or two. In this way, financial investment has high possibility of resulting in over- or under-investment by deviating from the movement of the financial profit rate.

Table 6. Relative amplitude and length of lead of investment cycle in manufacturing companies

Period	Relative Amplitude			Length of lead (unit: year)		
	1993–2001	2004–2012	2011–2019	1993–2001	2004–2012	2011–2019
Real investment	1.15	1.09	1.12	0.38	0.36	0.41
Financial investment	0.92	0.45		– 1.74	– 1.53	

Notes: The amplitude and the initial phase of real or financial profit rate cycle are set 1 and 0 respectively.

Blank cells indicate that the values are not computed because the estimated coefficients are not significant.

Sources: Calculated by the author from the data in Table 4a using the method explained in Appendix 3.

However, in reality, as shown in columns (2), (4) and (6) of Table 4a, in the estimated results of the financial investment functions, the coefficient of the current real profit rate is also positive and significant. In other words, the current real profit rate of the current year also has some influence on financial investment, so that the tendency of over- or under-investment of financial investment as described above is suppressed. However, this suppressing effect seems to depend on the fact that the share of the financial assets in the total assets is low (about 20%), as shown in Figure 5. As financialization progresses, that is, as the share of the financial assets increases, the effect of the real profit rate on financial investment will diminish, and the above-mentioned tendency of over- or under-investment in financial investment will become prominent.

By diversifying businesses and products, companies can offset the decline in profitability of some businesses and products with the high profitability of other businesses and products, and a high profit rate in a whole company can be maintained. This diversification of businesses and products is one of the ways by which companies deal with uncertainty about the future. However, financialization in non-financial companies means that business diversification progresses by financial investment, such as investment in equity method affiliates and other affiliated companies, rather than by real investment in consolidated companies. As described above, in the case of financial investment, it is difficult to forecast the financial profit rate due to the limited and incomplete knowledge and information about the business to be invested. Due to such low timeliness of adjustment of financial investment, it is highly likely that the business will fail and its profitability will decline.²¹

V Conclusion

The findings of this paper suggest that although decisions of real investment are forward-looking behavior, decisions of financial investment are backward-looking behavior. The reason

²¹ A recent example is the SoftBank Group, which had a loss of 1.4 trillion yen in its financial results for FY2019 as a result of rapid financialization by expansion of the “Vision Fund” business.

seems to be as follows. Real investment is investment in these manufacturing companies' core business, about which managers have a lot of knowledge and information that can be used to form an expectation of future profitability. However, financial investment in nonfinancial companies is investment in peripheral or emerging business carried by affiliated companies, about which managers have insufficient knowledge and information, especially in the case of overseas affiliates; so, these investments are decided mainly by reference to realized past profit rates. Moreover, because financial investment is not forward looking, it is less likely than real investment to be adjusted in a timely manner and more likely to result in over-investment or under-investment. Consequently, fluctuations of financial profits in nonfinancial companies are larger than fluctuations of real profits.

The results of the analyses presented in this paper demonstrate the usefulness of panel data for the purpose of analyzing profit expectations, investment and business cycles. They also provide support for key institutionalist and post-Keynesian concepts and principles, including uncertainty, imperfect knowledge, limited rationality, futurity, and the economic importance of institutionalized or customary patterns of behavior and decision-making. Thus, such analyses of micro data help to enrich the foundations and advance the frontiers of post-Keynesian institutionalism, which suggests the need for more of this type of research.

Appendix 1. Sources of Data and Definitions of Variables

Toyo Keizai Inc. "Financial Data Digest, 2003 Edition" includes financial data of companies listed in five stock markets of Tokyo, Osaka, Nagoya, Sapporo and Fukuoka, Nasdaq Japan Market and JASDAQ, whose information has been disclosed in "the securities report" from the fiscal year 1991 to the fiscal year 2001.

Toyo Keizai Inc. "Financial Data Digest, 2013 Edition" includes financial data of companies listed in all stock markets (including emerging equity markets), whose information has been disclosed in "the securities report" from the fiscal year 2002 to the fiscal year 2012.

Toyo Keizai Inc. "Financial Data Digest, 2020 Edition" includes financial data of companies listed in all stock markets (including emerging equity markets), whose information has been disclosed in "the securities report" from the fiscal year 2009 to the fiscal year 2019.

Consolidated financial data of manufacturing and non-manufacturing companies (excluding financial, insurance and securities industries) are used.

The number of listed companies increased continuously. In order to ensure comparability in the period, samples are limited to companies that were listed continuously during the period 1991–2001 or the period 2002–2012 or the period 2009–2019.

Merits of Japanese financial statements data after 1990 are as follows. First, inflation adjustment of data is not necessary because of nearly zero inflation in this period in Japan.

Second, various sorts of profit rates are computable since various components of assets and profits are available.

Some studies, especially Marxian studies, regarded only “operating income” as profits. However, the larger the firm size, the larger the investment in subsidiary or affiliate companies and the short-term equity investment, and the greater the financial income such as interests and dividends obtained from it. If the amount of profits, which is the numerator of the profit rate, does not include financial profits, the larger the firm size, the more the amount of profits and the profit rate would be underestimated. Also, in order to analyze contemporary companies under the trend of financialization and globalization, not only tangible fixed assets and intangible fixed assets, but also “investments and other assets” and current assets should be included in the denominator of the profit rate.²²

In Section III, the following four variables are used.

- (1) Total profits = “operating income” + “interest and dividend income” + “equity in earnings of affiliates”
- (2) Total assets: “total assets” = “current assets” + “fixed assets” (including “investments and other assets”).
- (3) Profit rate_t = Total profits_t / [(Total assets_t + Total assets_{t-1}) / 2]
- (4) Asset growth rate_t = ln (Total assets_t / Total assets_{t-1})

In Section IV, the following variables are used.

- (5) Real profits = “operating income”
- (6) Financial profits = “interest and dividend income” + “equity in earnings of affiliates”
- (7) Real assets = current assets + noncurrent assets (excluding “investments and other assets”).
- (8) Financial assets = “investments and other assets”.
- (9) Real profit rate_t = Real profits_t / [(Real assets_t + Real assets_{t-1}) / 2]
- (10) Financial profit rate_t = Financial profits_t / [(Financial assets_t + Financial assets_{t-1}) / 2]
- (11) Real asset growth rate_t = ln (Real assets_t / Real assets_{t-1})
- (12) Financial asset growth rate_t = ln (Financial assets_t / Financial assets_{t-1})

Appendix 2. Three Types of Expectation Models

(1) Linear extrapolations

Linear extrapolation is a forecasting method in which a straight line approximating the trend of past time series data is extended in the future. The future expected value is obtained on this

²² The classical definition of profit rate (= (added value–wage cost) / fixed assets) became extremely insufficient as an analytical concept of contemporary capitalism where surplus money is generally invested in subsidiary and affiliated companies and in short-term financial investments. When Commons (1934) criticized classical economics, one criticism was that the classical economists analyzed only tangible property and excluded intangible property and incorporeal property.

extended straight line. In the simplest linear extrapolation model, the expected future profit rate $r_{t+\alpha}^e$ is formed using only two past time series data: the current profit rate r_t and the previous profit rate r_{t-1} . When $\alpha > 0$, the linear extrapolation is a forward-looking expectation based on the past data.

$$\begin{aligned} r_{t+\alpha}^e &= r_t + \alpha(r_t - r_{t-1}) \\ &= (1 + \alpha)r_t - \alpha r_{t-1} \end{aligned} \quad (A1)$$

The current profit rate r_t and the previous profit rate r_{t-1} are used as explanatory variables in estimation of investment function. According to Equation (A1), when these estimated coefficients are noted a and b respectively, it is supposed that $a \geq 1$ and $b \leq 0$.

(2) Adaptive expectations

The simplest adaptive expectation can be formulated as a process for forecasting by partially correcting the forecasted value made in the previous period in consideration of the gap between this forecasted value and the actual value. In the following Equation (A2), β is a ratio of partial adjustment ($0 \leq \beta \leq 1$). As shown in the last line of Equation (A2), the forecasted value is a weighted average of a series of past actual values. Therefore, adaptive expectations are backward-looking. As each weight decreases exponentially, such as $\beta, \beta(1-\beta), \beta(1-\beta)^2$, it is called “Single exponential smoothing method” in the contemporary forecasting theory (Makridakis, et al. 1998, Armstrong 2002)

$$\begin{aligned} r_{t+1}^e &= r_t^e + \beta(r_t - r_t^e) \\ &= \beta r_t + (1 - \beta)r_t^e \\ &= \beta r_t + \beta(1 - \beta)r_{t-1} + \beta(1 - \beta)^2 r_{t-1}^e \\ &= \beta r_t + \beta(1 - \beta)r_{t-1} + \beta(1 - \beta)^2 r_{t-2} + \dots \end{aligned} \quad (A2)$$

When the third and higher terms with small weights are omitted, the current profit rate r_t and the previous profit rate r_{t-1} are used as explanatory variables in estimation of investment function. According to Equation (A2), when these estimated coefficients are noted a and b respectively, it is supposed that $0 \leq a \leq 1$ and $0 \leq b \leq 1$.

(3) Rational expectations

The rational expectations hypothesis assumes that expectations are forward-looking and agents can utilize all information. Therefore, agents can forecast future profit rate $r_{t+\alpha}^e$ without systematic errors.

$$r_{t+\alpha}^e = r_{t+\alpha} \quad (A3)$$

The current profit rate r_t and the correctly forecasted future profit rate r_{t+1} are used as explanatory variables in estimation of investment function. According to Equation (A3), when these estimated coefficients are noted a and b respectively, it is supposed that $0 \leq a \leq 1$ and $0 \leq b \leq 1$.

The following table summarizes differences in the three types of expectation models.

Table A1. Three types of expectation models

	Linear extrapolation	Adaptive expectation	Rational expectation
	Forward-looking	Backward-looking	Forward-looking
Estimated equation	$g_t = ar_t + br_{t-1} + c$		$g_t = ar_t + br_{t+1} + c$
Signs of estimated coefficients	$a \geq 1, b \leq 0$	$0 \leq a \leq 1, 0 \leq b \leq 1$	$0 \leq a \leq 1, 0 \leq b \leq 1$

Appendix 3. Measurement of Amplitude and Initial Phase of cyclical fluctuation

The magnitudes of the estimated coefficients shown in Table 1 and 4 seem to reflect the strength of the effect of the profit rate on the asset growth rate at the individual company level. Moreover, they reflect the length of lead or lag of the asset growth rate cycle, with respect to the profit rate cycle. However, the quantitative meaning is unclear in the raw data of these estimated coefficients. By assuming that the profit rate cycle can be expressed as a sine wave, I propose a new method to clarify the above-mentioned strength and length of lead or lag of the effect of the profit rate on investment.

Let us assume that the cyclical part of the profit rate (X) is represented by a sine wave, whose amplitude is one and whose initial phase is zero, as expressed by the following Equation (A4).

$$X = \sin \omega t \quad (\text{A4})$$

t refers to time (unit: year) and ω to angular frequency. I assume that $\omega = 2\pi / 5$, (i.e. the cycle is 5 years) taking into account the average length (5.3 years) of the five business cycles from 1993 to 2020 mentioned at the beginning of Section III.

Then, the second term and the third term of the right side of Equation (1), that is, the cyclically changing part (Z) of the asset growth rate can be expressed as

$$Z = a \sin \omega t + b \sin(\omega t - 2\pi / 5) \quad (\text{A5})$$

The right side of this Equation (A5) represents the composition of sine waves having the same angular frequency as shown in Figure A1, and the compounded sine wave is shown by Equation (A6).²³

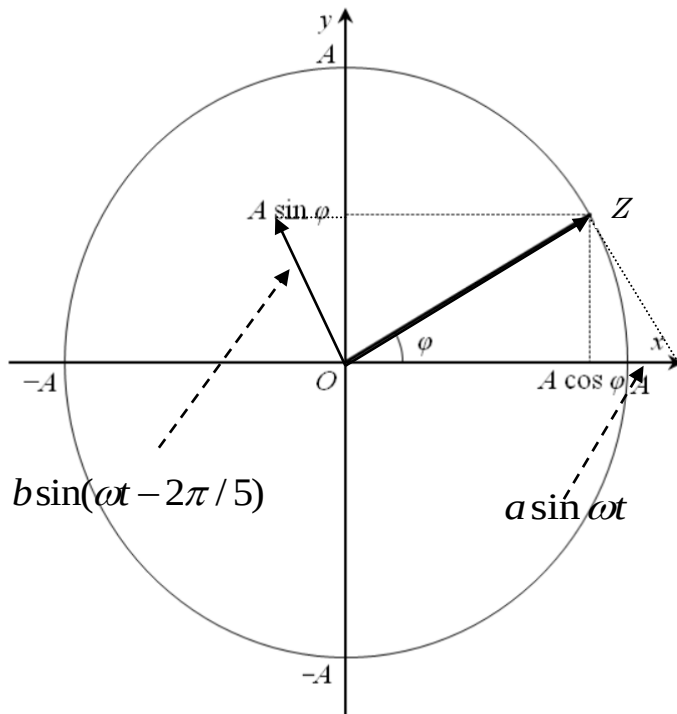
$$Z = \sqrt{a^2 + b^2 + 2ab \cos(2\pi / 5)} \sin[\omega t + \tan^{-1}\{b \sin(-2\pi / 5) / (a + b \cos(-2\pi / 5))\}] \quad (\text{A6})$$

According to Equation (A6), the amplitude (A) of the cyclically changing part of the asset

²³ Decomposing the second term of the right side of Equation (A5) by the compound angle formula of trigonometric functions, then rearranging by terms of $\sin(\omega t)$ and $\cos(\omega t)$, and then composing all terms by this formula, Equation (A6) is derived.

growth rate is $A = \sqrt{a^2 + b^2 + 2ab \cos(2\pi/5)}$. The magnitude of this amplitude represents the ratio of the asset growth rate cycle's amplitude to the profit rate cycle's amplitude. Therefore, it represents the strength of the effect of the profit rate on the asset growth rate. In addition, the initial phase (φ) of the cyclically changing part of the asset growth rate is $\varphi = \tan^{-1}\{b \sin(-2\pi/5) / (a + b \cos(-2\pi/5))\}$. The magnitude of this initial phase indicates the length of lead or lag of the asset growth rate cycle, with respect to the profit rate cycle. When the initial phase is a positive value, it shows the length of lead, and when it is a negative value, it shows the length of lag.

Figure A1. Composition of sine waves having the same angular frequency (the case when b is negative)



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