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Supply-side Estimate of Expected Equity Return on Industrial Japan

Analysis of Aggregate Accounting Data over Four Decades

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Abstract

This study measures historical equity returns over 42 years on the Japanese market by a supply-side approach using accounting data for 24 industries. It also demonstrates a method of constructing expected returns for the future. Equity return is generated from two fundamental sources: growth of shareholders' equity and dividend payments. The mean value of price returns caused by investor valuation changes from period to period is expected to be zero over the long run. Differences in fundamental risk characteristics among industries are reflected in their price volatilities, and further related to growth and value investment styles.

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1. Introduction: Fischer Black's Legacy

Fischer Black, one of the inventors of option pricing theory, wrote a three-page essay a few years before his death. It was titled "Estimating Expected Return" and opened with a terse "The key issue in investment is *estimating* expected return." The relevant abstract is quoted below:

> *If we want to estimate expected return on individual securities or on a portfolio, we need theory. Estimates based on past data are inaccurate, partly because of the many ways in which people can "mine" past data. "Explaining average return" is like explaining variance, but does little to help us estimate expected return. Theory can help, though, by telling us how factors are priced and why factors and securities are mispriced.*

Data are, of course, important. However, analysts and researchers tend to misbelieve that 'objective data' are 'correct data'. We must take Black's remark as a warning against empiricism without supporting theory.

The objective of this study is to estimate expected equity return (or cost of equity capital) for Japanese corporations. Our analysis will focus on corporate sectors of the economy, not individual firms. In particular, we are interested in industry-level statistics encompassing major industries excluding the financial sector. The primary motivation of this study is to apply fundamental analysis to look into the expected equity return being generated from the industrial business segments of Japan, Inc.

2. Supply-side Approach

2.1 Demand-side vs. Supply-side Approaches

Expected return on equity can be viewed from two sides ─ from that of investors, and from that of corporations. For investors, it is the *discount rate* to convert future cash flows (or earnings) of firms into present value, and also the *required rate of return* to invest capital in risky equity assets. For corporations, it is the cost of equity capital in having to pay (supply) certain returns to the shareholders who contribute equity capital. Thus, we can view expected return on equity either from the demand-side (investors) or supply-side (corporations).

From the demand-side viewpoint, investors are not well compensated unless they can expect a somewhat higher return than the risk-free interest rate. The difference is called equity risk premium. Models such as CAPM and APT are classified as demand-side models because they describe expected return from this perspective. The simplest model, CAPM, gives expected return (required rate of return) for a security i as described in Eq.(1).

$$E(r_i) = r_f + \beta_i \left(E(r_m) - r_f \right) \qquad \cdot\cdot\cdot (1)$$

On the other hand, from the supply-side viewpoint, corporations give return to shareholders by way of dividends and retained earnings out of their earnings using equity capital. For example, transforming the classic constant-growth dividend discount model, we can solve for the discount rate to describe expected return (cost of equity capital) on security i as in Eq.(2).

$$E(r_i) = E(g_i) + \frac{d_i}{P_i} \quad \cdot\cdot\cdot (2)$$

However, it is not easy to solve either equation because expected value is on the right-hand side in both. In Eq.(1), we encounter challenges not only in estimating beta, but also in estimating equity risk premium ($E(r_m)-r_f$). Therefore, we first have to estimate expected return on the overall equity market E(r). But this itself is a difficult task as the historical method using past average return as a proxy for future expectations is not so reliable since market returns gyrate wildly over time with a large standard deviation.

We also face a challenge in estimating expected growth rate E(g) in Eq.(2). However, the variation of corporate earnings and growth rates over time is much more modest compared to the volatility of market returns. In addition, an estimated growth rate is not merely a statistical expectation, but has economic meaning since corporate earnings are closely related to macroeconomic performance. Taking advantage of this feature, this study employs a supply-side model to analyze the return-generating process of equity capital in major industries of Japan.

2.2 Review of the Literature and Primary Contribution of This Study

The idea of capturing equity return from macroeconomic fundamentals was first proposed by Diermeier, Ibbotson and Siegel (1984). On the other hand, Estep (1987) demonstrated that the micro-level accounting data of firms are translated into a formula of equity return, which is then used to forecast return on equity. This study applies the latter method to semi-macro industry level data.

However, the supply-side approach has not been commonly used in empirical research since those early studies. The revival of the supply-side approach was initiated by Fama and French (2002), where they decomposed historical equity returns using corporate earnings and the dividend data of U.S. firms, and estimated average equity risk premium at 4.32% (earnings model) or 2.55% (dividend model) over the fifty-year period from 1951 to 2000. Meanwhile, Arnott and Bernstein (2002) traced data series back to the early 19th century, and presented a controversial view that forward-looking equity risk premium is almost zero, or possibly negative, from the present (around 2000). On the other hand, Ibbotson and Chen (2003) showed that historical equity premium was about 4% out of 9.4% total equity return, excluding 1.25% return due to a rise in P/E ratio from the geometric average return of 10.7% over the period from 1926 to 2000. The average return of long-run historical data contains return caused by valuation change over the period, but such valuation-driven return was a return component not generated from corporate earnings power, nor is it expected to be sustainable for the future.

Being inspired by such research in the U.S., Yamaguchi, Kanasaki, Makabe, and Komatsubara (2003) looked at Japanese corporate financial data and market return of the Tokyo Stock Exchange 1st Section, and estimated that the supply-side geometric mean return was 9.4%, of which the return caused by valuation change was -0.2%, over the forty-year period from 1962 to 2001. But there was a weakness in that study. Corporate financial statistics include industrial companies in the manufacturing and service sectors, not firms in financial sectors such as banks and securities brokerage firms. On the other hand, the Tokyo Stock Exchange market index (TOPIX with dividend) covers all companies listed on the exchange, including financial sectors. There is thus an inherent mismatching between these two series in terms of components in each data set.

This study tries to alleviate this mismatching problem by constructing a new market-weighted index, "Industrial Composite", excluding the financial sector so as to be directly comparable to the series constructed from fundamental corporate data[1]. In addition, this study further examined twenty-four industries comprising the aggregate market (excluding financials) so that more detailed analytical insight could be obtained.

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[1] *Industry classification systems are slightly different among sources: Tokyo Stock Exchange, Japan Securities Research Institute, and Corporate Financial Statistics by Ministry of Finance. This paper classifies industries by re-grouping these series to be comparable with each other. The fundamental return series of aggregate corporations by each industry are constructed from industry-level accounting data in Corporate Financial Statistics and year-end market values of industries as reported by the Tokyo Stock Exchange. For market return series by industry, we used total return series of the Japan Securities Research Institute. Our Industrial Composite was constructed by weighting market values at the end of December each year.*

Market returns are calculated from all listed firms on the exchange, but Corporate Financial Statistics includes all companies, listed and unlisted. Of the latter, we selected only large corporations capitalized at over 1 billion yen. There are, however, some large corporations that are not listed on stock exchanges. Therefore, there is no perfect match between fundamental return series and market return series with respect to sampled firms. Industry fundamental return series based on Corporate Financial Statistics are approximations for industry market return series.

3. Data and Model

3.1 Impact of Financial Sector

The market value of the financial sector has been historically large in the total market value of the Tokyo Stock Exchange 1st Section (TSE1). Over the past forty-one years (1963-2003), the financial sector on average accounted for about 20% of total market value, and over 30% at its peak in the late 1980s (**Exhibit 1**). Over the period, annualized total returns on equity were 11.1% (geometric mean) and 13.1% (arithmetic mean) for the financial sector, and for TSE1, 8.2% (geometric mean) and 9.4% (arithmetic mean). This indicates that the average return on the total market was made higher by the high total return of the financial sector, which had a dominant share of market value as well. Put another way, other industrial sectors such as manufacturing and services must have generated much lower return than the market average.

Then, how much lower return were those non-financial sectors generating? How much upward impact did the financial sector have on aggregate market return? As the aggregate market index is a weighted average portfolio of financial and (non-financial) industrial sectors, market return r_M is decomposed into Eq.(3) where the market value share of the financial sector is denoted by w_F, and total returns of the financial and industrial sectors are r_F and r_I respectively.

$$r_M = w_F \cdot r_F + (1 - w_F) \cdot r_I \qquad \cdot\ \cdot\ \cdot (3)$$

The first term on the right-hand side is the financial sector's contribution to market return, and the second term is that of the industrial sector. **Exhibit 2** shows estimated contributions from the two sectors to market return derived by Eq.(3) over the last forty-one years. Excluding the dominant financial sector, total return estimates were 7.9% (geometric mean) and 9.1% (arithmetic mean), which are only slightly lower than the TSE1 market index return. Standard deviations are approximately the same for both series. Looking at contributions (market-value share multiplied by total return), however, reveals that the annual average market return of 9.4% (arithmetic mean) was composed of 2.0% points from financials and 7.3% points from industrials. About 20% of the market return was attributable to the financial sector.

Exhibit 1: Proportion of Financial Sector's Market Value

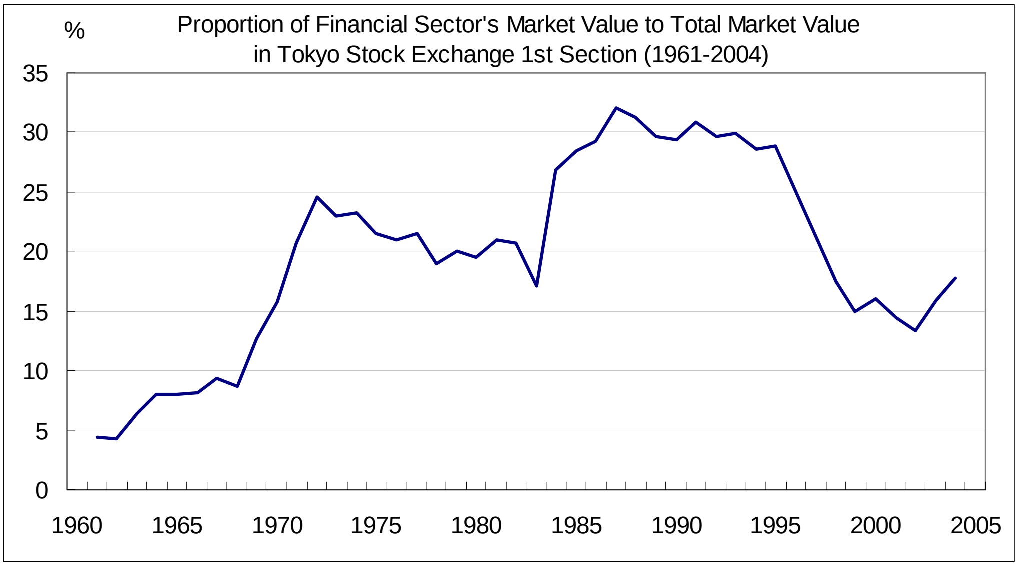

Exhibit 2: Contributions to Equity Market Return: Financials and Industrials

Contribution by Sectors to Equity Market Return (1963-2003)

		Financials	Industrials	TSE1
Total Return	Geometric Mean	11.1%	7.9%	8.2%
(Annualized)	Arithmetic Mean	13.1%	9.1%	9.4%
	Standard Deviation	23.1%	17.2%	17.5%
Sector's Proportion	Mean	20.2%	79.8%	100.0%
in TSE1	StdDev	7.9%	7.9%	---
Contribution	Geometric Mean	1.9%	6.6%	8.2%
	Arithmetic Mean	2.0%	7.3%	9.4%

Note: **Exhibit 2** shows *annualized* mean returns and standard deviations calculated from *monthly return* series. **Exhibit 3** reports different statistics for the industrial sector as it calculates *annual return* and standard deviations for the period 1962 to 2003.

3.2 T-Model Explained

In general, ex-post total return on equity, TR, is composed of expected return E(r) with positive value and unexpected return, ε, whose mean value is zero with stochastic variation over time.

$$TR = E(r) + \varepsilon = E(g) + \frac{d}{P} + \varepsilon \quad \cdot \cdot \cdot (4)$$

While past total return can be decomposed into a few parts by a variety of models, this study specifically employs the T-Model proposed by Estep (1987). The T-Model decomposes the total return on equity (TR) of any single firm or firms into three return components as described in Eq.(5). This formula is an identity under the condition that no net supply of equity capital occurs during period t. Ex-post total return for period t, TR_t, is perfectly decomposed into three parts.

$$TR_t = g_t + \frac{ROE_t - g_t}{PB_{t-1}} + \frac{\Delta PB_t}{PB_{t-1}}\left(1 + g_t\right) \quad \cdot \cdot \cdot (5)$$

where, g_t : internal growth of equity capital (book value) during period t .
(not including external finance by issuing new shares)
ROE_t : return on equity in period t.
PB_t : price-to-book ratio at end of period t.
ΔPB_t : change in PB during period t = $PB_t - PB_{t-1}$

A brief explanation is in order for the terms on the right-hand side of Eq.(5). In this paper, 'fundamental return' is the sum of the first and second terms, and 'valuation change' the third term. Capital return is a sum of the first term (growth of equity capital) and third term (valuation change in stock prices over the period), and income return is represented by the second term.

Comparing Eq.(4) and Eq.(5), three terms in both equations correspond to each other. The first term represents 'growth rate', the second term is 'dividend yield'. The third term is a residual (unexpected return, ε) in Eq.(4), but it is captured as price return caused by changes in the P/B ratio during the period. As we will show later, the expected value of the third term is statistically zero.

The advantage of the T-Model is that it describes total return in a relatively few fundamental variables. As it explicitly incorporates ROE and internal growth rate as variables, it is especially useful and looks familiar to security analysts who may want to use their own earnings estimates to form an expected return for a stock under analysis.[2]

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[2] *The advantage of using the T-Model is that it uses the P/B ratio for the valuation term so that numbers do not take negative value nor show large variation from one period to another as is the case when using P/E. The weakness of this model is that accurate estimation is difficult when a firm has a net supply of equity capital, either by issuing new shares or by decreasing its equity capital. In addition, fundamental return data are less frequently available than market returns, such as annually and semi-annually, because it uses reported accounting data. In this paper, the weaknesses inherent in the model are not a material problem as we use aggregate data over a long period with 42 annual observations.*

4. Analysis of Equity Return and Risk on Industrial Japan

4.1 Decomposing Total Return of the Aggregate Industrial Sector

Based on historical statistics in *Houjin-Kigyo-Toukei* (balance sheet and income statements) for large corporations (with equity book value of over 1 billion yen), the aggregate equity *fundamental returns* of 24 industries are estimated over the period from 1962 to 2003. On the other hand, equity *market returns* for the aggregate industrial sector are calculated over the same period as the market value weighted composite of 24 industry indices published in the Japan Securities Research Institute's *Kabushiki-Toushi-Shuekiristu* (Rate of Return on Equity) for the TSE1. The former is derived from accounting data, and the latter from market price and dividend data. **Exhibit 3** summarizes the result of historical returns and its decomposition by the T-Model as well as historical equity risk premium.

Over the forty-two years, the geometric averages of annual equity returns on overall industry in Japan were 7.8% for market return, and 7.2% for total return estimated using the T-Model. Both methods arrived at approximately the same level. Looking into components, growth of equity capital was 3.8%, yield was 3.4%, and the sum of these two, fundamental return, 7.2%, which is equal to total return. On the other hand, valuation change (price return) ― the third term of the T-Model ― was only -0.1% (geometric average), contributing almost nothing to total return. This fact reveals that long-run equity return is almost exclusively determined by fundamental return composed of growth and dividend yield.

Corporate fundamentals are relatively more stable and easier to forecast than stock prices. Among the return components of the T-Model, standard deviation is only 4.9% for fundamental return. The standard deviation of valuation change is 22.9%, being responsible for most volatility in total return. Serial correlation of fundamental returns is high at 0.90, while it is -0.14 for valuation change and -0.03 for total return. This observation indicates that corporate fundamentals follow certain trends, but stock price movements are a random walk.

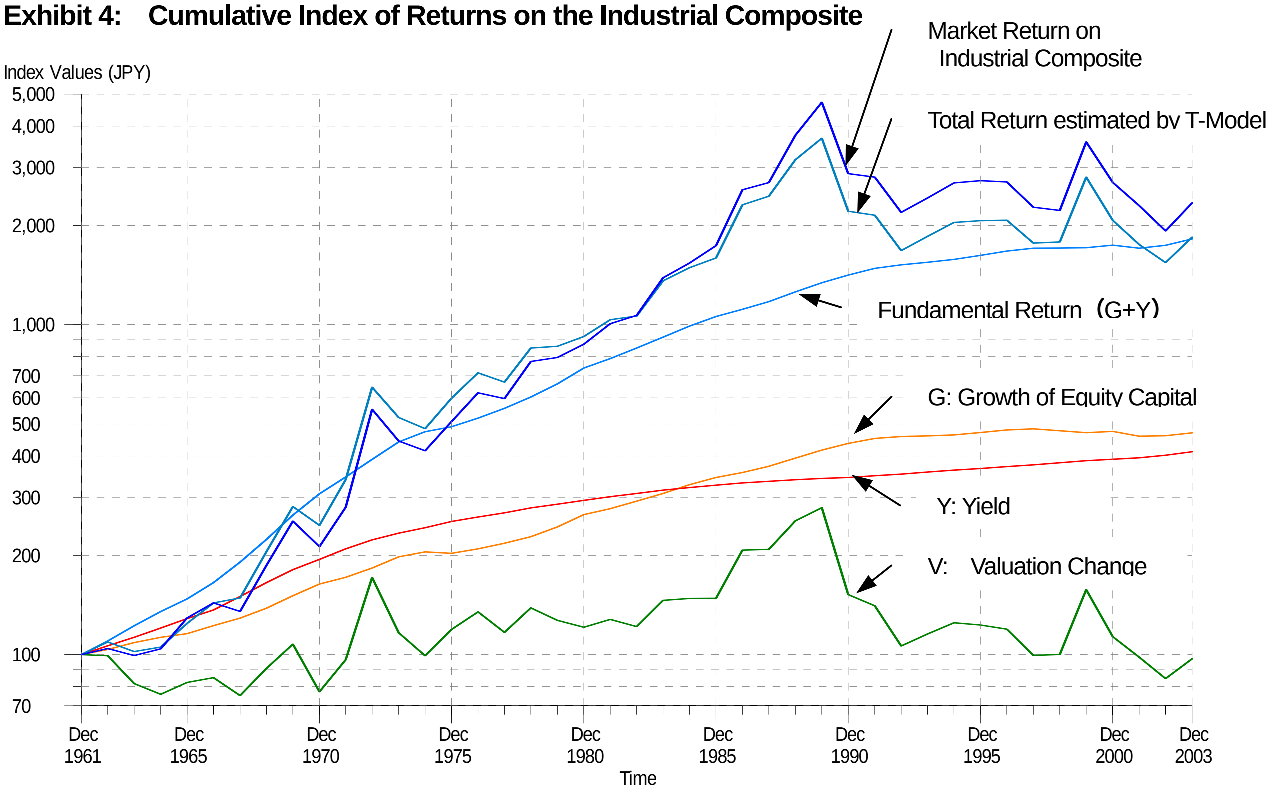
This can be visually understood when we draw a cumulative index graph (**Exhibit 4**) starting from 100 at the end of 1961. Equity market total return moves along the baseline of fundamental return (G+Y) over the long run, but it often runs off the path due to valuation changes. For example, it veered wildly from the line during periods such as the early 1970s of the economic boom initiated by then-Prime Minister, Kakuei Tanaka, who aggressively promoted his political slogan "Reconstructing Japan". It also went off during the bubble economy in the late 1980s. But, in the long run, such over-valuation does not last forever. The valuation return index ended 2003 at almost the same level as it was forty-two years previous. It shows wild cyclical movement, but its long-run average is zero.

Exhibit 3: Equity Return on the Industrial Composite (42 years)

Period: 1962-2003 (Annual Return, %)

			Geometric Mean	Arithmetic Mean	Standard Deviation	Serial Correlation
Equity Return estimated by T-model						
	①	G (Growth of Equity Captial)	3.8	3.8	2.9	0.73
	②	Y (Yield)	3.4	3.5	2.7	0.95
	③=①+②	G+Y (Fundamental Return)	7.2	7.3	4.9	0.90
	④	V (Valuation Change)	-0.1	2.3	22.9	-0.14
	⑤=③+④	TR (Total Return) = G+Y+V	7.2	9.6	23.7	-0.03
Market Return	⑥	Industrial Composite (excl Financials)	7.8	10.4	25.2	-0.07
Interest Rates	⑦	Overnight Call Rate (monthly average)	5.4	5.4	3.5	0.82
	⑧	Income Return on Long-term Gvt Bond	5.6	5.6	2.1	0.95
Historical Risk Premium		Risk-free Rates				
Based on Fundamental Returns						
	⑨=③-⑦	Short-term Interest Rate	1.8	1.9	3.8	0.70
	⑩=③-⑧	Long-term Interest Rate	1.6	1.7	4.0	0.83
Based on Market Returns						
	⑪=⑥-⑦	Short-term Interest Rate	2.2	5.0	25.4	-0.09
	⑫=⑥-⑧	Long-term Interest Rate	2.2	4.8	24.9	-0.10

Exhibit 4: Cumulative Index of Returns on the Industrial Composite



4.2 Equity Risk Premium

Now, let us calculate historical equity risk premium from the returns estimated using the T-Model. Equity risk premium is obtained by subtracting either the short-term interest rate (monthly average of the overnight collateralized call rate), or long-term interest rate (income return on 10-year Japanese government bonds), from the fundamental equity return that generates 'true' return for the long run. Over the past forty-two years, the average level of interest rates (short term or long term) was about 5.4% to 5.6%. Since interest rates have a strong serial correlation and low volatility as well as fundamental return, risk premium also shows high serial correlation and low standard deviation.

Equity risk premium thus estimated was about 1.8% to 1.9% on the short-term interest rate, and 1.6% to 1.7% on the long-term interest rate. These levels are significantly lower than those reported by previous supply-side studies (about 4%), but not as low as the theoretical prediction (less than 1%) indicated by Mehra and Prescott (1985) in their "Risk Premium Puzzle".

The issues we would emphasize here are, not the level of premium, but rather when and how much equity premium was generated historically. **Exhibit 5** shows a cumulative index graph of equity risk premium obtained from fundamental return, starting with 100 at the end of 1961. A striking fact here is that equity premium supplied by Industrial Japan had stopped by the early 1970s, and was almost flat thereafter. Equity risk premium has been virtually zero over the last three decades!

This indicates that the overall Japanese corporate sector has not supplied returns high enough to compensate for the risk that investors took. The supplied return has been about the same as risk-free interest rates, except for the period of high economic growth in the 1960s. **Exhibit 6** shows a year-by-year level of fundamental return estimated by the T-Model, and short-term and long-term interest rates. Since the late 1970s, annual fundamental returns have been gradually declining over time along with interest rates of approximately the same level. A macro economist would say that the corporate sector has been losing growth momentum as the economic growth rate has been decelerating, while interest rates have been high reflecting the high inflation rate in the 1970s.

Exhibit 5: Cumulative Index of 'Fundamental' Equity Risk Premium: 1962-2003

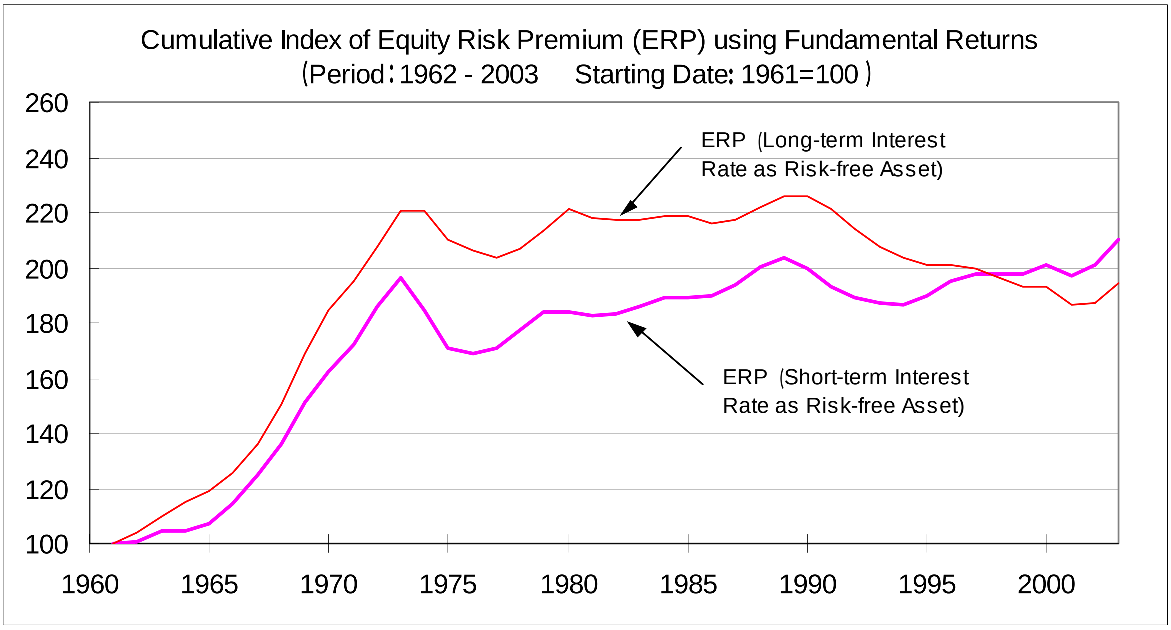
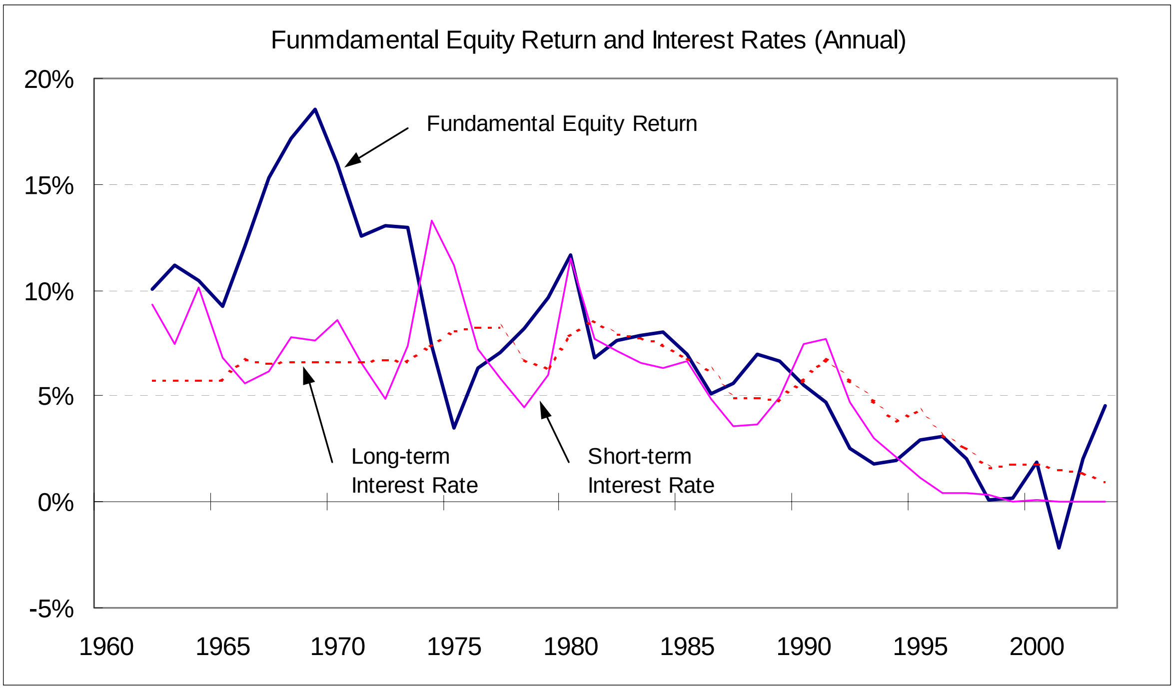


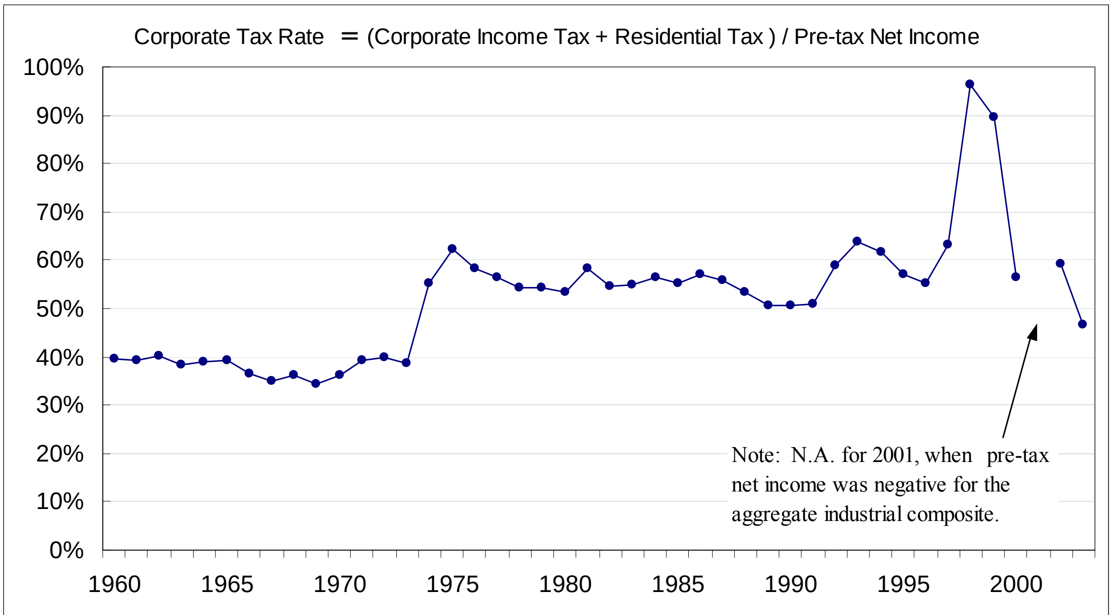
Exhibit 6: Level of Fundamental Equity Return and Interest Rates: 1962-2003



But it should be pointed out that the most important structural factor for the lower ROE since the late 1970s has been the corporate income tax rate, which was raised in 1974 and remained high thereafter. **Exhibit 7** shows historical corporate tax rates (the sum of income tax and residential tax divided by pre-tax income) calculated from *Houjin-Kigyo-Toukei* statistics. The average tax rate for the period from 1962 to 1973 was 38%, but 56% (almost 1.5 times larger) for the period from 1974 to 1989. If the tax rate had not been raised in 1974, after-tax income and ROE must have been about 40% higher than historical reality [calculation: (1.00-0.38)/(1.00-0.56)=1.41]. Then, equity risk premium must have been not zero, but 3% to 4%.

We often hear the argument that "Japanese individual investors are risk averse. They should invest more in stocks by taking risk. In order to promote stock investments, tax rules on securities transactions should be revised so that individuals have incentive to do so・・・". This kind of argument is utterly off-the-mark! The reason that stock investment did not attract investors was not because they were too risk-averse, but because there was a structural problem on the supply-side whereby sufficiently high return (or risk premium) could not be provided to the investors who take risk. Slowing economic growth and weakening corporate profitability were causing lower equity return from the top-line of income statements, but a more serious problem was that the government sector sucked up a portion of shareholder profit at the bottom-line in the form of higher corporate tax before it came down to shareholders. The Japanese government recognized that the corporate tax rate was too high relative to other advanced countries, and decided to gradually lower it to an effective tax rate of around 40% in recent years. But this tax reform came too late. Shareholders have already suffered 'The Three Lost Decades' due to a high corporate tax rate.

Exhibit 7: Corporate Tax Rate



Source: Author calculated from Houjin-Kigyo-Toukei-Chosa (Corporate Financial Statistics), Ministry of Finance,

4.3 Fundamental Risk and Investment Style

Discussion so far has not referred to volatility risk since we believe that statistical expected return should be zero for the price return caused by valuation change. However, we know that volatility risks are significantly different from one industry to another. Here, let us turn to the risk characteristics from a supply-side viewpoint.

Investment analysis usually measures risk as the standard deviation of total returns. A supply-side approach sees risks as being (higher) volatility and the (lower) predictability of fundamental returns. Compared to market returns, fundamental returns tend to have lower standard deviation and higher serial correlation, and are thus easier to forecast than stock prices. However, volatility and predictability vary among industries. From our experience, we all know that stock price volatility is higher for those industries and firms whose earnings are more volatile and less predictable.

Exhibit 8 plots 24 industries by standard deviation of fundamental returns on the *x*-axis, and by the standard deviation of valuation change (the third term of the T-Model), which is virtually the same as price return volatility, on the *y*-axis. Except for two outliers (oil & coal, other transportation & communications), we observe a positive correlation between the volatility of fundamental returns and stock price volatility.

Where serial correlation is higher for fundamental returns, it is easier to forecast earnings, and hence investment risk is lower. **Exhibit 9** plots 24 industries by annual serial correlation of fundamental returns on the *x*-axis, where further to the right (lower correlation) means lower predictability of next year's earnings as their movement tends to be rather random. The standard deviation of fundamental returns is plotted on the *y*-axis, where higher to the top means larger dispersion over time. Slicing the universe into four quadrants by the mean value of the *x*-axis and *y*-axis, 24 industries are classified into four groups with fundamental risk characteristics.

Industries (oil & coal, mining) in the top right quadrant may be labeled 'Speculative', since their fundamental returns tend to show lower serial correlations and larger standard deviations. Those in the bottom right quadrant (other transportation & communications, public utilities, textiles, pulp & paper) are termed 'Short cyclical' as they have lower serial correlation (less predictability) and lower standard deviation. The top left group (marine transportation, construction, real estate) may be labeled 'Long cyclical' because their fundamental returns show strong serial correlations and larger standard deviations, indicating some persistent trends in earnings but oscillating wildly over years. The bottom left group (autos, electronics, commerce, etc.) is named 'Secular trend', showing higher serial correlations and lower standard deviations. This group's corporate performance has been more consistent and reliable along with the long-term secular trend of the Japanese economy. Firms in this group have been the core of Industrial Japan and the primary driving forces of economic growth in Japan.

Exhibit 8: Volatility of Fundamental Returns and Valuation Change by Industry

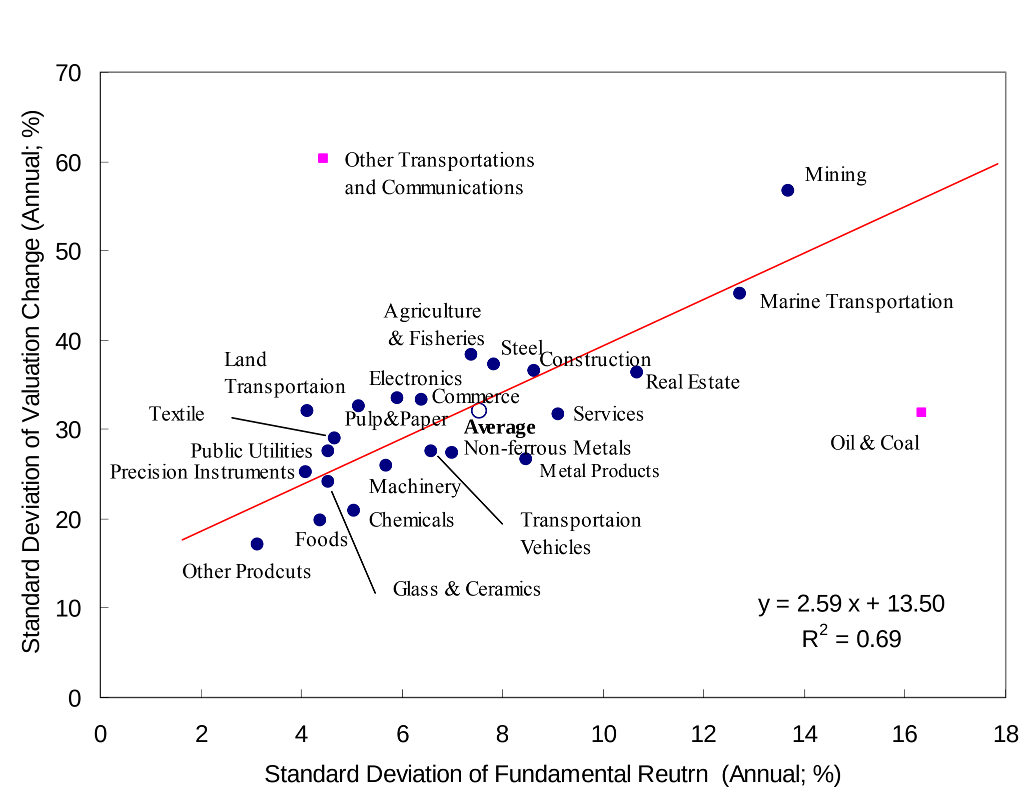
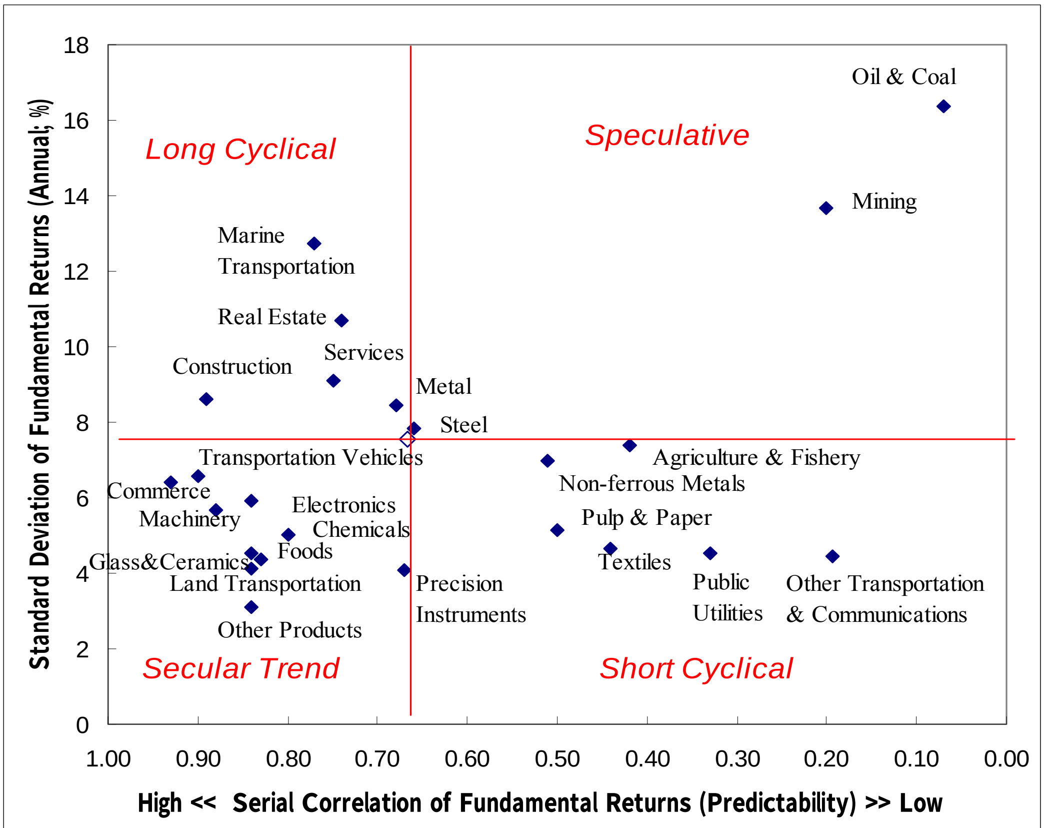


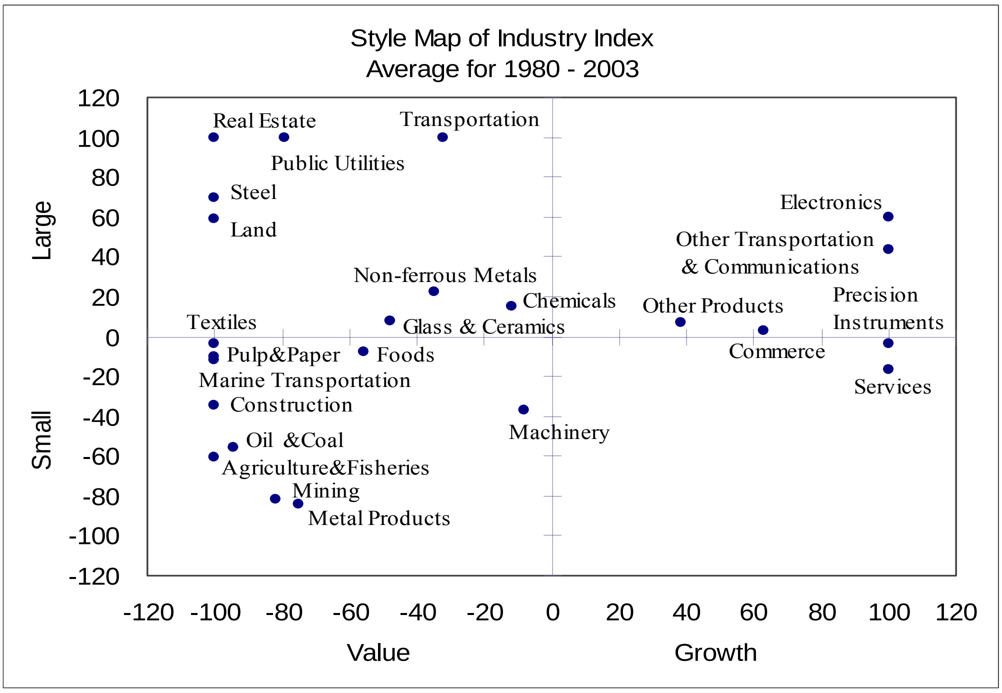
Exhibit 9: Industry Grouping by Variability Characteristics of Fundamental Returns



Fundamental risk characteristics by industry are closely related with growth and value investment styles. For example, those industries with cyclical fundamental returns would be suitable for value strategies taking advantage of opportunities in valuation changes. Growth strategies, on the other hand, would be more effective for industries with consistent fundamental returns and a higher growth rate of equity capital.

To test these hypotheses, we applied the return-based style analysis proposed by Sharpe (1992) to each of our 24 industries as a dependent variable, using four equity style indices (LG: large growth; LV: large value; SG: small growth; SV: small value) as independent variables[3]. Average style characteristics over 1980 to 2003 are mapped for the 24 industries in **Exhibit 10**. Those industries with cyclical fundamental returns are clustered where exposure is high to the value index. For example, cyclical industries include real estate, public utilities, and steel industries in the large-cap value area, and most industries in the small-cap area are also cyclical. Speculative sectors such as oil & coal and mining are also located in the small-cap value group. On the other hand, those industry groups with a secular trend, lower serial correlation, and smaller standard deviation tend to be scattered widely across areas from growth to the middle area.

Exhibit 10: Growth vs. Value Characteristics of Industry Index



[3] *Sharpe's style analysis is a quadratic programming method to minimize the variance of residual term, e_I, by estimating the optimal coefficients for b's in the equation below under constraints that b's are non-negative and their sum must be one. Where r_I is return series for an industry index I, and r_{LG}, r_{LV}・・・represents return series for four style indices,*

$$r_I = b_{LG,I} \cdot r_{LG} + b_{LV,I} \cdot r_{LV} + b_{SG,I} \cdot r_{SG} + b_{SV,I} \cdot r_{SV} + e_I$$

*In **Exhibit 10**, industry indices are plotted according to their relative positions in the universe, with the horizontal axis being the difference between growth and value coefficients, $[(b_{LG}+b_{SG}) - (b_{LV}+b_{SV})]$, and the vertical axis measuring large and small coefficients, $[(b_{LG}+b_{LV}) - (b_{SG}+b_{SV})]$.*

It has been often observed that the value index consistently outperforms the growth index over the long run. Researchers have been debating this return difference as to whether it is an anomaly or risk premium. Based on our findings that those industries with high sensitivity to the value index are predominantly cyclical, a plausible interpretation is that the return spread of value over growth may be risk premium reflecting the fundamental risk of cyclical earnings. (This will be further discussed in Section 5.3.)

5. Estimating Expected Return on Equity

5.1 Relationship among Equity Return, ROE, and Growth Rate

To understand the structure of expected return, this section analyzes the relative order of expected return and its components: return on equity, ROE, and internal growth rate, g. This analysis is important to understand the return-generating process of equity and to come up with reasonable ranges for estimates of equity risk premium. In our discussion below, we will omit the notation E(*) representing expected value for simplicity, but variables such as ROE, growth rate (g), and return (r) all represent expectations.

Denoting dividend payout ratio by δ, internal growth rate, g, is described as g = (1-δ)・ROE as it is the growth of equity capital by retaining the residual earnings after paying out dividends from after-tax net income. A firm might occasionally pay out dividends exceeding net income, but it cannot continue to do so forever. In the long run, the payout ratio has to be in the range of $0 \le \delta \le 1$, therefore return on equity is greater than the growth rate, ROE ≥ g. As long as capital for future growth is financed internally from retained earnings, the growth rate of equity capital cannot exceed the upper ceiling of ROE.

Expected return on equity, which is our primary interest, is expressed in terms of ROE multiplied by a certain coefficient if we transform the T-Model excluding the third term, which is statistically zero (long-run expected value).

$$\begin{aligned} r &= g + \frac{ROE - g}{P/B} \\ &= \left[1 - \delta \cdot (1 - B/P)\right] \cdot ROE \end{aligned} \quad \cdots (6)$$

Where 0<B/P≤1, the coefficient for ROE should be between 0 and 1. (i.e. 0<[1-δ・(1-B/P)] ≤1) Then ROE ≥ r, meaning that expected return would not exceed the ceiling of ROE. If a firm wants to grow, or if it wants to supply more equity return to shareholders, it has to first raise the ceiling of ROE.

What is the relative order between internal growth, g, and expected return, r? As ROE ≥ g holds, the second term of the T-Model must be a positive value. Therefore, since (r−g) = (ROE−g)･B/P ≥0, it must be that r ≥ g, indicating that the growth rate is lower than expected return on equity. To summarize all of the above, an inequality (7) should hold among expected return (r), return on equity (ROE), and the internal growth rate of equity capital (g), under the condition 0<B/P≤1 (or, P/B≥1).

$$ROE \geq r \geq g \quad \cdots (7)$$

5.2 Upper- and Lower-Bound of Equity Risk Premium

Equity risk premium, ERP, should take a positive value as long as investors are risk averse, since it represents additional return required by investors to take higher risk than for risk-free assets. As the second term on the right-hand side of Eq.(5) can be rewritten as d/P (dividend yield), expected return is simply the sum of growth and dividend yield: r = g + d/P. An inequality (8) holds for growth of equity capital (g) and dividend yield (d/P) for the aggregate equity market.

$$ERP = r_m - r_f = g + d/P - r_f > 0 \quad \cdots (8)$$

Rearranging the right-hand side of (8), we obtain another inequality (9).

$$g > r_f - d/P \quad \cdots (9)$$

This inequality indicates that fundamental capital return, g, should be larger than the difference between the risk-free rate and dividend yield. Such return difference represents the opportunity cost of receiving lower income return than for the risk-free rate, in order for investors to receive positive equity premium.

Is there an upper bound for equity risk premium? If we subtract the risk-free rate, r_f, from both sides of ROE ≥ r_m , where ROE is that of the aggregate corporate sector and r_m is the expected market return of equity representing the corporate sector, we obtain an inequality (10).

$$ROE - r_f \geq r_m - r_f = ERP \quad \cdots (10)$$

Equity risk premium has an upper bound at (ROE−r_f), implying that corporate managers utilize equity capital to generate profit in excess of the risk-free interest rate by taking business risk that is higher than parking capital in risk-free assets. Thus, the normal bound for equity risk premium should be restricted by inequality (11) below.

$$ROE - r_f \geq ERP \geq 0 \quad \cdots (11)$$

When an economy turns into a recession, the central bank would lower its policy short-term interest rate target. The lower short-term rate further drives down the long-term interest rate. During recessions both corporations and banks adopt more risk-averse behavior. As they prefer safer assets, demand for risk-free assets such as government bonds would increase, and market interest rates become lower. This process will continue until interest rates become low enough to induce corporate managers to take business risk to seek profit over the risk-free rate. At such stage, the relationship of $ROE - r_f \geq ERP \geq 0$ is restored. In the Japanese economy of the post-bubble period, the stock market hit bottom in mid-2003, and the long-term interest rate turned from a precipitous downtrend to an uptrend. It seems that the normal level of equity risk premium bounded by inequality formula (11) was finally restored around 2003 to 2004 in Japan.

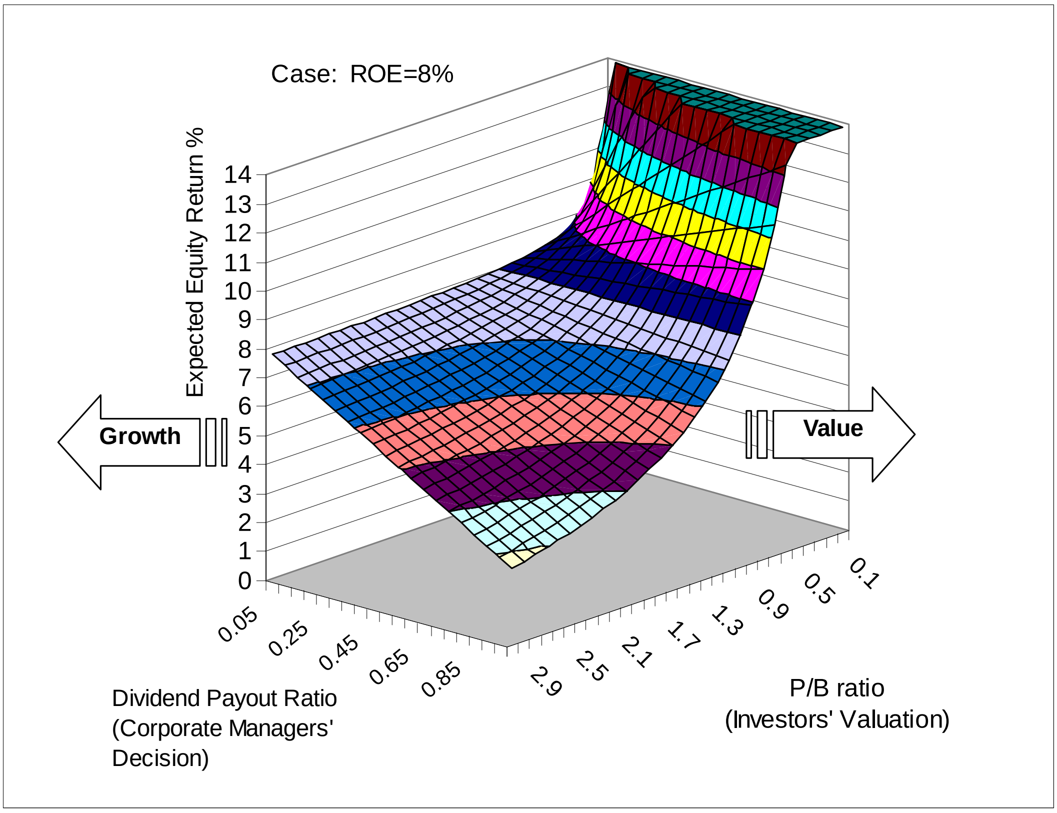
5.3 Structure of Expected Return

Eq.(6) shows that supply-side determinants of expected equity return are ROE, dividend payout, and P/B ratio. Among those three, ROE sets the upper bound for the level of expected return. Therefore, it is obvious that an increase (decrease) in ROE is a necessary condition for an increase (decrease) in expected return. Then, how do dividend payout and the P/B ratio affect expected return?

Exhibit 11 is a three-dimensional contour map, showing how expected return (vertical axis) is affected by changing two other variables, the payout ratio and P/B ratio. The payout ratio is decided by corporate dividend policy, while the P/B ratio depends on how investors decide the valuation of an equity. As the surface slopes down to front side, it indicates that an increase in dividend payout leads to lower expected return where $P/B \geq 1$ and $ROE > r$. It also indicates that an increase in the P/B ratio leads to lower expected return. In the area of $P/B < 1$, expected return is almost exclusively dependent on the level of the P/B ratio, and is not much affected by dividend payout.

We have to note, however, that dividend payout and the P/B ratio are not independent of each other in pricing a company’s stock. Suppose that a corporate manager has decided to increase the payout ratio in an attempt to lower cost of equity capital (expected return). Does his plan work? Probably not. Shareholders would think that a higher dividend payout means lower retained earnings. This may be an indication that the firm cannot find good growth opportunities, or that it cannot afford financing any investments for future growth from its internally generated capital. Thinking that a possible decline in future growth potential was imminent, investors would probably lower the valuation of the company’s stock, leading to a lower P/B ratio. As this valuation adjustment happens along with the dividend payout announcement, the equilibrium point for cost of capital would ‘slide’ from the front left to the back right without any change in height aspect.

Exhibit 11: Relationship of Expected Return, Dividend Payout, and P/B Ratio



This is an illustration that dividend payout does not affect cost of capital, as is consistent with the proposition of Miller and Modigliani (1961). Those firms located in the front left area in **Exhibit 11** are ‘growth companies’ that pay out dividend less, reinvest more of retained earnings for future growth of the business, and command higher P/B ratios. The firms located in the back right area in **Exhibit 11** are generally ‘value companies’ with lower P/B ratios that pay out more dividend income to investors, but supply less future growth of capital. Under a set of theoretical assumptions, both growth and value stocks have an identical level of expected returns.

Such assumptions required here are, as Miller and Modigliani posit, the following three conditions: (a) a perfectly competitive market, (b) rational pricing behavior on the part of investors, and (c) no uncertainty with respect to the future. Since value stocks tend to be cyclical and show larger variability in fundamental returns than growth stocks, the third condition of uncertainty does not hold equally for value and growth stocks. Apparently, value stocks are more uncertain with regard to future earnings. Investors requiring additional premium for compensating for this risk in value stocks is a good reason for value stocks commanding higher expected returns.

With regard to assumption (b) above, behavioral finance would immediately point out that investors are not behaving rationally, but with some cognitive biases. According to behaviorists, investors tend to be overly pessimistic regarding value stocks, especially at their bottom, and overly optimistic regarding growth stocks, especially at their peak. Lower P/B ratios for value stocks often reflect deteriorating financial solvency or faltering earnings of the firms concerned. When investors form a pessimistic forecast of their future recovery, the P/B ratio could become excessively depressed. On the other hand, investors tend to pay too much for growth stocks, whose future prospects are often an illusion rather than a reality. Paying too much for growth stocks results, over the long term, in their underperformance to the market index. Especially when an economy is in a deep recession, investor attention is directed to a few 'blue-chip' companies with stable earnings and higher growth. As a result, growth stocks are over-priced and value stocks depressed. This is exactly what happened in the bipolarized market of the late 1990s in Japan.

5.4 Current Estimate: An Illustrative Example

Finally, let us estimate the expected equity return as of today (August 2005), using Eq.(6). A few necessary inputs are readily available from a daily newspaper. For example, the 2nd August issue of the *Nippon Keizai Shinbun* (*Nikkei*) reports the previous day's statistics on aggregate (including financials) for the Tokyo Stock Exchange 1st Section.

- ROE: Forecast-based earnings yield (E/P) =5.6%. Actual P/B ratio=1.64.
  Then, we can calculate forward-looking ROE = 5.6×1.64＝9.18%. As Japan is recovering from a serious deflationary economy, we assume that the corporate sector will be able to sustain this level of ROE in the coming years.
- Dividend payout: Forecast-based dividend yield (d/P)=1.18%.
  Using E/P=5.6% as reported above, the forecast payout ratio would be 1.18÷5.60=0.21. We assume corporations will maintain this payout level in the future.
- B/P ratio: P/B=1.64, then its inverse B/P=0.61.

Plugging in all those numbers in Eq.(6), we obtain an estimate of 8.4% as the expected return for Japanese equities (TSE1) as of 1st August 2005.

$$E(r_{TSE1}) = [1 - 0.21 \times (1 - 0.61)] \times 9.18\% = 8.43\%$$

The yield on long-term government bonds on that day was 1.345%. Then, the market implied expected equity risk premium of 7.1%.

6. Summary

Equity returns are supplied to shareholders from corporations who utilize shareholders' capital to do business. Analysis of aggregate industrial sectors revealed that the long-run equity return has been generated from their fundamental return, but price return caused by valuation change is expected to be zero over the long run. In the Japanese economy, a supply-side estimate of equity risk premium was almost zero over the last three decades since the 1970s. The primary causes for this low risk premium were declining ROE over time and, more importantly, the excessively high corporate income tax rate imposed by the Japanese government on shareholders' earnings.

Future expected return also depends on the fundamentals of Japanese industries. As the inequality relationship 'ROE ≥ r ≥ g' shows, the supply-side approach indicates that raising ROE is the primary way to achieve higher expected equity return. In order to supply sufficiently high return to investors for shouldering risk, not only has the corporate sector to make efforts to raise ROE, but the government has also to adopt a tax policy to lower the corporate tax burden so that it does not unreasonably hurt shareholders.

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