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## Which is Better: Value Strategy or Growth Strategy?

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#### ABSTRACT

**Purpose:** On the backdrop of the recent value versus growth debate in both academics and investment community, this paper investigates which is a better strategy, value or growth strategy.

**Design/methodology/approach:** Reworking the Euler equation, this paper derives the relationship among return, profit growth, and risk. We use three different risk metrics proposed by Park and Fang (2021). We regress the value minus growth return on profit growth and risk variables to determine which is the primary driver of the return in the Korean stock market. The data run from 2000 through 2021.

**Findings:** Our data show that the accumulated return on value minus growth stocks steadily increases over 2000-2012 in Korea, indicating that value stocks outperform growth stocks over the long horizon. Our regression results show that the time-varying risk effect reverts from negativity contemporaneously to positivity with a time lag, and its temporal effect is negligible when aggregated in time. There exists a positive long-run risk effect on the value minus growth return. However, the effect of profit growth on return is not significant, indicating that growth firms' profit prospect is not a factor in the determination of value minus growth return.

**Research limitations/implications:** In the past, stock market uncertainty (risk) have been most caused by either financial system failures or technological innovations. Whether value stocks outperform growth stocks or vice versa may crucially depends on the causes of stock market uncertainty. We need to refine our model to account for the differences in the causes of stock market uncertainty.

**Originality/value:** Our model is a first attempt to combine profit growth and risk in a unifying framework to explain the value and growth spread in the stock market. The conditional CAPM is a risk-based approach in which profit growth is not accounted for.

Keywords: Value minus growth return, Time-varying risk effect, Long-run risk effect, Reverting risk and return relation, Profit growth effect

## I. Introduction

In the investment community, the choice of value strategy or growth strategy depends on whether value stocks outperform growth stocks or vise versa. Value

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strategy refers to the investment strategy of buying value stocks and short-selling growth stocks. Growth strategy means buying growth stocks and short-selling value stocks. Value strategy is chosen if and when investors expect that value stocks outperform growth stocks over their investment horizon. Growth strategy is chosen if and when growth stocks outperform value stocks.

Traditionally, value strategy has been a favored strategy in the industry. In recent decades, however,

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the returns to value strategy have faded. In academics, several researchers find that growth firms outperform value firms for some periods (e.g., Capaul et al., 1993; Asness et al., 2000). These findings led investors to doubt value strategy in their investments. Notwithstanding these findings, Blitz and Hanauer (2021) and Israel et al. (2021) argue that it is premature to call the value strategy dead. On the backdrop of the recent value versus growth debate in both academics and investment community, this paper investigates which is a better strategy, value or growth strategy.

Value stocks are relatively cheap, but growth stocks are relatively expensive when we compare their prices to each other concerning some firm values such as book values or earnings. Typically, value stocks are sold much below their book values, but growth stocks are way above their book values. These divergences of the firm's prices may be due to the differences in growth prospects or riskiness between value stocks and growth stocks. As the name " growth " indicates, growth firms are expected to grow faster than value firms. Value firms are riskier than growth firms, and their prices are more depressed. If and when risk is a primary factor in the determination of value minus growth return, value stocks are expected to outperform growth stocks because of their risk compensation. If and when growth is a primary factor, on the other hand, growth stocks are expected to outperform value stocks.

In order to explore which strategy is better, this paper extends Park and Fang (2021), and Park et al. (2021) and derives the relationship among risk, profit growth, and return in a unifying framework. Our model has some special features: First, this paper differentiates between the time-varying risk effect and the long-run risk effect on return. The time-varying risk effect reverts from negativity contemporaneously to positivity with a time lag. The temporal effect of time-varying risk on return is negligible when aggregated in time. It is because the first negative effect is negated by the second positive effect. The first negative effect is the "volatility feedback effect" in the literature (e.g., Campbell and Hentschel, 1992). The second positive effect is the conditional CAPM's (e.g., Petkova and Zhang, 2005; Ang and Chen, 2007). The reverting

effect of time-varying risk explains that growth firms outperform value firms for some periods. However, a positive long-run risk effect exists on the value minus growth return. The long-run risk effect in our model is the static CAPM's of Sharpe (1963) and Lintner (1965) and explains that value firms earn a higher average return than growth firms over a long horizon.

Our model also predicts that profit growth differentials between value and growth firms affect the value minus growth return. Ours is in line with Asness et al. (2000)'s prediction that the earnings growth spread between value and growth stocks is a future indicator of the value minus growth return.

In this paper, using the Korean data from 2000 -2021, we conduct an empirical investigation of the choice of value strategy or growth strategy. Our data show that the accumulated return on value minus growth stocks steadily increases over 2000-2021 except for a few reversal periods. These preliminary data indicate that value firms outperform growth firms over the long horizon. This paper finds that risk relative to profit growth is the primary driver of value minus growth return and advises investors to opt for value over growth.

This paper contributes to the literature in two important ways: First, the extant literature considers either risk (e.g., Bai et al., 2019) or profit growth factor (Arsness et al., 2000) in the analysis of value minus growth return and do not put together both factors simultaneously. In this study, we account for the effects of risk and profit growth on the value minus growth return together in our regression. By doing so, we can determine what drives the value minus growth return dominantly, risk or profit growth. Second, using the Korean data from 2000 - 2021, we investigate the choice of value strategy or growth strategy. We find that risk is a more important determinant of value minus growth return than a profit growth opportunity and advise investors to choose a value strategy over a growth strategy.

The paper is organized as follows: Section 2 reviews the literature. Section 3 extends Park et al. (2021) and derives the relationship among risk, profit growth, and return of value firms and growth firms. Section 4 provides data and summary statistics of risk, profit growth, and return of value firms and growth firms in the Korean stock market. The data run from 2000 to 2021. Section 5 is on estimation. Based on our derivations in Section 3, we specify our regression equations in Sub-section (5.1) and report our empirical results in Sub-section (5.2). Finally, we discuss our results and conclude our remarks in Section 6.

## II. Literature Review

Value strategy literature has a long tradition of a risk-based approach. Fama and French (1992 and 1996) attribute the value stock risk factor to the value firms' financial distress, partly responsible for the excess stock return in their three-factor model. Petkova and Zhang (2005) find that value stocks tend to covary positively, and growth stocks negatively with a market risk premium. Zhang (2005) and Bai et al. (2019) ascribe the value stock risk to the asymmetric adjustment cost of assets in place of the value firms, especially in bad times. Ai and Kiku (2013) show that growth options are less risky than value assets because growth options act as a hedge against risks in assets in place. Since investors should be, in equilibrium, compensated more for holding a riskier asset, these studies predict that value firms should earn a higher average return than growth firms over a long horizon.

The risk-based approach to value strategy has two different interpretations. The value premium (i.e., a positive return on value minus growth stocks) is an anomaly in the stock market (referred to as the value premium puzzle) because it is an alpha effect but not a beta effect of the CAPM. This argument is backed by the empirical studies in which the data over the post-1963 period are used (e.g., Fama and French, 1992). However, the later studies show that the value premium is not an anomaly because it is a beta effect of the conditional CAPM, which accounts for the timevarying beta or market risk premium. This argument is supported by the empirical studies in which the data over a long 1926-2001 is used (e.g., Ang and Chen, 2007; Bai et al., 2019). In a cross-sectional analysis, Song (1999) also finds the book-to-market effect on the returns across firms in the Korean stock market, thus favoring a value strategy over a growth strategy.

On the other hand, Asness et al. (2000) show that the earnings growth spread between value and growth stocks is a future indicator of the value minus growth return. Based on the Gordon model, the Asness et al. (2000) model predicts that when growth firms experience faster earnings growth, growth firms outperform value firms. In recent decades, several researchers find that growth firms outperform value firms for some periods (e.g., Capaul et al., 1993; Asness et al., 2000).

The value or growth strategy literature described above says that two factors determine the value minus growth return, i.e., the return on value/growth strategy. They are the differences in risk and profit growth between value and growth firms. A key question is what drives the value minus growth return dominantly, risk or profit growth? If and when the difference in risk is an overwhelming driver of the value minus growth return, value firms will earn a higher average return than growth firms. In such a case, we advise that investors choose a value strategy over a growth strategy. On the other hand, if and when the difference in profit growth is a primary driver of the value minus growth return, growth firms would outperform value firms. We advise that investors would better choose a growth strategy over a value strategy in such a case.

#### III. Risk, Profit Growth, and Return

Section 3 derives the risk's and the profit growth's relations to return in the stock market. Park et al. (2021) study the effect of risk on the value minus growth return. Here we extend Park et al. (2021) by incorporating the profit growth's effect on the value minus growth return.

Park et al. (2021) differentiate between the timevarying risk effect and the long-run risk effect on the value minus growth return. They rework the Euler equation to show that the time-varying risk effect on value minus growth return is reverted from negativity contemporaneously to positivity with a time lag. Since the second positive effect negates the first negative effect over time, the time-varying risk effect is negligible when aggregated in time. However, they find that there exists a positive long-run risk effect on the value minus growth return.

Following Cochrane (2000), we write the Euler equation as

$$P_t = E_t(m \ X_{t+1}), \tag{1}$$

stating that the current asset price,  $P_t$  is an expected value of the future payoff,  $X_{t+1}$  multiplied by its stochastic discount factor (SDF), m. The SDF is, in equilibrium, determined as the marginal rate of substitution between consumption at times t and t+1. The parameters associated with the SDF are those of the investor's risk aversion and time preference.

We define a long-run steady state in which risk is invariant with time and constant. Reworking the Euler equation (1), Park et al. (2021) show that there is a particular relationship between risk and return at a long-run steady-state equilibrium such that

$$E(R) = R_f + \gamma \quad Var(R), \tag{2}$$

where *R* is a stock market (gross) return; E(R) is an unconditional mean return;  $R_f$  is a risk-free gross rate; Var(R) is an unconditional variance of return that would prevail at a long-run steady- state.  $\gamma > 0$ and depends on the degrees of risk aversion and time preference. In a long-run steady-state, a typical stock's price is expected to increase at a constant rate. A stock market with a greater risk earns a higher average return over a long horizon. Equation (2) is a static CAPM of Sharpe (1963) and Lintner (1965).

Next, we explore how the time-varying risk affects the stock market's return fluctuation. The time-varying risk, by nature, is transitory and moves around its long-run risk defined in (2). We measure the timevarying risk with a conditional variance of return; instead of that, we measure the long-run risk with an unconditional variance of return. Reworking the Euler equation, Park et al. (2021) show that  $P_t$  is a negative function of the time-varying risk. In that event, the difference in the expected (gross) return and the current (gross) return in the stock market depends on the aggregate stock market risk in the following manner:

$$E_t(R_{t+1}) - R_t = g' * [var_t(R_{t+1})], \qquad (3)$$

where g' is the first-order derivative of the function,  $E_t(R_{t+1}) - R_t = g[var_t(R_{t+1})]$ , and measures the responsiveness of  $[E_t(R_{t+1}) - R_t]$  to an increase in  $var_t(R_{t+1})$ . g' includes  $\gamma$  and is positive. We note that the lower case variance,  $var_t(R_{t+1})$  is the conditional variance measured in terms of the deviations around its long-run level.

Equation (3) dictates that an increase in the timevarying risk (above its long-run level) causes a more considerable discrepancy between  $E_t(R_{t+1})$  and  $R_t$ by lowering  $P_t$ . At a predetermined  $P_{t-1}$  and a given expected payoff,  $E_t(X_{t+1})$ , a decline in  $P_t$  means a lower  $R_t$  and a higher  $E_t(R_{t+1})$ . In sum, the Euler equation states that other things (e.g., future payoff) being equal, an increase in the time-varying risk lowers return contemporaneously and raises return during upcoming periods. The first negative effect is the "volatility feedback effect" in the literature (e.g., Campbell and Hentschel, 1992). The second positive effect is the conditional CAPM's (e.g., Ang and Chen, 2007; Bai et al., 2019).

Equation (3) explains the short-term return fluctuations in the stock market when the time-varying risk moves around its long-run level as defined in (2). When the time-varying risk returns to its long-run level,  $E_t(R_{t+1})$  becomes equal to  $R_t$  as  $var_t(R_{t+1})=0$  in (3). In such a circumstance,  $P_t$  is expected to grow at a constant rate in the long run as dictated in (2). When the time-varying risk increases above its long-run level, the stock return falls first below its long-run return before it rises above its long-run return during upcoming periods. The effect that an increase in risk (i.e., future volatility) drives down return contemporaneously is the "volatility feedback effect". Campbell and Hentschel (1992) find that volatility feedback has little effect on the unconditional variance in (2).

Next, we relate profit growth to return. Rearranging (3), we have that

$$R_{t} = E_{t}(R_{t+1}) - g'* [var_{t}(R_{t+1})]$$
(4)

Equation (4) states that holding  $var_t(R_{t+1})$  constant, an increase in (expected) profit growth,  $E_t(R_{t+1})$ raises return,  $R_t$  by an equal amount. Henceforth, the discrepancy between  $E_t(R_{t+1})$  and  $R_t$  remains unchanged at the same risk level, and equation (3) holds at the same time.

In sum, there are two sources of a higher expected return: increases in risk and profit growth. An increase in risk raises expected returns by depressing the current price and return. On the other hand, a higher profit growth raises expected return and current price and return. Financial or health crises such as the Covid-19 pandemic are typical examples of the former, and technological innovation is of the latter.

Next, we derive the relationship among risk, profit growth, and return at a portfolio level. Consider value minus growth portfolio, v-g. Define the portfolio betas of value stocks and growth stocks as  $\beta_v$  and  $\beta_g$ , respectively. Applying the CAPM to (3), we have the risk and return relation for v-g such that

$$E_{t}[R_{v-g,t+1}] - R_{v-g,t} = g'^{*}(\beta_{v} - \beta_{g}) [var_{t}(R_{t+1}).$$
(5)

Equation (5) states that the difference in the expected return and the current return of v-g is an increasing function of the aggregate stock market risk on the evidence that  $\beta_v > \beta_g$  (e.g., Petkova and Zhang. 2005). The sensitivity of the return's difference to risk depends on the portfolio beta's magnitude.

At a long-run steady-state, we have the same risk and return relation for the value minus growth portfolio as (endnote 1)

$$E(R_{v-q}) = \gamma \left(\beta_v - \beta_q\right) \quad Var(R).$$
(6)

Ai and Kuku (2013) introduce the differential effect of long-run consumption risk across book-to-market sorted portfolios. Their analysis is comparable to our long-run risk effect on the return of value and growth stocks. They study a cross-section of equity returns while ours is on the time-series relation between risk and return.

Rearranging (5), we have:

$$R_{v-g,t} = E_t [R_{v-g,t+1}] - g'^* (\beta_v - \beta_g) [var_t(R_{t+1})]$$
(7)

Equation (7) states that holding  $var_t(R_{t+1})$  constant, a higher  $E_t[R_{v-g,t+1}]$  raises  $R_{v-g,t}$  by an equal amount. Using the Gordon model, Asness et al. (2000) derive that a higher  $E_t[R_{v-g,t+1}]$  raises  $R_{v-g,t}$  by an equal amount. However, their model does not include the effect of risk on the value minus growth return.

#### IV. Data and Descriptive Statistics

Our data consists of stock market data and financial data. Stock market data are the KOSPI 200 firms' daily stock prices and the KOSPI 200 index. Financial data are the KOSPI 200 firms' year-end book values and quarter-end operating and net profits. The data run from January 2000 to December 2021. We collect our data from DataGuide web (http://www.dataguide.co.kr), which is serviced by a private data vending company, FnGuide Inc., in Korea.

We rebalance our portfolios as follows: First, all firms' book-to-market ratios are updated using the market prices on the first business day of each year. Second, based on the rankings of the year's book-tomarket ratios of the KOSPI 200 firms, the top 20/40 stocks (top deciles/top quintiles) are assigned value stocks, and the bottom 20/40 stocks (bottom deciles/ bottom quintiles) are assigned growth stocks every year. Last, we newly form a value minus growth stocks portfolio at the beginning of 2000 to 2021.

Figure 1 shows the accumulated returns on the value minus growth stocks portfolio from 2000 until 2021. If value firms earn a higher average return than growth firms, we expect the accumulated return on the value minus growth stocks portfolio to grow over time steadily. As seen in Figure 1, the accumulated return steadily increases from 2000 to 2021 except for a few periods of reversal. From early 2020 through 2021 of the Covid-19 pandemic times, the return on value minus growth stocks repeatedly fell first and rose later. We think that the significant rise in the time-varying risk during the pandemic causes

the fall first and rise later phenomena in the stock market. The accumulated returns vary more significantly with deciles than with quintiles.

This steadily growing accumulated return on value minus growth stocks portfolio is similar to those documented in other countries such as the U.S., the U.K., and Japan by Capual et al. (1993). They study bi-annually rebalanced value and growth indexes.

Table 1 shows the summary statistics of the portfolios' monthly returns of the value, the growth, the value minus growth, and the KOSPI 200 index for the sample period of January 2000 - December 2021. The numbers with and without parentheses refer to those with quintiles and deciles, respectively. KOSPI 200 is value-weighted while the value stocks and the growth stocks portfolios



Note: A stock's return at time t is a price return computed as  $\ln(P_t) - \ln(P_{t-1})$ . The value stocks and the growth stocks are equally weighted. We compound the accumulated returns daily.

Figure 1. A	Accumulated	return	on	value	minus	growth	portfolio
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	Return			Sharp ratio			BM ratio				
	Kospi 200	Value	Growth	Value- growth	Kospi 200	Value	Growth	Value- growth	Value	Growth	Value- Growth
Mean	0.42% (0.42%)	0.35% (0.23%)	-0.72% (-0.47%)	1.08% (0.70%)			-0.088	0.166	5.802 (4.120)	0.288 (0.388)	5.514 (3.732)
Maximum	20.78% (20.78%)	31.80% (24.59%)	28.23% (26.82%)	23.19% (18.78%)	0.067	0.040			26.588 (17.790)	1.022 (1.049)	25.565 (16.741)
Minimum	-23.5% (-23.5%)	-46.63% (-41.9%)	-39.27% (-38.5%)	-18.64% (-14.6%)	(0.067)	(0.028)	(-0.061)	(0.135)	1.713 (1.385)	0.133 (0.203)	1.495 (1.122)
Standard Deviation	6.26% (6.26%)	8.81% (8.17%)	8.17% (7.71%)	6.50% (5.17%)					6.094 (3.666)	0.122 (0.141)	5.993 (3.539)

Table 1. Summary statistics of monthly returns of value, growth, and value minus growth

Note: The numbers with and without parentheses refer to those with quintiles and deciles, respectively. The Sharp ratios of the KOSPI 200, the value, the growth, and the value minus growth stocks are computed by taking the ratios of the portfolio's returns to their standard deviations. Value spread is the value stock BM ratio minus growth stock BM ratio.

are equally weighted. The value minus growth portfolio earned the mean monthly return of 1.08% (with deciles) and 0.70% (with quintiles). When evaluating the value minus growth portfolios' relative performance in the Sharp ratio, the value minus growth portfolio's Sharp ratio (computed as the return/ standard deviation) is 0.166 with deciles and 0.135 with quintiles. Compared to the Sharp ratio of 0.067 of KOSPI 200, these are about two times as high as the KOSPI 200's. The BM spreads with quintiles are less than those with deciles.

We measure  $x_t$  by an equally weighted average of the operating profit growth and the net profit growth of the value and the growth firms, respectively. The operating profit is earnings before interest and taxes (EBIT), while the net profit is after interest and taxes.

Table 2 reports the summary statistics of monthly  $x_t$  of the value firms and the growth firms for the period of 2000 - 2021. The statistics are computed using both the operating profit growth and the net profit growth for  $x_t$ . Both are nominal figures, which are not price-deflated. Profit data are available every quarter. We convert  $x_t$  from quarterly to monthly data by an intra-quarter interpolation. The value and the growth firms are yearly rebalanced.

Certain firms (e.g., low BM ratio's firms) are named "growth firms" because profits of those firms are supposed to grow faster than other firms (e.g., value firms) in the future. Contrary to this conventional wisdom, Table 2 shows that the value firms performed

Table 2. Summary statistics of monthly profit growth of value and growth firms

	Operating p	profit growth	Net prof	it growth
	Value	Growth	Value	Growth
Mean	0.048	0.017	0.105	-0.063
Maximum	5.985	0.321	5.997	0.296
Minimum	-7.916	-0.537	-2.923	-5.097
Std. Dev.	1.256	0.095	1.000	0.477

Note: Operating profit is earnings before interest and taxes (EBIT). Net profit is earnings after interest and taxes. The firms in Korea release profit data every quarter. We convert the quarterly data into the monthly figures using an intraquarter interpolation. We sort out value stocks and growth stocks with deciles and form portfolios with equal weighting. The profit data run from Ql of 2000 to Q3 of 2021. a higher profit growth than the growth firms over the sample period of 2000-2021 in Korea. The mean growth rate is 4.80% for the value firms and 1.70% for the growth firms when  $x_t$  is measured in terms of the operating profit growth. The mean growth rate is 10.50% for the value firms and -6.03% for the growth firms when  $x_t$  is the net profit growth. The difference in sample means may not be a good measure of the difference in expected growth between the value and the growth firms due to irrational expectations or rare events, as pointed out in Pastor and Veronesi (2007). However, it is not an exceptional observation that the value firms exhibited faster growth rates than the growth firms in Korea. Chen (2017) reports that in yearly rebalanced portfolios, dividends of value stocks grew faster than those of growth stocks in the U.S.

Following Park and Fang (2021), this paper uses three risk metrics, i.e., market variance  $\sigma_t^{2}(M)$ , the variance of typical stock  $\overline{\sigma}_t^{2}$ , and the ratio of these two variances. The ratio is called a fractional non-diversifiable risk. It is also similarly known as correlation risk in the literature (e.g., Pollet and Willson, 2010; Adrian et al., 2018). This paper wants to determine whether the fractional non-diversifiable risk is more responsible for the return fluctuations than the individual risk at the portfolio levels of value stocks and growth stocks. Our market portfolio, *M* is KOSPI 200.  $\overline{\sigma}_t^{2}(i)$ is an average variance of individual stocks for i =1, 2...*M*.

Table 3 shows the summary statistics of our three risk metrics,  $\sigma_t^{2}(M)$ ,  $\overline{\sigma}_t^{2}(i)$  and the ratio of these two variances.  $\sigma_t^{2}(M)$  and  $\overline{\sigma}_t^{2}(i)$  are the variances in month t and computed using GARCH(1,1). We see from Table 3 that the means of  $\sigma_t^{2}(M)$ ,  $\overline{\sigma}_t^{2}(i)$  and  $\sigma_t^{2}(M)/\overline{\sigma}_t^{2}(i)$  are 0.005, 0.024, and 0.176, respectively. When we convert those two variances into annual standard deviations, they are approximately 0.24 and 0.53, respectively. The risk of the market portfolio is much less than the risk of the typical stock. These numbers are quite close to the standard deviations estimated in Elton and Gruber (1977).

Table 3. Summary statistics of three risk metrics

	$\sigma_t^{2}(M)$	$\overline{\sigma}_t^2(\mathbf{i})$	$\sigma_t^2(M)/\overline{\sigma}_t^2(i)$
Mean	0.005	0.024	0.176
Maximum	0.087	0.168	0.636
Minimum	0.000	0.005	0.012
Std. Dev.	0.008	0.023	0.108
Observations	264	264	264

Note:  $\sigma_t^{2}(M)$ ,  $\overline{\sigma_t}^{2}(i)$  are the variance of the daily log return of KOSPI 200 and the average variance of the daily log returns of individual stocks, respectively. The ratio  $\sigma_t^{2}(M)/\overline{\sigma_t}^{2}(i)$  measures the fraction of the non-diversifiable risk relative to the individual risk of a typical stock and is called the fractional non-diversifiable risk (Park and Fang, 2021). They are estimated using GARCH (1,1)

One thing to note is that these risks vary much over time. The market variance's standard deviation is far greater than its mean, and the maximum of the variations in the variance is 0.087 (= 0.087-0.000), which is a 28% change from month to month. This time-varying risk of the market portfolio is due to the time-varying nature of both individual risk and the fractional non-diversifiable risk, i.e., the ratio of two variances.

## V. Estimation

#### A. Specification and hypotheses

The empirical finance literature shows that the time series of stock return exhibit heteroscedasticity that the variance of  $R_{t+1}$  depends on the variance of  $R_t$ . Whitelaw (1994) finds that return moves ahead of variance. Taking these into consideration, we replace the variance of  $R_{t+1}$  expected at time t,  $var_t(R_{t+1})$  by the contemporaneous variance,  $var(R_t)$  in (5) for our specification.

Using (5), (6), and (7), we specify our regression equations as follows:

$$r_{t} = a_{0} + a_{1} E_{t} x_{t+1} + a_{2} \sigma_{t}^{2}(M) + a_{3} (\sigma_{t-1}^{2}(M)) + \epsilon_{t},$$
(8)

$$r_{t} = b_{0} + b_{1} E_{t} x_{t+1} + b_{2} \sigma_{t}^{2}(i) + b_{3} \sigma_{t-1}^{2}(i) + b_{4} \frac{\sigma_{t}^{2}(M)}{\overline{\sigma_{t}}^{2}(i)} + b_{5} \frac{\sigma_{t-1}^{2}(M)}{\overline{\sigma_{t-1}}^{2}(i)} + \epsilon_{t}, \qquad (9)$$

where  $\epsilon_t$  is a random error term. We use net (value minus growth) return  $r_t$  instead of gross return  $R_t$  in (8) and (9). The monthly profit growth term,  $E_t x_{t+1}$  on the right-hand side of (8) and (9) is assumed to follow AR(2) process and accordingly estimated. (endnote 2). The variance terms are the sample variances which are computed as an equally weighted average of daily squared returns within month t.(endnote 3)

The constant terms  $a_0$  and  $b_0$  in (8) and (9) pick up the long-run risk effect on return as determined in (6). The long-run risk effect in our model is the static CAPM's of Sharpe (1963) and Lintner (1965). The variance terms capture the time-varying risk effect on return, which reverts with a time lag as depicted in (5). The time-varying risk represents a transitory deviation from the long-run risk level. The first negative effect of time-varying risk is Campbell and Hentschel's "volatility feedback effect" (1992). The second positive effect is the conditional CAPM's (e.g., Petkova and Zhang, 2005; Ang and Chen, 2007). Since the second positive effect negates the first negative effect, the time-varying risk effect on value minus growth return is negligible when aggregated in time. The profit growth term,  $E_t x_{t+1}$  captures the cetris paribus effect of expected future profit growth on the value minus growth return, given the time-varying risk level. We expect that  $a_0 > 0$ ,  $a_1 > 0$ ,  $a_2 < 0$  and  $a_3 > 0$  in (8), and  $b_0 \rangle 0, b_1 \rangle 0, b_2 \langle 0, b_3 \rangle 0, b_4 \langle 0, \text{ and } b_5 \rangle 0$  in (9). We rename (8) and (9) as models 1 and 2, respectively.

- From (8) and (9), we posit three hypotheses:(1) Hypothesis 1: There exists a positive long-run risk effect on value minus growth return.
- (2) Hypothesis 2: The time-varying risk effect reverts from negativity contemporaneously to positivity with a time lag.
- (3) Hypothesis 3: A higher profit growth of growth firms relative to value firms raises the return on growth stocks relative to value stocks.

### B. Empirical results

Table 4 reports the regression results of (8) and (9) for the yearly- rebalanced value minus growth

portfolio when the operating profit growth (Panel A) and the net profit growth (Panel B) are used for  $x_t$ , respectively. As seen in Panel A of Table 4, the constant coefficients are positive and significant in

Table 4	4.	Regression	results	of	(8)	and	(9)
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Panel A	Operating	Profit	Growth
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	9						
Variable		Model 1		Model 2			
variable	Coefficient	Model 1         Model 2           t-Statistic         Prob.         Coefficient         t-Statistic           2.8915         0.0042         0.0131         1.6820           -1.7515         0.0811         -0.0043         -1.8239           -1.5441         0.1238         0.2121         0.8665           0.8786         0.3804         0.2121         0.8665           -0.0743         -0.2916         -0.1375         -2.3353           0.1063         2.2007         R-squared 0.055         Adjusted R-squared 0.036	Prob.				
С	0.0127	2.8915	0.0042	0.0131	1.6820	0.0938	
$x_t$	-0.0040	-1.7515	0.0811	-0.0043	-1.8239	0.0693	
$\left[\sigma^{2}(M)\right]$	-0.9822	-1.5441	0.1238				
$\left[\sigma_{t-1}^{2}(M)\right]$	0.5772	0.8786	0.3804				
$\left[\overline{\sigma}_{i}^{2}\right]$				0.2121	0.8665	0.3870	
$\left[\frac{-}{\sigma_{i-1}}^2\right]$				-0.0743	-0.2916	0.7708	
$\left[\frac{\sigma^2(u)}{\overline{\sigma_i}^2}\right]$				-0.1375	-2.3353	0.0203	
$\left[\frac{\sigma_{t-1}^{2}(u)}{\overline{\sigma}_{i-1}^{2}}\right]$				0.1063	2.2007	0.0287	
		R-squared 0.018			R-squared 0.055		
	Adjı	isted R-squared 0.	006	Adjı	usted R-squared 0.	.036	
	Dur	bin-Watson stat 2.	019	Dur	bin-Watson stat 2.	037	

#### Panel B: Net profit

Variable	Model 1			Model 2			
variable	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	
С	0.0130	2.8988	0.0041	0.0129	1.6445	0.1013	
$x_t$	-0.0024	-0.7061	0.4808	-0.0023	-0.7125	0.4768	
$\left[\sigma^2(M)\right]$	-0.9618	-1.5170	0.1305				
$\left[\sigma_{t-1}^{2}(M)\right]$	0.5520	0.8345	0.4048				
$\left[\overline{\sigma}_{i}^{2}\right]$				0.2151	0.8802	0.3796	
$\left[\overline{\sigma}_{i-1}^{2}\right]$				-0.0850	-0.3333	0.7392	
$\left[\frac{\sigma^2(u)}{\overline{\sigma_i}^2}\right]$				-0.1333	-2.3030	0.0221	
$\left[\frac{{\sigma_{t-1}}^2(u)}{{\overline{\sigma}_{i-1}}^2}\right]$				0.1058	2.1869	0.0297	
	R-squared 0.013				R-squared 0.049		
	Adjusted R-square 0.002			Adjı Dur	usted R-squared 0.	.030 033	
Note: Models 1 and 2	) are as follows:	oni-watson stat 2.	V17	Dui	on-watson stat 2.		

ote:	Models 1 and 2 are as follows:	
	Model 1: $r_t = a_0 + E_t x_{t+1} + a_2 \sigma_t^2 (M) + a_3 (\sigma_{t-1}^2 (M)) + \epsilon_t$	(8)
	Model 2: $r_t = b_0 + E_t x_{t+1} + b_2 \overline{\sigma_t}^2(i) + b_3 \overline{\sigma_{t-1}}^2(i) + b_4 \frac{\sigma_t^2(\mathcal{M})}{\overline{\sigma_t}^2(i)} + b_5 \frac{\sigma_{t-1}^2(\mathcal{M})}{\overline{\sigma_{t-1}}^2(i)} + \epsilon_t.$	(9)

 $\sigma_t^{-i}(i) = \sigma_{t-1}^{-i}(i)$  (9)  $r_t$  is the monthly returns on value minus growth stocks.  $E_{x_{t+1}}$  is the expected growth of the operating (net) profit growth of value minus growth stocks over the period of t to t+1. We rebalance value stocks and growth stocks yearly. Variances (explanatory variables) in month t are estimated using sample variance, i.e., the sum of the daily squared returns in month t. We use HAC standard errors and covariance (Bartlett kernel, Newey-West fixed) to correct for heteroscedasticity of regression residuals. The sample period is from January of 2000 to September of 2021. model 1 (p<0.01) and model 2 (p<0.1). The magnitudes of 1.27% in model 1 and 1.31% in model 2 are pretty close to the unconditional mean return of 1.08% as shown in Table 1. The constant terms in (8) and (9) pick up the long-run risk effect. The time-varying risk effect is reverted with a time lag in models 1 and 2, i.e.,  $a_2 < 0$  and  $a_3 > 0$  in (8), and  $b_4 < 0$  and  $b_5 > 0$  in (9). The fractional non-diversifiable risk variable in model 2 is significant at time t (p<0.05) and time t-1 (p<0.05), but the other risk coefficients are not significant. The profit growth variable is significant in models 1 (p<0.1) and 2 (p<0.1), but has a wrong sign.

Panel B of Table 4 shows the results of (8) and (9) when we use the net profit growth for  $x_t$ . The constant coefficients are positive and significant in model 1 (p<0.01) and model 2 (p<0.1). The magnitudes of 1.30% in model 1 and 1.29% in model 2 are pretty close to the unconditional mean return of 1.08% as shown in Table 1. The time-varying risk effect is reverted with a time lag in models 1 and 2, i.e.,  $a_2 \langle 0$  and  $a_3 \rangle 0$  in (8), and  $b_4 \langle 0$  and  $b_5 \rangle 0$  in (9). The fractional non-diversifiable risk variable in model 2 is significant at time t (p<0.05) and time t-1 (p<0.05), but the other risk coefficients are not significant. The profit growth variable is not significant in models 1 and 2, and has a wrong sign. The results in Panels A and B are very similar.

The upshot is that risk is the primary driver of the value and growth return. Notably, the long-run risk effect is consistently significant and more critical than the time-varying risk effect. Profit growth is not a factor determining the value minus growth return. In fact, the value firms' profit had grown faster than the growth firms' profit in Korea throughout the study period. which is contrary to conventional wisdom.

## VI. Discussion and Conclusion

Because of the recent sluggish performance of value strategies, investors are confused and even skeptical of the strength of value strategy relative to growth strategy. Conceptually, two factors are determining the value stock's return relative to a growth stock's return. They are the differences in risk and profit growth between value firms and growth firms. Several researchers argue that value stocks should outperform growth stocks because value firms are riskier than growth firms (e.g., Zhang, 2005; Bai et al., 2019). Asness et al. (2000) show that when growth firms experience a faster earnings growth, growth firms outperform value firms.

This paper extends Park et al. (2021) and derives the relationship among risk, profit growth and return in the stock market. Based on the derivations, we posit three hypotheses: (1) there exists a positive long-run risk effect on value minus growth return (hypothesis 1); (2) the time-varying risk effect reverts from negativity contemporaneously to positivity with a time lag (hypothesis 2); (3) a higher profit growth of growth firms raises the return on growth firms relative to value firms (hypothesis 3).

This paper has tested three hypotheses using the Korean data from 2000-2021. We do not reject hypotheses 1 and 2 at some significance levels (between p<0.01 and p<0.1). However, we reject hypothesis 3 at several significance levels. Furthermore, the profit growth's regression coefficient has a wrong sign.

Based on our test results, this paper may conclude that risk is a dominant factor determining the value minus growth return in the Korean stock market. All the more, the value firms' profit had grown faster than the growth firms' profit throughout 2000 - 2021. It is contrary to the conventional wisdom that the name "growth firm" is meant. Indeed, the accumulated return on the value minus growth stocks has steadily increased from 2000 to 2021 (except for few periods of reversal) in the Korean stock market. This paper advises investors to choose a value strategy over a growth strategy over a long horizon.

It may be interesting to see how the return behaved during the current Covid-19 pandemic in the Korean stock market. At the outbreak of the pandemic in early 2020, the stock market fell sharply, but some months later rose back. In the following year, the stock market fell first and rose later responding to the pandemic news. This paper finds that the timevarying risk effect on value minus growth return reverts from negativity contemporaneously to positivity with a time lag (hypothesis 2). Figure 1 verifies that the value minus growth return repeated fall first and rise later in the Korean stock market during the pandemic times.

There is one caveat. In this paper, we suppose that investors rebalance value and growth stocks every year. The frequency of rebalancing may materially affect the value strategy's investment performance. If it is so, we advise investors to be mindful of how long they should hold the value minus growth portfolios before rebalancing them.

#### Endnote

- 1. Since v-g is a zero-investment portfolio, we do not have  $R_f$  on the right-hand side of (6).
- 2. We obtained similar results assuming an AR(1) process for  $x_t$ .
- 3. We use sample variance instead of GARCH (1,1) for the estimates of explanatory variables in (8) and (9). We regress return on variances which, in turn, follows a GARCH process. In such a case, we would better use the GARCH-M model (Engle et al., 1987) for our estimation of (8) and (9). However, the GARCH-M model is not well suited for estimating (8) and (9) because of the lagged variance variables as one of the explanatory variables.

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