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Can Leverage Level Explain Value Premium

-- Based on China's A-share market

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Abstract: According to the traditional MM theory, in the case of taxation, the level of leverage of a company will affect its market value. This article conducts an empirical study on the reasons for the existence of the value premium in China's A-share market. It is believed that different levels of leverage of enterprises will have an impact on the value of enterprises in China's A-share market, thereby affecting their profitability. After constructing a Fama three factor capital asset pricing model and confirming that there is indeed a value premium in the Chinese stock market, this paper incorporates the financial leverage, operational leverage, and comprehensive leverage of enterprises in the A-share market into the Fama three factor capital asset pricing model, and uses the OLS regression method for enterprises in the Chinese A-share market. The empirical results show that the value premium reflects the compensation for taking more risks and is related to financial leverage, operational leverage, and comprehensive leverage.

Keywords: Leverage, Value Premium, Three Factor Model, MM Theorem.

1. Journals Reviewed

In recent years, many scholars have conducted a lot of empirical research on why stocks with high book to market ratios obtain higher returns than stocks with low book to market ratios. The existing literature mainly focuses on the following aspects in explaining the "puzzle of value premium": explanations based on data mining and sample selection bias; Risk based interpretation; An explanation based on the nature of investor behavior. Black (1993) and Mackinlay (1995) pointed out that due to data mining, the specificity of the sample interval caused a value premium, and he believed that this situation would not continue in the future. As early as 1990, Lo and Mackinlay proposed the issue of data mining, which they referred to as data snooping. Kothari et al. (1994) believed that due to sample selection bias, when the analysis is based on assets in the compustat database, research may generate significant bias. However, some scholars later found that the BM effect still exists significantly after testing the stock market outside the United States or extending the test period, thereby denying the explanation of Black et al. In addition, some scholars attribute the value premium to risk compensation pairs, and different scholars have different views on the impact of risk on yield. Fama and French (1992) and Chen and Zhang (1998) believe that value stocks are generally companies whose market expectations for the company's future are not optimistic. They have lower returns, higher earnings uncertainty, higher leverage levels, and higher risks. Therefore, higher returns from value stocks than growth stocks are compensation for risks. Carlson et al. (2004) simulated the relationship between expected returns and internal investment decisions, and found that the value premium was driven by operational leverage. Novy Marx (2007) provided empirical evidence in support of the Carlson et al. (2004) model. Cai Haihong and Wu Shinong (2003) found evidence that they refused to explain the value premium from a behavioral perspective. Wang Jinbin (2004) proved that there is a significant value premium in China's stock market. The CAPM model well explains the investment premium of the value stock portfolio, and adding the explanatory factor of the difference between the premium of the value stock portfolio and the growth stock portfolio improves the fitting degree of the model. Wu Shinong, Xu Nianxing (2004), Shi Yuyou, et al. (2008) found that there is a significant book to market effect (BM effect) in China's stock market, and the changes in cross-sectional returns of Chinese stocks depend on risk factors. Fama and French (2006) and Ang and Chen (2007) found that the unconditional CAPM model had no explanatory power for the value premium after 1963. Therefore, scholars revised the CAPM model and began to study the relationship between time varying risk and value premium. The core of this type of literature is β Changes will occur as the economic state or macroeconomic variables change. Petkova and Zhang (2005) used conditional CAPM to study the relative risk of value stocks and growth stocks, and found that time-varying risk can explain the value premium. Zhang (2005) found that value stocks have higher risks than growth stocks when studying the relationship between time-varying risk and value premium, especially when the economic environment is poor (the cost of risk is higher). Cooper (2006) developed an actual option model based on the work of Zhang (2005), which takes into account the observed value premium. He showed that the irreversibility of investment is the driving force behind the value premium. Lewellen and Nagel (2006) expressed doubts about the conclusions drawn by the conditional CAPM model used in Zhang (2005)'s study; However, Guo et al. (2009) demonstrated a positive correlation between value premium and conditional variance. They further demonstrated that value stocks are more risky than growth stocks when the economy is poor. Some scholars attribute the value premium to behavioral factors, believing that investors will predict future stock trends based on the past stock prices and operating conditions of enterprises. Especially, investors naively infer past company performance, leading to an overreaction of stock prices to "too high" and "too low" growth stocks. Based on behavioral factors, Gulen et al. (2011) used a Markov transformation model to examine the time-varying nature of value premiums, and found that there was a

significant difference in the response of expected returns between value stocks and growth stocks to the overall economic environment impact. Value premiums were time-varying, rising during periods of high volatility, and then gradually declining. Huang Fenhong and Wang Zhiqiang (2015) used the GJR GARCH M model to investigate the time-varying idiosyncratic volatility characteristics of Chinese value stocks and growth stocks based on the conditional CAPM framework, and analyzed the correlation between value premium and time-varying idiosyncratic risk. The results showed that idiosyncratic volatility risk can explain value premium. Lakonishok et al. (1994, LSV), La Porta et al. (1997), Ali et al. (2003) believe that the market always underestimates value stocks and overestimates growth stocks. When the market corrects price errors, value stocks gain higher returns than growth stocks. A study by Griffin and Lemmon (2002) found that companies with high distress risks have the greatest return reversals before and after the release of earnings announcements, so the benefits of distress risk are attributed to mispricing. Berker and Wurgler (2006) believe that stock prices are influenced by investors' "emotional" states. Brennan and Wang (2010) showed that when stock prices are affected by mispricing, the expected return may depend not only on the basic risks included in the standard asset pricing model, but also on the type and extent of asset mispricing. Doukas et al. (2010) examined the relationship between mispricing and arbitrage risk, and found that stocks with high arbitrage risk have higher mispricing than stocks with low arbitrage risk. Wang Lei and Liu Yaqing (2011) drew a conclusion that the value premium was caused by investors' overreaction to the company's development expectations by decomposing the book to market ratio. Zhang Zongxin and Wang Hailiang (2013) introduced subjective belief as a variable to empirically analyze investor sentiment and market volatility. The results show that investor sentiment has a significant positive impact on both belief and yield volatility. Clark and Qiao (2020) did not find evidence of behavioral factors that contribute to the premium, such as overreaction/underreaction. However, they do find strong evidence that it is reasonable to explain the value premium puzzle from the perspective of risk compensation in China's stock market.

In summary, there are few literatures that use different leverage of companies as an explanation for the value premium of companies. This article will then explore whether financial leverage, operational leverage, and comprehensive leverage of enterprises in the Chinese A-share market can be used as an explanation factor for the value premium.

2. Research Assumptions and Model Construction

2.1. Research Hypothesis

Hypothesis 1: Financial leverage acts positively on corporate returns, which is one of the explanatory factors for value premium.

With the capital structure unchanged, the larger the financial leverage coefficient, the more sensitive the return on capital is to changes in the EBIT margin, which means that if the EBIT margin increases, the capital margin will increase by a greater margin. Therefore, financial leverage may affect the value of the enterprise and thus the rate of return.

Hypothesis 2: Operating leverage acts positively on corporate returns and is an explanatory factor for value premium.

The operating leverage coefficient is a reflection of the operating status of enterprises. Large-scale enterprises often have a high proportion of heavy assets, which determines that their profit change rate is far greater than the sales change rate. When business increases, profits will multiply by the multiple of operating leverage, which indicates that if a company has a higher operating leverage, the greater the margin of profit change, and vice versa, the greater the loss. Therefore, operating leverage may affect the value of the enterprise and thus the rate of return

Hypothesis 3: Comprehensive leverage acts positively on corporate returns and is an explanatory factor for value premium.

Comprehensive leverage refers to the combined effect of operational and financial leverage. According to the previous two assumptions, if both operational and financial leverage can positively affect the return of an enterprise, then comprehensive leverage should also be able to positively affect the return of an enterprise under the conditions of the above assumptions.

2.2. Model Building

2.2.1. Fama French three factor model

1. Factor construction

First, construct risk factors. The grouping method is 2 × Method 3: Firstly, divide the market value of sample stocks into small market value group (S) and large market value group (B) according to their size. Secondly, according to the size of the book to market ratio, the sample stocks are sorted in Groups S and B, and are divided into six groups on average, namely, S/L, S/M, S/H, B/L, B/M, and B/H. Finally, the time series of the scale factor SMBt and the book to market ratio HMLt (where t=1,2,511) is constructed by dividing the returns of each portfolio. The specific formula is:

SMBt=[(SL+SM+SH)-(BL+BM+BH)]/3

HMLt=[(SH+BH)-(SL+BL)]/2

2. variable selection

Financial leverage (Cwgg), Operating leverage (Jwgg), Comprehensive leverage (Zhgg)

2.2.2. Four factor model

1. Factor construction

The specific formula is:

E[Rit]-Rft=βi(E[Rmt]-Rft)+aiSMBt+hiHMLt

Where E [Rit] represents the yield of asset portfolio (individual stock) i in period t; Rft represents the risk-free return rate for the period t; E [Rmt] represents the market yield for the period t; SMBt is the scale factor yield ratio for period t; HMLt is the book to market ratio factor yield of period t, βi represents the coefficient of market risk of portfolio i, ai represents the coefficient of scale factor, and hi represents the coefficient of book to market ratio factor.

In order to investigate whether the value premium compensates for the higher financial leverage risk of Chinese A-share companies, the following procedure will be used in this article. In Step 1, we tested whether financial leverage risk can be captured by standard CAPM. To do this, we run the following regression: Ri-Rf=ai+b (Rm-Rf)+u. Where Ri is the calculated monthly weighted return of the portfolio. Rf is the monthly risk-free interest rate, converted from the three-month fixed deposit benchmark interest rate; Rm This is the weighted market return of the A-share stock market. If leverage is a risk factor that CAPM ignores, we expect the abnormal return on intercept measurements in regression to

increase as leverage increases. In Step 2, we examined the relationship between financial leverage, operational leverage, comprehensive leverage, and average stock returns. If three types of leverage are risk factors for value premiums, we may observe that companies with high levels of leverage receive higher average returns than companies with low levels of leverage.

2. Sample selection and data processing

This article selects the 26th week of 2010 to the 26th week of 2016 as the sample interval, with a time span of 6 years and a total of 511 valid data. The risk-free rate of return in this article is the benchmark interest rate announced by the central bank for fixed deposit in March, as well as the financial leverage, operating leverage, and comprehensive leverage data of listed A-share companies. All data used in this study were collected from China Stock Market and Accounting Research (CSMAR Guotai Jun'an Database), and Fama three-factor data was obtained from Guotai Jun'an.

3. Empirical Analysis

3.1. Descriptive Statistics

Table 1.

stats	ri	rm	SMB1	HML1	Cwgg	Jygg	Zhgg
mean	-0.0262	-0.0327	0.00503	0.000309	1.459	1.248	1.863
sd	0.164	0.0646	0.0295	0.0273	1.381	0.575	2.307
skewness	10.33	-0.132	0.330	0.513	4.820	4.129	5.000
kurtosis	484.2	4.402	3.415	3.919	29.31	23.18	31.23
min	-0.879	-0.273	-0.0659	-0.0719	0.0775	1	0.250
p5	-0.222	-0.135	-0.0460	-0.0383	0.790	1	0.838
p25	-0.107	-0.0717	-0.0149	-0.0179	0.986	1	1.009
p50	-0.0406	-0.0324	0.00510	-0.00323	1.074	1	1.199
p75	0.0342	0.00164	0.0224	0.0169	1.351	1.260	1.683
p99	0.429	0.120	0.0931	0.0771	10.82	4.922	17.84
max	12.79	0.131	0.0991	0.0944	10.82	4.922	17.84
N	325394	325394	325394	325394	325415	322348	313608

t statistics in brackets

p < 0.10, ** p < 0.05, *** p < 0.01

Table 1 reports the descriptive statistical analysis of the full sample of the main variables used in this study, including the total number of sample observations of individual stock returns and risk-free returns, market portfolio factors, scale factors, book to market ratios, financial leverage, operating leverage, and comprehensive leverage, as well as the average, standard deviation, skewness, kurtosis, minimum, maximum, and 25% quantile values of the observed values of each variable Time series averages of 50% quantile values (i.e., median), 75% quantile values, and 90% quantile values. Where ri is the mean value of the difference between the individual stock yield and the risk-free interest rate, which is -0.0261, and the standard deviation is 0.1647, indicating that the difference between the individual stock yield and the risk-free interest rate was higher than people expected between the 26th week of 2010 and the 26th week of 2016, and the volatility of the individual stock yield was significant. Skewness is 10.33, and kurtosis is 484.15. Skewness is not significantly different from normal distribution, and kurtosis is higher than normal distribution. The average value of the RP market portfolio factors is 0.01, the standard deviation is 0.1, and the skewness and kurtosis are small, indicating that they basically conform to the normal distribution. The SMB1 scale factor has a small mean and standard deviation, and basically conforms to a normal distribution. The average book to market ratio of HML1 is 0.00026, with a standard deviation of 0.0272; SMB1 has a mean value of 0.005 and a standard deviation of 0.029, with deviations in both skewness and kurtosis; The average value of financial leverage, operating leverage, and comprehensive leverage is around 1.5, with small standard deviation and kurtosis, but a large skewness.

3.2. Three Factor Efficiency Test of Chinese Stock Market

According to the three factor model formula:

$E[Rit]-Rft= \beta i(E[Rmt]-Rft)+aiSMBt+hiHMLt$

The three factor data of China's A-share market obtained from CSMAR were regressed using stata software, and the regression results are shown in Table 2:

Table 2.

VARIABLES	ri
rm	1.098***
	(273.913)
SMB1	0.548***
	(62.733)
HML1	0.209***
	(22.114)
Constant	0.007***
	(23.192)
Observations	325.394
R-squared	0.209
F	28699

t statistics in brackets

p < 0.10, ** p < 0.05, *** p < 0.01

The three factors are regressed using OLS by narrowing the three factor data (replacing values that are outside the variable range of 99 percent and less than 1 percent with percentile values). From Table 3 of the regression results, it can be seen that the market factor, scale factor, and value factor all reject the assumption of a coefficient of 0 at a 99% confidence level, indicating that the value and size of enterprises in the Chinese A-share market do affect the return rate of enterprises. The coefficient of the scale factor SMB1 is 0.548, indicating that

the larger the enterprise's size, the greater its return rate, and verifying that the larger the enterprise's size, The higher the rate of return of the enterprise. The coefficient of the value factor HML1 is 0.209, which indicates that the book value of enterprises in the Chinese A-share market is about high, and their stock returns will also be correspondingly high. This satisfies the value premium hypothesis, indicating that there is a value premium in the Chinese A-share market. From the fitting degree of the model, the square value of R is 0.209, and the fitting degree of the model is average.

3.3. Regression Analysis

According to the regression equation:

E[Rit]-Rft= β i(E[Rmt]-Rft)+aiSMBt+hiHMLt+ciCwgg

E[Rit]-Rft= β i(E[Rmt]-Rft)+aiSMBt+hiHMLt+miJygg

E[Rit]-Rft= β i(E[Rmt]-Rft)+aiSMBt+hiHMLt+liZhgg

VARIABLES	(1) model1 ri	(2) model2 ri	(3) model3 ri
rm	1.097*** (274.229)	1.097*** (272.501)	1.096*** (267.194)
SMB1	0.547*** (62.801)	0.546*** (62.332)	0.548*** (61.375)
HML1	0.210*** (22.263)	0.212*** (22.366)	0.211*** (21.852)
Cwgg	-0.001*** (-2.970)		
Jygg		-0.002*** (-3.398)	
Zhgg			-0.001*** (-4.848)
Constant	0.008***	0.009***	0.008***
Observations	(18.932)	(13.699)	(21.421)
R-squared	324,519	321,453	312,734
F	0.210	0.210	0.208
	21590	21328	20506

t statistics in brackets

p < 0.10, ** p < 0.05, *** p < 0.01

3.3.1. Ncorporating financial leverage into a three factor model

Model 1 incorporates financial leverage into a three factor model. After all data has been deflated and financial leverage has been added, the regression results show that the market factor, scale factor, and value factor still reject the original assumption at a 99% confidence level. The coefficient of the scale factor SMB1 has changed to 0.548 and remains positive after addition, which still does not comply with the scale effect, And the scale factor of coefficient change slightly increases after adding financial leverage. The coefficient of the value factor HML1 has changed to 0.210, which is slightly higher than the coefficient without adding financial leverage, indicating that the addition of financial leverage can share the explanatory power of the value premium to a certain extent. The financial leverage coefficient is - 0.001, and the original assumption is rejected at a 99% confidence level, indicating that financial leverage can explain the yield to some extent, but the financial leverage coefficient is negative, contrary to the assumption in this article, which means that the higher the financial leverage level of the enterprise, the lower the yield.

3.3.2. Incorporating operational leverage into a three factor model

Model 2 incorporates operating leverage into a three-factor model, and also performs tailing treatment on all the above variables. From the regression results of adding operating leverage, it can be seen that market factors, scale factors, and value factors reject the original hypothesis at a confidence level of 99%, with the coefficient of scale factor SMB1 changing to 0.546, which has little change from the coefficient value of the three-factor model. The coefficient of HML1 has changed to 0.212, slightly increasing compared to the coefficient without adding operating leverage, indicating that the addition of operating leverage can explain the value premium to some extent. The operating leverage coefficient is -0.002 and the original assumption is rejected at a 99% confidence level, indicating that operating leverage can explain the yield to some extent, but the operating leverage coefficient is negative. Similarly, contrary to the assumptions made in this article, it means that the higher the level of operating leverage of the enterprise, the lower the yield.

3.3.3. Integrating comprehensive leverage into a three factor model

After over-tailing all variables in Model 3 and incorporating comprehensive leverage into the three-factor model, from the perspective of regression results, the coefficients of the three factors are almost the same as those of the model without comprehensive leverage, and still maintain high significance, indicating that the effects of the three factors on Chinese A-share market enterprises are significant after adding comprehensive leverage. After adding comprehensive leverage, the comprehensive leverage coefficient is -0.001, which rejects the original hypothesis at a 99% confidence level, indicating that comprehensive leverage has an impact on the return rate of the enterprise and has a negative impact. That is, the higher the comprehensive leverage of the enterprise, the lower the return rate of the enterprise, which is inconsistent with the original hypothesis. From the overall regression results of adding three levers, it

can be seen that the t values of market factors, scale factors, and value factors are larger, Reject the hypothesis at a 99% confidence level, where the coefficient of the scale factor SMB1 changes to 0.548, indicating that the larger the enterprise's size, the greater its return, which is still inconsistent with the scale effect. The coefficient of the value factor HML1 changes to 0.211, which is almost the same as the coefficient of the three-factor test model, but the coefficient decreases after the addition of leverage, indicating that the addition of leverage can explain the value premium to some extent. From the fitting degree of the model, the square value of R is 0.208, and the fitting degree of the model is still average.

4. Conclusions and Recommendations

After conducting a three factor test on China's A-share market and incorporating leverage ratio as the fourth factor into the three factor model, and conducting empirical analysis, the following conclusions are reached:

Conclusion 1: In the three-factor effectiveness test of China's A-share market, it is found that there is indeed a value effect in China's A-share market, indicating that the larger the market value of enterprises in China's A-share market, the stronger their profitability and the higher their yield.

Conclusion 2: The regression results of adding different leverage to the three-factor model show that operational leverage, financial leverage, and comprehensive leverage are all related to the return of the enterprise, but the leverage of the enterprise is negatively correlated with the return of the enterprise, that is, the higher the leverage level of the enterprise, the lower the return of the enterprise, which indicates that enterprises in China's A-share market do not meet the tax shield effect, which is most likely due to the increase in the leverage level of the enterprise, This leads to an increase in the cost of bankruptcy and ultimately a decrease in the profitability of the enterprise.

Conclusion 3: From the regression results of the three levers, operational leverage has the greatest impact on the return of enterprises, followed by financial leverage, and comprehensive leverage.

Conclusion 4: The value premium coefficient varies with the addition of different leverage, indicating that the addition of leverage can explain the value premium to a certain extent.

References

[1] Wang Jinbin. Value Premium: China's Stock Market 1994-2002 [J]. Financial Research. 2004 (3): 79-89.

[2] Wang Lei, Liu Yaqing. Analysis of the Causes of the Book to Market Value Ratio Effect in China's Stock Market: Based on the Behavioral Finance Perspective [J]. Economics and Finance, 2011 (10): 43-48.

[3] Shi Yuyou, Zhong Weizhou, Ma Jun, et al. Equity ratio, book value ratio, company size, and stock investment risk of stocks - Taking the stock risk of 10 listed companies in the Shanghai securities market as an example [J]. Financial Research. 2008 (6): 122-129.

[4] Wu Shinong, Xu Nianxing Comparative Study on Rational and Irrational Pricing Models of Assets [J] Economic Research, 2004, (6): 105-116.

[5] Ashiq Ali, Lee-Seok Hwang, Mark A.Trombley, 2003, Arbitrage risk and the book-to-market Anomaly,Journal of Financial Economics,69: 355 -373.

[6] Andrew Ang,Joseph Chen,2007,CAPM over the long run: 1926 -2001,Journal of Empirical Finance, 14:1 -40.

[7] K.C Chan, Nai- Fu Chen, 1991,Structural and Return Characteristics of Small and Large Firms,The Journal of Finance,4 :1467- 1483.

[8] Nai- Fu, Feng Zhang, 1998, Risk and Return of Value Stocks,The Journal of Business,4 :501-535.

[9] Werner F.M De Bondt, Richard H.Thaler,1967, Further Evidence On Investor Overreaction and Stock Market Seasonality.3 :557-581.

[10] Huseyin Gulen, Yuhang Xing, and Lu Zhang,2011,Value versus Growth: Time-Varying Expected Stock Returns, Financial Management:381-407.

[11] S.P Kothari,Jay Shanken, Richard G.Sloan, 1995,Another Look at the Cross-section of Expected Stock Returns,The Journal of Finance, 1 :185-223.

[12] Rafael La Porta,Josef Lakonishok,Andrei Shleifer,Robert Vishny,1997,Good News for Value Stocks: Further Evidence on Market Efficiency, The Journal of Finance,2 :859-874.

[13] A craig Mackinlay,1995, Multifactor models do not explain deviations from the CAPM,3 :3-28

[14] Ralitsa Petkova , Lu Zhang,2005, Is value riskier than growth?,Journal of Financial Economics ,78:187-202.

[15] Ludovic Phalippou, 2008, Where Is the Value Premium?, Financial Analysts Journal,2 :41-48.

[16] Barr Rosenberg, Kenneth Reid, Ronald Lanstein, 1985, Persuasive evidence of market inefficiency,11:9- 15.

[17] Andrei Shleifer, Robert W.Vishny, 1997, The Limits of Arbitrage, The journal of Finance, 1 :35-55

[18] S.P. Kothari, Jonathan Lewellen, Jerold B. Warner, 2006, Stock returns, aggregate earnings surprises, and behavioral fifinance, 79:537-568.

[19] Ephraim Clark, Zhuo Qiao,2019,The value premium puzzle, behavior versus risk: New evidence from China,The Quarterly Review of Economics and Finance,76:12-21.

[20] Daniel, K., & Titman, S., 1997, Evidence on the characteristics of cross-sectional variation in common stock returns. Journal of Finance, 52: 1– 33.

[21] Lakonishok, J., Shleifer, A., & Vishny, R. W., 1994, Contrarian investment, extrapolation and risk. Journal of Finance, 49: 1541– 1578.

[22] Fama, E., K. French. Common Risk Factors in the Returns on Stocks and Bonds[J]. Journal of Financial Economics, 1993, 33(1):3-56.

[23] Fama, E., K. French. Industry Costs of Equity[J]. Journal of Financial Economics, 1997,43(2):153- 193.