The Efficient Market Hypothesis, Price Multiples, And The German Stock Market

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ABSTRACT

One of the great exercises of financial research is to examine the efficiency of the stock markets. There are many reasons for this endeavor. One is due to the importance efficiency has on the allocation of capital and the impact on economic activity. Others center on the desire to find an exploitable anomaly for active investment management. This paper sought to do both. The paper explores the German stock market over a five year period ending December 31, 2007. The objective was to examine the value of price multiples in developing portfolios that would not only question the efficient market hypothesis for the market but provide an investment tool to achieve above market risk adjusted returns for an active investment style. The paper explored this by creating portfolios of (1) top ranked (low) price multiples and (2) bottom ranked (high) price multiples. Three multiples were chosen. These were (1) Price to Book (PBK); (2) Price to Current Earnings (PEC), and (3) Price to Normalized Earnings (PER). The hypotheses were that low price multiples would outperform, on a risk adjusted basis, high price multiples, and hedged (long/short) would likewise outperform the market on a risk adjusted basis. Support for either of these hypotheses questions the efficiency of the markets and could provide a pragmatic investment strategy. The results of the study suggest not only that the efficiency of the German stock market can be questioned but that a workable investment strategy involving price multiples could be implemented. The results noted that low price multiples outperformed high price multiples in all cases but not necessarily on a risk adjusted basis. Hedged portfolios likewise outperformed the universe and population. Hedged PBK had an Adjusted Sharpe Ratio of 0.50; the Hedged PEC had an Adjusted Sharpe Ratio of 0.30; and the Hedged PER had an Adjusted Sharpe Ratio of 0.23. These should be compared against an Adjusted Sharpe Ratio for the market of 0. Finally, an equally-weighted Hedged position of PBK, PEC, and PER had an Adjusted Sharpe Ratio of 0.44.

INTRODUCTION

The concept of an efficient market is paramount in investment theory. Eugene Fama (1970) noted that in an efficient market any new information would be immediately and fully reflected in equity prices. Consequently, a financial market quickly, if not instantaneously, discounts all available information. Therefore, in an efficient market, investors should expect an asset price to reflect its true fundamental value at all times. Bruno Solnik (1996) has noted that since the true fundamental value is unknown, the only way to test for market efficiency is to detect whether some specific news is not yet incorporated in the asset price and could therefore be used to make some abnormal profit.

CAPITAL MARKET THEORY

The variables employed in an attempt to achieve abnormal profits have been numerous. Those variables employed come from one or both subsets of capital market theory. These two subsets of capital market theory are (1) the Capital Asset Pricing Model (CAPM) and (2) the Arbitrage Pricing Theory (APT).

Many researchers prefer the Arbitrage Pricing Theory approach since it requires less stringent assumptions than CAPM and many believe it provides similar results. Richard C. Grinold and Ronald N. Kahn (1995) of

BARRA noted that "this makes it sound like the APT is a dominant theory. The difficulty is that the APT says it is possible to forecast expected stock returns. But it does not tell you how. It has been called arbitrary pricing theory for just this reason. The CAPM, in contrast, comes with a "user's manual."

This "lack of a user's manual" makes APT a far more complex theory. The APT states that each stock's expected excess return is determined by the stock's factor exposures. The theory doesn't say what the factors are or whether it provides the weighting of the factors. Many, such as Grinold and Kahn, have noted that this is where science steps out and art steps in.

Multi-factor models are in reality three types. Fundamentally, they all must deal with common factors which influence many stocks rather than being specific to a single stock. The three multi-factor models are (1) the Statistical Factor Model; (2) the Macroeconomic Factor Model; and (3) the Firm's Attribute Factor Model.

It is the third multi-factor model, the Firm's Attribute Factor Model, which is of particular interest in this investigation. There are, in general, four subsets. These sub-sets are (1) Economic Factors; (2) Earnings Momentum Factors; (3) Price Momentum Factors; and (4) Valuation Factors.

VALUATION FACTORS

It is the latter subset, Valuation Factors, which is the focus of this paper on the German Stock Market. Valuation factors have become increasingly popular due to publicity given to Warren Buffett and others engaged in so-called intrinsic valuation investing. Hence, there are multiple models for valuation measurement.

This paper chose to use three valuation measurements. These were (1) Price to Book (PBK); (2) Price to Current Earnings (PEC); and (3) Price to Normalized Earnings (PER). The first two price multiples are well known. The third is actively used as well but not as common. Price to Normalized Earnings can be best noted by taking an eight year regression of time and earnings per share. The regressed or eighth year earnings per share become the "normalized earnings" to apply against the price. This allows for a company currently unprofitable (and not included in any PEC listing) to be included in a study.

VALUATION AND EFFICIENT MARKETS

Valuation is the most important aspect of active portfolio management. Active managers, in order to justify their roles and compensation, must believe their assessment of value is better than the market or consensus assessment by providing a risk-adjusted return greater than a buy and hold strategy. The modern theory of valuation connects stock values to risk-adjusted expected total returns. This theory of valuation is closely related to the theory of option pricing and is consistent with CAPM and APT. Further, valuation, or perhaps, more importantly mis-valuation, is clearly connected to expected returns.

Assume that in any domestic APT model, some form of the firm's attributes will be incorporated. In this context, the domestic APT model proposed by Grinold and Kahn (1994) of BARRA notes the importance of valuation fundamentals in its construction. In general, it is an attempt to measure whether the stock is expensive compared to the current fundamentals.

Valuation anomalies fall into the traditional empirical test of the semi-strong form of the Efficient Market Hypothesis. Some studies suggest stock selection based on fundamental security analysis will not outperform the market due to analysis competition. Other studies suggest pockets of price inefficiency exist and produce statistically significant positive abnormal returns.

The valuation parameter of the price earnings multiple is one example (Basu, Levy and Lermon). The legendary Benjamin Graham's (and his research assistant, Warren Buffett) investment strategy favored low PE, higher-quality companies with more stable future earnings and, therefore, stock prices favorable for positive abnormal returns. A study spanning 1956-1975 by Oppenheimer and Schlarbaum (1981) provided further validation

to the Graham approach. Other valuation parameters have been the focus of other studies (Fama and French (1992); Chan, Harnao and Lakonishok (1991); and Ferson and Harvey (1991)).

RESEARCH HYPOTHESES

The foregoing demonstrates there is research to support the predictive capabilities of valuation rules, at least, in the U.S. markets. This avenue of research is now being expanded to analyze the German stock market.

The first hypothesis herein tested is the classical Benjamin Graham thesis against a section of German equities: low valuation outperforms high valuation as well as a buy and hold market strategy (the index). The valuation proxies utilized in the study as previously noted were (1) Price to Book (PBK); price to current earnings (PEC), and (3) price to normalized earnings. If the results are in the predicted direction and high enough on a risk-adjusted basis, the German stock market efficiency can be questioned.

The second hypothesis herein tested is that the hedged portfolios (going long the low price multiples and short the high price multiples) of the above valuation proxies will be positive on a risk-adjusted basis. This likewise calls into question the German stock market efficiency but also will allow for investors to achieve a riskless return.

The hypothesis of this paper is that stocks with high price momentum will outperform stocks with low price momentum on a risk-adjusted total return basis. If this be the case, the efficiency of the German stock market could be subject to question.

DATA AND METHODS

This paper will explore the total return behavior, risk-adjusted, of German equities selected by the above noted hypothesis. The data source is First Call World Equities. The study will involve a five year period ending December 31, 2007. The initial study year contains 1016 stocks decreasing to 853 in the last year. The data is so constructed that the three most common biases are eliminated. There is no look ahead bias, no restatement bias, nor any survivorship bias to the data. Ford Equity Research provided their estimate of normalized earnings. Mergent provided their estimate of the financial strength of the company on a nine point scale 1 (best) to 9 (worse), A-priori, it was decided only to use stocks six or better (B- or better) in the study. This resulted in the size of the population being reduced to about 28.77% on average.

The stocks will be selected into the top twenty and bottom twenty for a five-year analysis. The stocks will be re-balanced on a yearly basis. All results will be expressed in local currency on a total return basis.

An estimate of turnover and transaction costs will be made in order to allow the use of the methodology in pragmatic investment management. Output variables noted were (1) Capitalization (expressed in millions of local currency); (2) earnings variability (the standard error as a percent of normalized eight year earnings as regressed); (3) current to normalized earnings; (4) the estimated growth rate; (5) dividend yield; (6) quality; and (7) debt to assets.

DATA RESULTS

A summary of the results of the study can be found on the following pages.

GERMAN PRICE MULTIPLE STUDY
SUMMARY 2003-2007

Item	PBK	PEC	PER	Universe B-or Better	German Stock Market	
(I) PORTFOLIO RETURNS AND STATISTICS						
Indexed Top 20 CAGR	39.76%	21.65%	33.69%	24.12%	26.97%	
Indexed Bottom 20 CAGR	23.12%	17.01%	28.38%	24.12%	26.97%	
Hedged CAGR	16.63%	4.64%	5.31%	0.00%	0.00%	
Equally-Weighted Hedged--Avg.				0.00%	0.00%	10.14%
Indexed Top Adj. Sharpe Ratio	1.24	2.15	1.21	2.37	1.48	
Indexed Bottom Adj. Sharpe	1.81	1.38	1.57	2.37	1.48	
Hedged Adj. Sharpe Ratio	0.5	0.3	0.23	0	0	
Equally-Weighted Hedged ASR				0	0	0.44
Average Annual Turnover Top	47.50%	77.50%	56.25%			
Average Annual Turnover Bottom	52.50%	24.12%	26.97%			
Average Universe N(B- or Better)				244		
Average Stock Market N					848	
Average Percentage in Study						28.77%
(II) TOP 20 PRICE MULTIPLE STATISTICS						
Mean	0.704	7.207	6.205			
Median	0.745	7.202	6.3			
Mean STD	0.275	2.662	1.985			
Minimum	0.012	0.712	1.5			
Maximum	1.209	11.3	10.1			
N	120	120	120			
(III) BOTTOM 20 PRICE MULTIPLE STATISTICS						
Mean	15.16	247	62.29			
Median	9.914	95.35	36.4			
Mean STD	18.17	309.5	77.5			
Minimum	5.797	50.5	3.3			
Maximum	99.99	999.9	5152			
N	120	120	120			
(IV) UNIVERSE PRICE MULTIPLE STATISTICS						
Mean	3.217	32.4	26.57			
Median	2.163	19.4	18.7			
Mean STD	5.179	64.58	42.01			
Minimum	0.012	0.712	1.5			
Maximum	99.99	822.2	980			
N	1556	1339	1520			

Item	PBK	PEC	PER	Universe B-or Better	German Stock Market
(V) GERMAN STOCK MARKET PRICE MULTIPLE STATISTICS					
Mean	2.729	39.78	24.77		
Median	1.453	18.7	14.95		
Mean STD	6.396	80.84	44.72		
Minimum	0	0.002	0.4		
Maximum	99.99	822.2	999.9		
N	4931	3081	4832		
(VI) OTHER TOP 20 DESCRIPTIVE STATISTICS					
Capitalization					
Mean	1674	3668	1525	3904	1275
Median	253	484	286	541	42
Mean STD	6144	9376	4594	10015	5890
Minimum	1	20	1	1	0
Maximum	58284	58284	35701	99118	99118
N	114	118	119	1507	4800
Earnings Variabilty					
Mean	170.6	82.91	180	85.67	349.5
Median	50.5	29.5	44	31	154
Mean STD	281.2	184.7	302	175.9	378.3
Minimum	1	1	1	1	1
Maximum	99	999	999	999	999
N	114	118	119	1507	4800
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Current to Normal Earnings					
Mean	-0.13	2.813	-0.76	0.864	-6.69
Median	0.895	1.315	0.36	1	0.6
Mean STD	5.86	8.046	3.573	4.296	43.1
Minimum	-15.8	0.51	-15	-22.7	-984
Maximum	39.65	66.86	2.08	82.75	222
N	114	118	119	1507	4800
Estimated Growth					
Mean	8.044	10.92	7.647	10.22	9.49
Median	8	10	8	10	9
Mean STD	5.868	5.17	4.779	5.694	8.722
Minimum	0	0	0	0	0
Maximum	24	22	25	25	25
N	114	118	119	1507	4800

Item	PBK	PEC	PER	Universe B-or Better	German Stock Market
Dividend Yield					
Mean	3.646	4.425	3.409	2.399	1.57
Mean	2.7	3.3	2.2	2	0
Mean STD	5.029	5.501	5.667	2.825	3.788
Minimum	0	0	0	0	0
Maximum	37.3	39.4	37.3	39.4	877
N	114	118	119	1507	4800
Quality					
Mean	5.614	5.034	5.361	4.967	7.256
Median	6	5	6	5	8
Mean STD	0.672	1.012	0.81	1.088	1.795
Minimum	3	2	3	1	1
Maximum	6	6	6	6	9
N	114	118	119	1507	4800
Debt to Assets					
Mean	0.5076	0.5927	0.5757	0.586	0.5612
Median	0.54	0.63	0.54	0.61	0.6
Mean STD	0.2276	0.2163	0.2413	0.234	0.2652
Minimum	0.04	0.07	0.07	0	0
Maximum	0.98	0.97	0.98	1	1
N	117	117	117	1531	4797
(VII) OTHER BOTTOM 20 DESCRPTIVE STATISTICS					
Capitalization					
Mean	3639	2852	2555	3504	1275
Median	872	533.5	587	541	42
Mean STD	8880	8739	6509	10015	5890
Minimum	47	25	16	1	0
Maximum	47584	69806	41665	99118	99118
N	107	116	117	1507	4800
Earnings Variablity					
Mean	89.91	98.77	208.5	85.67	349.5
Median	37	41.5	61	31	154
Mean STD	190	184.5	313.4	175.9	378.3
Minimum	2	2	4	1	1
Maximum	999	999	999	999	999
N	107	116	117	1507	4800

Item	PBK	PEC	PER	Universe B-or Better	German Stock Market
Current to Normal Earnings					
Mean	0.754	0.528	4.12	0.864	-6.69
Median	1	0.3	1.01	1	0.6
Mean STD	1.313	0.546	13.59	4.296	43.1
Minimum	-7.7	0	-19.2	-22.7	-984
Maximum	5.49	3.39	82.75	82.75	222
N	107	116	117	1507	4800
Estimated Growth					
Mean	11.98	10.67	13.5	10.22	9.49
Median	11	10	12	10	9
Mean STD	6.965	7.33	7.39	5.694	8.722
Minimum	0	0	0	0	0
Maximum	25	25	25	25	25
N	107	116	117	1507	4800
Dividend Yield					
Mean	1.593	1.65	1.213	2.399	1.57
Median	1	0.95	0.5	2	0
Mean STD	1.591	3.185	2.108	2.825	3.788
Minimum	0	0	0	0	0
Maximum	6.2	25.8	19.8	39.4	877
N	107	116	117	1507	4800
Quality					
Mean	4.925	5.259	5.308	4.967	7.256
Median	5	5	6	5	8
Mean STD	1.139	0.835	0.876	1.088	1.795
Minimum	1	2	2	1	1
Maximum	6	6	6	6	9
N	107	116	117	1507	4800
Debt to Assets					
Mean	0.5912	0.6087	0.5449	0.586	0.5612
Median	0.61	0.63	0.57	0.61	0.6
Mean STD	0.2499	0.2755	0.2529	0.234	0.2652
Minimum	0	0	0	0	0
Maximum	1	1	1	1	1
N	115	115	116	1531	4797

(VIII) HEDGED STATISTICS

Year	(A) PBK Hedged Top 20	Bottom 20	Combined	(B) PEC Hedged Top 20	Bottom 20	Combined
2003	45.685	3.173	42.513	28.2	12.48	15.72
2004	12.95	20.936	-7.976	7.317	10.986	-3.669
2005	99.834	27.994	71.84	33.652	27.655	5.997
2006	37.266	27.884	9.382	16.891	33.525	-16.634
2007	18.142	38.598	-20.456	23.939	3.053	20.876

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PBK Hedged		Year	B-Better	German Stock Market	PEC Hedged	
		2003	32.32	52.151		
Mean	19.0606	2004	16.253	18.072	Mean	4.458
Standard Error	16.91434	2005	35.377	43.902	Standard Error	6.744155
Median	9.382	2006	26.964	18.553	Median	5.997
Mode	#N/A	2007	11.4	7.681	Mode	#N/A
Standard Deviation	37.8216				Standard Deviation	15.08039
Sample Variance	1430.474				Sample Variance	227.4181
Kurtosis	-1.25351	Mean	24.2628	28.0718	Kurtosis	-0.96623
Skewness	0.597223	Median	25.954	18.553	Skewness	-0.49357
Range	92.296	Mean STD	10.2585	18.9525	Range	37.51
Minimum	-20.456	Minimum	11.4	7.681	Minimum	-16.634
Maximum	71.84	Maximum	35.377	52.151	Maximum	20.876
Sum	95.303	N	5	5	Sum	22.29
Count	5				Count	5

Year	(C) PER Hedged Top 20	Bottom 20	Combined	(D) Equally-Weighted Hedged Combined
2003	52.706	6.221	46.485	34.906
2004	17.173	17.547	-0.374	-4.006
2005	78.95	50.732	28.218	35.352
2006	29.525	38.44	-8.915	-5.369
2007	2.986	33.822	-30.836	-10.139

PER Hedged		Hedged EQ.-WTD.	
Mean	6.9156	Mean	10.1488
Standard Error	13.69025	Standard Error	10.24909
Median	-0.374	Median	-4.006
Mode	#N/A	Mode	#N/A
Standard Deviation	30.61233	Standard Deviation	22.91765
Sample Variance	937.1148	Sample Variance	525.2189
Kurtosis	-1.23286	Kurtosis	-3.25706
Skewness	0.195565	Skewness	0.562863
Range	77.321	Range	45.491
Minimum	-30.836	Minimum	-10.139
Maximum	46.485	Maximum	35.352
Sum	34.578	Sum	50.744
Count	5	Count	5

DATA ANALYSIS

An analysis of the data was favorable to the hypotheses. Each of the price multiple subsets presented the following conclusions.

(1) **Price to Book.** The low price to book portfolio outperformed the high price to book portfolio at 39.76% compared to the high price to book portfolio at 23.12% a difference of 16.63%. The low price to book portfolio outperformed both the universe (B- or better) at 24.12% and the population at 26.97%. The low price to book portfolio did not, however, outperform on a risk adjusted basis. The Adjusted Sharpe Ratio (Mean/Standard Deviation) stood at 1.24 compared to 2.37 for the universe and 1.48 for the population. Turnover averaged 47.50%

(2) **Price to Current Earnings.** The low price to current earnings portfolio outperformed the high price to current earnings portfolio at 21.65% compared to 17.01%. The portfolio did not outperform either the universe or the population. On an Adjusted Sharpe Ratio it did produced a score at 2.15 compared to 2.37 for the universe and 1.48 for the population. Turnover averaged 77.50%.

(3) **Price to Normalized Earnings.** The low price to normalized earnings outperformed the high price to normalized earnings at 33.69% compared to 28.38%. This 33.69% outperformed both the universe at 24.12% and the population at 26.97%. The Adjusted Sharpe Ratio at 1.21 was inferior to the universe at 2.27 and the population at 1.48. Turnover averaged 56.25%.

(4) **Hedged Price to Book.** The hedged portfolio (going long the low 20 stocks and shorting the high 20 stocks) resulted in a favorable Adjusted Sharpe Ratio of 0.5 with an mean return of 19.06%. This compares to an Adjusted Sharpe Ratio of 0 for both the universe and population. Turnover averaged 47.50% for the long and 52.50% for the short.

(5) **Hedged Price to Current Earnings.** The hedged portfolio resulted in a favorable Adjusted Sharpe Ratio of 0.30 compared to 0 for both the universe and the population. Turnover for the long averaged 77.50% and 24.12% for the short.

(6) **Hedged Price to Normalized Earnings.** The hedged portfolio had an Adjusted Sharpe Ratio of 0.23 with a mean return of 6.9156%. Turnover for the long stood at 56.25% while the short stood at 26.97%.

(7) **Hedged Equally-Weighted.** The hedged equally-weighted portfolio takes into account all three of the hedged portfolios. It showed a clear advantage with an Adjusted Sharpe Ratio of 0.44 and a risk-free return averaging 10.14%, Transaction costs would be substantial as six portfolios (noted above) are utilized.

CONCLUSIONS

The results of this study are in line with others clearly indicating the superior performance of low price multiple investing for wealth maximization. Two of the three (PBK and PER) provided superior returns to both the universe and population. It is quite possible that the PBK strategy (with a return of 39.76% some 12.79% better than the population) could outperform after transaction costs (commissions, bid-ask spreads, and slippage). Unfortunately, neither of them had superior Adjusted Sharpe Ratios. All three of the low price multiples outperformed high price multiples (PBK, PEC and PER) not only in terms of returns but Adjusted Sharpe Ratios as well. In an efficient market, this should not occur.

The hedged portfolios likewise clearly dominated both the universe and the population. While not overly pragmatic for investment management due to transaction costs (except price to book), they clearly show the inefficiency of the German stock market.

The Efficient Market Hypothesis remains one of the cornerstones of investment theory. The fact that low price multiple strategies continue to achieve superior performance however remains a paradox. It is well known and should therefore not exist either in the United States or as demonstrated by this paper in Germany. Both are developed markets with signal informational knowledge. This observable inefficiency should not exist.

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