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The Pricing of Finnish Stocks; A Survey of Some Empirical Research

ABSTRACT

The present survey of recent developments in empirical asset pricing research at Hanken focuses mainly on the pricing of equities. First, we summarize stylized facts about the data sets we typically use. Apart from distributional characteristics we briefly discuss anomalies in stock returns. We summarize empirical results concerning autocorrelation as well as different explanations for such autocorrelation. Furthermore, we present a variety of different specifications of asset pricing models applied starting off by describing return generating processes, and then moving over to unconditional and conditional asset pricing tests. Other, miscellaneous topics round up the survey.

1. INTRODUCTION

The purpose of this survey is to summarize a body of research focusing on understanding how prices of equities are determined on the Finnish stock market. In equilibrium, on a well-functioning efficient market, prices respond instantaneously to relevant new information. Further-

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more, asset prices compensate for inherent systematic risks. It is therefore fundamental to all market participants to assess the efficiency of the market as well as the ultimate sources of systematic risk. A special characteristic of the Finnish market is that it includes a great number of thinly traded securities producing significant first order autocorrelation in daily, weekly and even monthly returns challenging the assumption of efficient markets[1]. A second general trait is that the market itself is small both in terms of overall capitalization and in terms of the number of companies listed on the main stock exchange: the Helsinki Stock Exchange (HeSE).

In the mid-1980's a liberalization process of money markets was initiated and had an impact on the return characteristics of the HeSE. This gradual process deregulated capital in- and outflows almost totally from the mid-1980s to early 1990s with the natural consequence of continuously increasing the impact of foreign investors. This deregulation process has occurred simultaneously with a general trend towards globally integrated financial markets. Simplifying somewhat, it might be said that there are two crucial and distinct features in the institutional setting of the Finnish equity market.

First, there is the question of thin trading and liquidity in general. What is, e.g., the impact of thin trading and low liquidity on the pricing of Finnish equities, risk factors and tests of asset pricing models? From the early 1990's onward availability of intra-day data has given rise to an entire new research area, market microstructure, which enables a closer study of specific characteristics of the pricing process. Indeed, much of the results obtained over the years, and also to be covered briefly by this survey, are based on end-of-day closing prices. Availability of higher frequency data may change, or at least refine, many of the conclusions drawn when market microstructure effects are more systematically integrated into the design of asset pricing research.

Second, global integration of financial markets constantly changes the relevant information set to be used by (local and international) market participants for risk estimation purposes. While the overall trend is evident with global sources of risk becoming more and more important to the pricing of local assets, a notable home bias persists. The main question is, what are the relevant priced factors for financial markets operating in a small open economy gradually moving from partial segmentation towards more integrated financial markets?

Much of the results of the research reported in this survey focus on these two core issues, either explicitly or implicitly. The structure of this survey is as follows. First, we summarize stylized facts about the data sets we typically use. Apart from distributional characteristics we

1 Berglund (1986) reports that average proportion of trading days on which trading occurs in a stock listed on the HeSE is only about 50% in the 1977–82 period. More recently, Hedvall (1994) uses intraday data and computes several measures of liquidity. The average relative frequency of days with trades ranges in his sample from roughly 90% in the 1987–February 1989 period to about 70% in the March 1989 – April 1991 period.

briefly discuss anomalies in stock returns. Then, we summarize empirical results concerning autocorrelation as well as different explanations for such autocorrelation. We summarize a variety of different specifications of asset pricing models used in this research starting off by describing return generating processes, and then moving over to unconditional and conditional asset pricing tests. Other, miscellaneous topics round up the survey.

2. CHARACTERISTICS OF THE RETURN DISTRIBUTION

2.1. Moments of the return distribution

One major bedrock of empirical research in general is the availability of good quality data. A starting point for the empirical asset pricing research at Hanken was accordingly the development of a new stock market index, the so-called WI index for the Helsinki Stock Exchange (HeSE) by Berglund et al. (1983). The WI index weights are proportional to the total market value of each stock, i.e., the closing price times the number of shares outstanding. The WI index was compared to two alternative, widely used indices: the KOP index which derived its weights from the book value of assets of companies listed on the HeSE big board, and the UNITAS index which was based on fixed weights computed from taxation values of assets and corresponding trading volumes. Subsequently, the WI market value weighted index was continued by a similar index constructed by the Helsinki Stock Exchange called the HEX return index.[2]

Table 1 provides a summary of the first four moments of the HeSE market return distributions for daily, weekly and monthly returns using the WI and HEX indexes. For comparison, table 1 also displays similar statistics for the larger and more liquid Stockholm Stock Exchange (StSE). The shorter return intervals show notable fat-tailedness and negative skewness.

2.2. Anomalies and irregularities

In order to analyze whether return anomalies discovered on other exchanges are present on the thin security market of Helsinki Berglund (1986) comprehensively studies HeSE returns covering the period 1970–83. His results can be summarized in the following way. First, clear evidence of non-normality in the distribution of daily, weekly and monthly returns was found. Second, a day-of-the-week effect appearing as higher weekend returns than the average daily return was detected. Third, month-of-the-year effects showed up as higher January returns (3.62% vs. 1.26% during the other 11 months), and as similar seasonal patterns compared to other exchanges if January was excluded. Fourth, the firm size effect appeared as a tendency

2 Hernesniemi (1990) reports high correlations between the two indices.

TABLE 1. Stock market return distribution

Return-horizon	Market	Mean	St.dev.	Skewness	Kurtosis	Period	Study
Daily	HeSE	0.000	0.011	–0.635	15.162	1987–95	Vaihekoski (1996)
Weekly	HeSE	0.001	0.030	–0.228	3.402	1987–95	Vaihekoski (1996)
Monthly	HeSE	0.005	0.047	–0.039	1.923	1920–93	Knif et al. (1996)
	HeSE	0.008*	0.071	0.004	0.242	1987–95	Vaihekoski (1996)
	StSE	0.009	0.043	–0.029	1.264	1920–93	Knif et al. (1996)
	StSE	0.028	0.062	–0.827	2.786	1982–88	Löflund (1992)
	StSE	0.008*	0.065	–0.942	–	1981–90	Nummelin (1994)

*** Stock market returns in excess of 1-month T-bill return.**

of a higher return for small firm portfolios suggesting a liquidity premium. Finally, Berglund (1986) observed a clear firm size effect in January returns.

3. PREDICTABILITY

3.1. Serial correlation

A general trait of Finnish stock returns is that they display significant first order serial correlation. For example, Vaihekoski (1996a) reports significant first order autocorrelation in daily, weekly and monthly market returns on the HeSE (see Table 2 below). Furthermore, 6 industry portfolios out of 7 display significant first order serial correlation on the daily return interval, while roughly half of the portfolios are serially correlated on the weekly and monthly level. In

TABLE 2. Stock market first order serial correlation on the HeSE

Return-horizon	Market	ρ_1	Period	Study
Daily	HeSE	0.208*	1987–95	Vaihekoski (1996a)
Weekly	HeSE	0.115*	1987–95	Vaihekoski (1996a)
Monthly	HeSE	0.250*	1920–93	Knif et al. (1996)
	HeSE	0.244*	1987–95	Vaihekoski (1996a)

*** Different from zero on the 5% level of significance.**

an earlier study, Berglund (1986), serial dependence in individual stocks was detected in daily but not in weekly and monthly returns. Table 2 provides a representative summary of first order serial correlation of the market index returns on the HeSE.

Correspondingly, Knif et al. (1996) found a significant serial correlation of 0.140 for the StSE for the period 1920–93. The reasons for the observed serial correlation may be local market-specific or global externally driven tendencies or more probable, a combination of both. Generally, we would expect different explanations for the observed serial correlation for different return horizons. From a market-specific point of view Berglund and Liljeblom (1988) empirically investigate the relative importance of different sources of market serial correlation for daily returns. Market serial correlation taken as the first-order serial correlation in the logarithmic differences of a market index may apparently be explained by the serial correlation of individual stock returns. The other, less apparent, explanation advanced in the literature concerns nonsynchronous trading in individual stocks. The specific trading procedure employed on the HeSE at the time was a call auction market which may have contributed to the observed first-order market serial correlation. Berglund and Liljeblom (1988) show that the rules of the exchange produce additional intra-day nonsynchroneity in stock returns and thus aggravate the problem of market serial correlation. They further attempt to assess the importance of this additional cause of market serial correlation. Subsequently, it should be noted that serial correlation persists even after the electronic HETI trading system was launched in 1989 suggesting the existence of non-trading mechanism related origins of serial correlation. Other possible explanations for the observed monthly serial correlation are reported in Vaihekoski (1996a–d, 1997). Still another "peso phenomenon"[3] based possibility is described in Berglund and Löflund (1996).[4]

In order to investigate if the structure of the Finnish return autocorrelation is the same as in other countries Knif et al. (1996) empirically analyze, in the spirit of Engle and Kozicki (1993) and Engle and Susmel (1993), the long-run persistence of a common serial correlation feature in the index return series of the two closely related Scandinavian equity markets: the Finnish and the Swedish stock markets. The paper covers the period from January 1920 through December 1993 (see Table 2). Monthly index quotations for the period are analyzed as a complete series as well as split in four structurally different subperiods. The return series of both Finland and Sweden seem to have an autocorrelation component present both before and af-

3 Peso phenomena refer to problems in measuring return expectations from data samples that are unrepresentative of the expectations actually held by the market during the sample period.

4 Other interesting extensions of this research include option pricing applications. The impact of stock market serial correlation on the pricing of index options has been investigated by Berglund, Liljeblom and Hedvall (1990). In a somewhat related study the same authors analyze the effects of return autocorrelation on stock index option volatility estimation [Berglund, Hedvall and Liljeblom (1990)].

ter World War II, but this feature is more pronounced in the Helsinki return series. The strongest common autocorrelation feature is found in the period after the 1974 oil crises. Nevertheless, the feature does not seem to be common over all the subperiods considered. The common codependency in the last subperiod can be interpreted as a sign of increasing integration between the markets.

3.2 Instrumental variables

There is a large body of international evidence that returns are predictable using some observable market-wide instrumental variables such as past dividend yields, long and short money market rates (or their spread), and credit spreads. To the extent such predictability is due to changing risks and prices of risks, the market may still be viewed as being efficient, and the presence of significant first order monthly return serial correlation is "rational" in the sense that it is predicted by some conditional asset pricing model. This explanation is obviously less likely for daily or weekly return intervals, where frictions in the trading process are likely to be more dominant. Results of predictive regressions from five studies are reported in Table 3.[5] Typically, the obtained adjusted in-sample R^2's are similar or higher than for comparable international data (some Swedish and US results are provided in table 2 for comparison purposes). Vaihekoski's results for Finnish stocks show that adjusted R^2's are in the 0.02 (daily) – 0.10 (monthly) range. Knif and Högholm (1996) attain quite high in-sample R^2's for longer return intervals.

Berglund and Liljeblom (1990) study the relationship between stock exchange trading volume and the properties of the corresponding stock returns. The properties that they investigate are: the volatility of the stock price, the degree of leptokurtosis in the returns, and finally, the serial correlation in returns. The comparison of a low turnover with a high turnover period for the HeSE reveals that for the high turnover period the leptokurtosis of the return distribution is lower, as expected. Contrary, to their expectations, however, they found stock price volatility to be higher. Finally, regarding serial correlation their results are mixed, which can be explained by a non-linear pattern of serial correlation, being mainly positive for small changes and mainly negative for large changes. The results imply that considerable caution is warranted in empirical research which covers substantial shifts in the level of trading activity on the exchange.

Knif and Högholm (1991) compare different forecasting approaches for the prediction of common stock returns on three different levels of time aggregation. The comparison considers

5 In many cases testing the predictability of asset returns is but a first step in assessing the validity of conditional asset pricing models. We shall return to these tests in Section 6.2 below.

TABLE 3. Predictability of Finnish stock returns with instrumental variables. Adjusted R-squares from OLS regressions compared with corresponding results for StSE and US

Return-horizon	Market	Data type	Avg. adj. R^2	Period	Study
Daily	HeSE	Market	0.050	1987–95	Vaihekoski (1997)
Daily	HeSE	Size	0.040	1987–95	Vaihekoski (1997)
Daily	HeSE	Industry	0.026	1987–95	Vaihekoski (1997)
Weekly	HeSE	Market	0.044	1987–95	Vaihekoski (1997)
Weekly	HeSE	Size	0.054	1987–95	Vaihekoski (1997)
Weekly	HeSE	Industry	0.027	1987–95	Vaihekoski (1997)
Monthly	HeSE	Market	0.104	1987–95	Vaihekoski (1997)
Monthly	HeSE	Size	0.152	1987–95	Vaihekoski (1997)
Monthly	HeSE	Industry	0.085	1987–95	Vaihekoski (1997)
Monthly	HeSE	Market	0.300	1977–90	Knif-Högholm (1996)
Bi-monthly	HeSE	Market	0.310	1977–90	Knif-Högholm (1996)
Quarterly	HeSE	Market	0.310	1977–90	Knif-Högholm (1996)
Monthly	StSE	Size	0.082	1977–90	Nummelin (1994)
Monthly	StSE	Industry	0.076	1977–90	Nummelin (1994)
Monthly	StSE	Size&Ind.	0.063	1977–83	Löflund (1994)
Monthly	StSE	Size&Ind.	0.165	1984–90	Löflund (1994)
Monthly	US	Individual	0.110	1975–93	Knif et al. (1995)

Instrumental variables used in the studies (observed at time t–1 or earlier): Vaihekoski (1997): Finnish stock market return, 3-month Helibor rate, yield spread between 12-month and 1-month Helibor, interest rate volatility, change in the FIM/USD exchange rate, FIM/USD exchange rate volatility, January dummy. The comparison results: Nummelin (1994): return on the value-weighted Swedish stock market index, change in the yields of 10-year Swedish government bonds, return on a US stock market index and changes in the 3-month German Treasury bill rate. Löflund (1994): lagged Morgan Stanley Capital International world equity return, change in 3-month German Treasury bill rate, change in SEK/USD exchange rate, USD/SEK exchange rate volatility, Swedish market return, change in Swedish 10-year government bond yields. Knif and Högholm (1996): Changes in import, export and consumer price indices, unanticipated change in the index of industrial production and returns on a five-year Government Bond. Knif et al. (1995): Projected dividend yield, price to book ratio, market capitalization, cash flow to price, price to earnings, volatility and their corresponding ranked values.

univariate time series-approaches, such as exponential smoothing and ARIMA, and econometric modeling approaches, such as dynamic regression. State space forecasting as well as state space regression models are applied. The models were fitted on monthly returns for 1980–88 and on weekly and daily returns for 1987–88. Market returns for 1989 are used as forecast targets. Overall, they found the naive univariate models to perform surprisingly well in comparison with more complex econometric models. Their results clearly indicate that the structure of the series is very different for different return intervals, which means that a forecasting approach that is successful on one return interval may be unsuccessful on another. Furthermore, their results also indicate an absence of efficiency on the Finnish equity market. The

econometric models clearly indicate deviation from the semi-strong form of efficiency, in the sense that the Stockholm Stock Exchange seems to be a leading indicator for Helsinki. The univariate models also imply deviation from weak form efficiency, at least for the monthly level. In comparison with earlier results for the HeSE the model selection seems to be sensitive not only to the aggregation level but also to the chosen historical time period.

In a subsequent study Knif and Högholm (1996) study the inter-dependence of the first two moments of the distribution of returns on the Helsinki Stock Exchange. Using again data on three different levels of time aggregation and two different out-of-sample forecast horizons weak empirical evidence is presented indicating that the information in past internal as well as external Finnish macroeconomic variables improves predictability of the volatility more than the predictability of returns. Accounting for lags in the price settlement, i.e., an autoregressive structure, improved predictability for both returns and volatilities. Accounting for a GARCH effect or historical volatilities neither improves the model fit nor out-of-sample forecasts of market returns when past macroeconomic information is included in the model. However, both model fit and forecasts of market volatility are improved by the use of information on past market returns.

3.3 International information flows

As a consequence of the deregulation process and the global integration of financial markets the HeSE is receiving more and more attention by international analysts. Table 4 presents the summarized results.

In the first of a series of papers regarding integration of the Nordic stock exchanges Knif and Emaus (1993) analyze the lead and lag structures of the closely related Finnish and Swedish stock markets. The approach taken is univariate spectral analysis and cross-spectral analysis. Hence the purpose is to study the differences in the spectral characteristics between the two markets and to capture the lead and lag structure between the markets as well as the changes in the spectral characteristics of the market return series over time. The empirical results clearly indicate differences between the return spectra of the two markets. The more volatile Swedish market exhibits a two-day periodicity and autoregressive dependence of about two weeks. The cross-spectrum of the two return series shows a Swedish lead of about 10 days, which decreases to 5 days for the latter part of the observation series. The non-linearity of the phase, however, indicates a compound effect of several leading terms.

The paper by Pynnönen and Knif (1997) expands the recent empirical studies of international capital market integration. Their study covers a very long time span from January 1920 to December 1994. Furthermore, using a variety of approaches the paper clarifies previously published confusing results regarding the lead-lag structure between these markets. The results

TABLE 4. Results regarding international information flows and HeSE

Markets	Return horizon	Period	General results	Study
HeSE and StSE	Daily	January 1977–December 1989	Decreasing StSE lead from 10 to 5 days	Knif et al. (1993)
HeSE and StSE	Monthly	January 1920–December 1994	Shocks are absorbed within one month	Pynnönen and Knif (1997)
HeSE, StSE Denmark, Norway, Germany, Switzerland, France, UK, Hong-Kong, Japan and USA	Daily	September 1993–August 1994	Clear local and global effects of shocks	Knif and Pynnönen (1997)

indicate that no evident cointegration or even fractional cointegration between the markets exists. An analysis of short-term dynamics indicates that virtually all shock impulses are absorbed in both markets within one month. Sub-period analyzes reveal increasing instantaneous causality between the markets over the course of time, whereas no meaningful Granger-causality is found.

In a recent paper Knif and Pynnönen (1997) empirically study the impact of the world's leading stock markets (USA, Japan, Hong Kong, UK, France, Switzerland and Germany) on the returns of the markets in the Nordic countries (Denmark, Finland, Norway and Sweden). The order and the degree of processing both "local" and "global" information is investigated using a combination of cointegration analysis and VAR modeling of daily returns covering the period from September 1993 to August 1996. Adjusting for the effect of the mismatch in opening hours of the different markets they present the following results. Firstly, price changes in the US will affect all other markets during the following day and even the US returns the following day. Secondly, price changes in the Asian Pacific markets are completely absorbed in price changes in Europe and seem to affect US prices only through European price changes. Finally, of the Nordic markets; Finland, Norway and Sweden are sensitive to deviations from a long-run cointegration relation between the Norwegian and the Swedish markets, whereas returns from the Danish markets show a different dependence structure.

4. RETURN GENERATING PROCESS

4.1 Single and multiple factor models

A fundamental question in asset pricing is the identification of economic forces that influence stock prices. The Capital Asset Pricing Model assumes the existence of a single market benchmark portfolio while Merton's (1973) intertemporal CAPM and Ross' (1976) APT allow for the possibility of several factors. While typically financial research has extracted latent factors from return data, or pre-specified macroeconomic or other fundamental factors, Knif and Luoma (1992) utilize the spectral analytical approach for a descriptive characterization of individual return series from the Helsinki Stock Exchange. On the basis of eleven original descriptive spectral characteristics, obtained from the log spectrum of the return series, three principal characteristics of the spectrum, i.e. size, shape and variability, are developed. Furthermore, the connection between these characteristics and the original return series is analyzed. The descriptive power of the principal characteristics is evaluated using a grouping of the stock return series based on the company type. The empirical results indicate that the spectral approach can be used for descriptive as well as analytical analysis of stock market behavior. This early paper resulted in a series of papers applying the frequency domain approach for the analysis of the time series properties of return data.

4.2 Time-varying parameters

A great body of literature, e.g., Ferson-Harvey (1990), has questioned the validity of the assumption that betas are constant over time. Indeed, the mere fact that the stock price level changes over time adjusts the degree of financial leverage which should affect equity betas (single market factor case). There is also evidence that volatility of assets changes over time leading to possible adjustments in the betas. There are various ways of modeling time-varying betas, some of which will be dealt with below.

One of the earliest more comprehensive studies regarding time-variability of the single factor market model applied to Finnish stock return data is found in Knif (1989). Using monthly returns for individual stocks quoted on the HeSE over the period January 1970 to December 1985 Knif builds up his empirical analysis in three main parts. First, he estimated the single factor market model using recursive OLS. Secondly, he utilizes the recursive residuals in order to test for parameter variability over time. Finally, the third part of Knif's study considers the possibility of modeling the variation in the parameters using a number of simple autoregressive models. The results summarized below in table 5 show that in 34 cases out of 39 the hypothesis of constant parameters was rejected in favor of a beta-parameter variability according to a stationary AR(1) model. In about half of the cases a significant ARCH effect was found.

TABLE 5. Summary of descriptive results for the estimation of the AR(1) model parameters for the time varying market risk for the 56 HeSE stocks in the sample. April 1970 to December 1988

Return horizon	individual long-run average beta	auto-regression coefficient	residual variance	adj.R^2
MONTHLY				
average	0.903	0.096	0.004	.221
std.dev	0.244	0.344	0.003	.126
BI-MONTHLY				
average	0.907	0.097	0.007	.264
std.dev	0.262	0.324	0.007	.161
QUARTERLY				
average	0.885	0.063	0.008	.301
std.dev	0.272	0.312	0.009	.181

Knif (1989).

The predictability or fit of the empirical market models did not, however, improve by utilizing an ARCH structure for the residual variance. The time variation in the betas was estimated using a Kalman filter approach.

In another paper regarding the time-variation of betas Knif and Emaus (1993) examine the persistence of order correlation over time among market betas of individual common stocks. A comparison of the stock markets in Helsinki and Stockholm is conducted with different lag structures. In order to map the time variability of the order persistence a Kalman filter approach is utilized for the estimation of the ex ante expected as well as the ex post market risk. The empirical results clearly show a much lower order persistence among the common stocks on the smaller Helsinki Stock Exchange. As expected, the results also reveal a much higher order persistence among the ex ante market risk expectations than among the ex post estimates of the market risks. Furthermore, the persistence in the ex ante market risk expectations seems to be high enough for meaningful use in portfolio management.

5. STOCK RETURN VOLATILITY

Numerous international studies have established that equity volatility changes over time. The most natural explanation for the time variation is perhaps that volatility in financial claim prices changes because the underlying real sector risks change. There may, e.g., be technological shocks or other production-related uncertainty, or consumer demand uncertainty. Another pos-

sible explanation for changing volatility is that volatility is contagious over different financial markets, i.e., that there is a transference of volatility phenomenon at work.

The first explanation for stock market volatility has been explored by Liljeblom and Stenius (1997), who relate stock market volatility to measures of macroeconomic volatility. Liljeblom and Stenius (1997) estimate monthly Swedish and Finnish stock market volatility with a GARCH model and with a simple proxy based on a AR(12) model of squared residuals from a regression of returns on monthly calendar dummies and 12 return lags, as originally suggested by Schwert (1989). The sample period is 1921–91. These stock market volatility measures were then related to the following macroeconomic risk variables: industrial production volatility and terms-of-trade volatility. Furthermore, recession dummies were employed in order to test for leverage induced volatility changes. The results of their study are similar to those on US data. Generally, they found no strong relationships between stock market volatility and the level of economic activity but they did detect a weak dependency between stock market volatility and the growth of stock market trading volume. Contrary to the results of Schwert (1989) this relationship was found to be negative.

Recent studies regarding transference of volatility shocks between equity markets mainly utilize time domain approaches for the analysis of lead-lag structures. The paper by Pynnönen et al. (1996) presents and applies a cross-spectral approach for the analysis and mapping of second order information flows in stock prices, i.e., volatility shock transference. An ARMA-GARCH model is applied in the estimation of the autoregressive structure in the return series. The squared residuals are then used in the analysis of volatility spill over between the Helsinki Stock Exchange and the Stockholm Stock Exchange. The univariate results suggest that the markets have common time lags in volatility shocks and that this lag has become shorter in the pass of time. The bivariate results indicate that the lead-lag structure in volatility spill over is highly dependent on the time period studied.

6. ASSET PRICING TESTS

Unconditional asset pricing tests can be seen as nested special cases of conditional asset pricing models where possibly all key parameters such as betas, risk premia or market prices of risk are allowed to change over time. While more general, the drawback with conditional asset pricing models is the large number of extra parameters needed to estimate the model. However, still another extension may in many cases be warranted because observed data sequences do not always reflect actual expectations held by the market. Therefore, ”peso phenomena” where expectations of possible regime switches, some of which perhaps did not manifest themselves in observed data, further challenge the explanatory power of all asset pricing models. In

the most general setting conditional asset pricing model parameters would be regime specific, as well as time-varying. A paper by Berglund and Löflund (1996) studies such peso phenomena on the Finnish stock market and this paper is briefly reviewed in section 8 below. "Pure" unconditional and conditional asset pricing tests on Finnish stock market data is the topic of this section.

6.1 Unconditional asset pricing tests

The results of a traditional Fama-MacBeth (1973) two-pass approach to empirically test the CAPM suffer from the errors-in-variables (EIV) problem in the betas. Firstly, especially with Finnish data, there is the problem of thin trading biasing beta estimates in the first step. The problem of beta estimation on short return intervals when stocks are subject to thin trading has been investigated by Berglund, Liljeblom and Löflund (1989). They show that differences in trading frequency between different HeSE stocks produce a serious bias towards what appears to be stability in betas. However, the use of correction procedures for thin trading in daily HeSE stock returns between 1977–1985 does not significantly improve unbiasedness or efficiency of unadjusted OLS beta estimates.

A second way of reducing the EIV bias in estimated betas is to utilize external information. For example, time-variability in betas could be modelled by postulating relations with relevant instrumental variables. Alternatively, available cross-sectional information can be maximized by the use of individual stocks instead of portfolios. With this approach, however, it is important to ensure that noisy beta predictions are given a smaller weight than more accurate ones. Consequently, the paper by Berglund and Knif (1997) propose an adjustment of the cross-sectional regressions to give larger weights to more reliable beta forecasts. Applying this approach to data from the Helsinki Stock Exchange produces a significant positive relationship between returns and predictive beta while the traditional Fama-MacBeth (1973) approach finds no relationship at all.

6.2 Conditional asset pricing tests

A possible rational explanation to predictability of returns is that risks and prices of risk change predictably over time. Hence, a conditional asset pricing model may account for the observed predictabilities.

Vaihekoski (1996a) explores the ability of the conditional CAPM to account for the predictability of Finnish size and industry portfolios on daily, weekly and monthly return intervals for the 1987–95 period. He estimates the model asset-by-asset using Generalized Method of Moments. The main results are that a conditional asset pricing model is able to capture predictability and, in line with Ferson and Harvey (1990), most of the predictability is accounted

for by changes in the risk premia rather than in the betas. Interestingly, the model's ability to capture predictability decreases with the size of the portfolio, i.e. liquidity effects could be related to model deviations. Generally, the conditional asset pricing model produces sharper predictions of expected returns using longer data intervals.

On Finnish data Vaihekoski (1996b) estimates a two-factor conditional asset pricing model originally tested by Shanken (1990) on US data. The two factors are a local stock market factor and a local interest rate factor. In the model, betas and conditional variances are assumed to be linearly related to a set of predefined instrumental variables. Test assets are seven size, industry and leverage ranked portfolios, and the sample period is 1987–95. The main result is that the data reject the conditional mean-variance efficiency of some unspecified combination of the stock and bond benchmarks. In line with the results of Nummelin (1994a and b) for Swedish asset pricing, Vaihekoski finds some evidence that a bond market factor is relevant for pricing of Finnish equities as well.

In a paper of Vaihekoski (1996c) international factors are added to the conditional pricing model. The test method is similar to Vaihekoski (1996a). Using the Morgan Stanley world equity portfolio, Salomon Brothers world bond portfolio and a USD/FIM-based currency factor as the three factors in the model, Vaihekoski finds that each of the three factors has incremental significance in explaining predictability of Finnish size and industry portfolios. He also rejects the full integration hypothesis for Finnish equities during the 1987–95 period. Especially small company portfolios appear to be segmented from the global financial markets. Industries leaning more heavily towards local stocks display similar characteristics.

Nummelin (1997) examines the empirical performance of a global conditional three-moment CAPM. He employs monthly Finnish stock market data for 1987–95. To explore the robustness of the three-moment model, it is also examined if local equity market returns, exchange rate fluctuations and movements in overall stock market turnover come into play after accounting for global market portfolio risk exposures. The findings indicate that these additional factors are not generally able to detect deviations from the three-moment CAPM and time-varying global coskewness affects the cross section of expected returns on local size portfolios even after accounting for other factors.

Recently, Nummelin and Vaihekoski (1996) have studied issues related to time-varying global equity market integration from a Finnish perspective. Using Finnish firm size ranked portfolios and a conditional five-factor asset pricing model, they examine several restrictions on asset return behavior. The main finding is that a proxy for changing market integration – lagged foreign equity ownership – has a significant impact on the relative importance of local and global risk factors. Nummelin and Vaihekoski (1996) also report that the rewards to local and global risks change predictably over time and both local and global sources of risk are

TABLE 6. Time-varying betas and the HeSE risk premium

	Summary statistics for the cross-sectional regressions.					
Aggregation level	OLS Premium g_t (t-value)	const	R^2	WLS Premium g_t (t-value)	d_t	R^2
MONTHLY						
average	0.001 (0.24)	0.017	0.05	0.009 (2.05)	0.010	0.13
standard deviation	0.063	0.058	0.07	0.066	0.053	0.11
BI-MONTHLY						
average	0.007 (0.75)	0.030	0.05	0.016 (1.09)	0.024	0.38
standard deviation	0.099	0.076	0.06	0.155	0.134	0.24
QUARTERLY						
average	0.015 (1.09)	0.040	0.07	0.019 (1.35)	0.036	0.17
standard deviation	0.119	0.093	0.07	0.122	0.086	0.14
QUARTERLY with 'constant market betas'						
average	–0.022 (–0.14)	0.073	0.03			
standard deviation	0.115	0.139	0.04			

Berglund and Knif (1992).

consistently needed to explain the cross-section of expected returns from size portfolios. But, it is also found that the implied reward-to-risk characteristics of small and large firms are different, which suggests that markets are segmented in a more complicated manner than assumed by our model.

6.3 Risk premia

In a preliminary paper Berglund and Knif (1992) analyze how the results of a CAPM test on data for the HeSE will change when time-varying betas are used instead of constant betas. The most important implication of the CAPM is a positive relationship between stock returns and risk measured by the beta coefficient. In contrast to previous results a positive average risk-premium of plausible magnitude is obtained (see table 6 above). However, large standard errors make these point estimates quite imprecise. The resulting time series of risk-premiums is checked for possible dependencies using ARIMA models. A non-linear relationship between ex post risk premiums and returns is revealed. This is consistent with the fact that the cross-sectional dispersion between betas tends to increase when the market goes down and decrease when the market goes up.

7. PORTFOLIO MANAGEMENT

In the area of portfolio management, Liljeblom, Löflund and Krokfors (1997a,b) investigate the benefits from international diversification from a Nordic investor's perspective. The paper reports increasing covariability and volatility of international equity and currency markets. Hence, diversification benefits of international diversification may be compromised. To assess this ex ante mean-variance, optimal international portfolio strategies are constructed both hedged and unhedged for currency risk. These strategies indicate that there are substantial benefits from international diversification for Finnish investors as well as other Nordic investors, and these benefits appear larger in the latter subperiod where currency risk was higher due to free floating during some of the period. Equally weighted world and Nordic indices perform fairly well. Results concerning currency hedging are somewhat mixed. Generally speaking, the global minimum variance portfolio displays the best reward to risk tradeoffs for Nordic investors.

A comprehensive performance evaluation of Finnish mutual funds during the period 1991–95 is conducted by Liljeblom and Löflund (1995). They focus on the effects of proper benchmark selection, market timing effects and stability of performance. Performance measures are related to the fund expenses and size. The sample includes a maximum number of 37 Finnish mutual funds including stock, bond are balanced funds. The results clearly indicate that Finnish mutual funds display no abnormal performance. Neither do Finnish fund managers possess significant market timing skills. These results are independent of the benchmark used. When performance is related to fund characteristics, a negative relationship between the fund's expense ratio and fund performance (Jensen's alpha) is found, giving support to the view that management does not increase performance sufficiently to justify higher fees.

8. OTHER RELATED TOPICS

Liljeblom (1985) has investigated the currency risk of the Finnish stock market. She provides tests of efficiency of the Helsinki Stock Exchange during periods when the external value of the FIM was changed. The results indicate that the Finnish stock market is sensitive to contemporaneous changes in the external value of the FIM. This sensitivity can largely be explained by re- and devaluation events. Filter strategies formed on the basis of buy and sell signals from currency movements were not found to be profitable. Hence the study supports weak form efficiency of the HeSE.

Berglund and Löflund (1996) investigate whether a "Peso effect" is present in Finnish stock market returns in the 1989–1992 period when the market experienced a highly persistent, prolonged fall. The paper suggests a peso-based rationalization for this. The peso effect is due to

the central bank's commitment to defend the pegged exchange rate against a devaluation. The resulting disequilibrium may give rise to a peso phenomenon in stock returns. Market participants held devaluation expectations which did not materialize until much later but nevertheless affected stock market pricing well before the actual devaluation. Using a number of simplifying assumptions Berglund and Löflund show that the seemingly anomalous persistent pattern of negative stock market returns can be accounted for by a peso phenomenon produced by the currency-related disequilibrium.

Hedvall, Liljeblom and Nummelin (1997) investigate the price process of the dually listed (Helsinki – New York) Nokia shares. They find that the price process of Nokia has significantly changed after listing on the NYSE. Relative daytime/overnight domestic volatility shifts dramatically, and signicantly lower post-listing opening volatility and bid-ask spreads are observed. An error correction model of the relative contributions of the two exchanges to the price process of Nokia suggests pricing on the HeSE being mostly driven by NYSE trading rather than vice versa.

9. CONCLUSIONS

This survey article has presented Hanken-based research on asset pricing. We have focused on the pricing of equities. As noted in the introduction there are two special features of the Finnish equity market. First, the market is small both in terms of market capitalization and number of firms listed. Liquidity is very low on a global scale. Thin trading effects abound in the data. Second, the gradual process integrating the domestic market into the global financial markets took off in mid 1980s affecting asset pricing in several dimensions. Underneath these special questions lie the usual asset pricing questions: What kind of economic risks cause price reactions in Finnish equities? What is the source of the predicability and autocorrelation in stock returns? How does international information affect returns and returns volatility? Here are some of the main qualitative findings of this research:

First, it is clear that Finnish stock returns display very strong first order serial correlation – even in monthly returns. Berglund and Liljeblom (1988) argue that such autocorrelation stems from the aggregation of individual stocks to portfolios (a market index in their case), i.e. portfolio autocorrelation reflects the underlying autocorrelation of individual stock returns, which in turn is largely due to thin trading. In other words, friction in the trading process appears to be an important source of serial correlation. However, the observed serial correlation can also be due to predictability of a time-varying risk premium utilizing a set of past information [e.g. Vaihekoski (1997)]. This means that information variables capturing investors' expectations at a particular point in time can predict future stock returns on daily, weekly and monthly levels.

Hence, it is possible that serial correlation arises because of changing information. Rather than being a "technical" artifact of trading procedures, serial correlation is a reflection of "real" serial correlation in the economic fundamentals. This might not represent a violation of market efficiency as it may be disadvantageous for agents to implement serial correlation-based trading strategies, for example by leading to increased consumption variance. This explanation is obviously more plausible for longer return horizons such as monthly or quarterly returns.

Second, shocks in both international and local factors cause price reactions in Finnish stocks. During the period from the 1970s to the 1990s the local stock market factor is significantly present in pricing of Finnish equities. Furthermore, a local interest rate factor is a significant second factor. Over time, the significance of international factors has increased although their significance in pricing is clearly second to the local market factor. International diversification is (still) beneficial for Nordic investors despite the increased equity market correlations and increased equity and currency volatilities.

Conditional asset pricing models have replaced unconditional models. This is mainly due to the fact that Finnish returns show such clear predictable patterns that taking this fact into account in the asset pricing models yields much sharper results. The benefits have been substantial. For example, Berglund and Knif (1992) find that the Finnish unconditional market risk premium, which in previous tests invariably was insignificantly different from zero or even significantly *negative*, is positive once time-variation in betas is taken into account. The evidence in Vaihekoski (1997) clearly shows that taking into account time-varying risk premia and betas (covariances) significantly enhances the performance of asset pricing models with Finnish data.

Recent research efforts in the asset pricing area have focused, in greater detail, on the process of integration and the impact of illiquidity on pricing in this context. Furthermore, there is a need to understand more deeply the role of peso phenomena in explaining past non-stationarities in especially Finnish stock returns. Also, the time series dependencies in the return moments are investigated with increasingly sophisticated econometric methods in order to assess the fundamental sources of return moment predictability. ■

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