Investigating European ETFs: The Case of the Swiss Exchange Traded Funds

by

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Abstract

In this paper we study the performance and the trading characteristics of a sample of 36 Swiss Exchange Traded Funds during the period 2001-2006. Using daily data we find that Swiss ETFs underperform their underlying indexes and encumber investors with greater risk. We also find that Swiss ETFs do not adopt full replication strategies and the magnitude of tracking error is substantial to an approximate average of 1.02%. Further investigation reveals that the tracking error is positively related to the management fees and risk of ETFs while the impact of expenses on ETFs performance is negative on ETF investor returns. Finally, in regression results we estimate that the volume of Swiss ETFs is positively affected by the intraday price volatility, the number of trades, and the trading frequency while a significant part of volume is unrelated to the above factors.

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1. Introduction

The inception of the Standard and Poor's Depository Receipts (SPDRs) on the AMEX Exchange in 1993 and the subsequent rapid growth of Exchange Traded Funds (ETFs) with products known as Qubes (QQQ), Diamonds, and iShares, have enhanced investment choices and brought new challenges to the professional portfolio management.

ETFs are investment hybrids of ordinary corporate stocks and open-ended mutual funds. They are baskets of shares aimed to closely replicate the performance and risk levels of specific indexes. They are subject to exchange trading rules offering flexibility to investors along with the ability to buy or sell the entire market with a single transaction at any time during the day.

This paper focuses on the ETFs traded in the Swiss Stock Exchange to examine a number of testable hypotheses related to: the ability of ETF managers to replicate the behavior and performance of the underlying index, the factors that affect the trading behavior of ETFs, the role that expenses play on the ETF performance, the magnitude of tracking error. Empirical evidence on some of these hypotheses exist on ETFs trading in the U.S., Canada, Australia, and Asian markets but academic research on Swiss ETFs is absent.

The Swiss Stock Exchange is one of the four major players in the European ETF market with a turnover of 6.2 billion euros in 2005 and constantly growing with 48 ETFs currently traded. By analyzing the trading behavior of Swiss ETFs we not only provide market participants with information on the workings of the market but we allow for comparisons with ETFs in other developed markets.

The investors' need to take positions in the entire market rather than in a specific portfolio is the result of empirical evidence on mutual funds that active management, on the average, does not produce above-normal returns. A number of authors [Malkiel (1995), Gruber (1996)] attribute the managerial inability to "beat the market" to the increased expenses incurred by the managers in an effort to do so. As a result, the above-normal returns they achieve on a gross level are reduced to normal level after expenses are deducted. This realization made investors direct most of their money to mutual funds that track a market index rather than search for a mutual fund that promises to could "beat the market." These investors' preferences led to the growth of index funds making index providers the world's largest asset managers.

Yet, besides tracking the market, investors preferred to take positions in and out of the entire market quickly with just one order, with minimum transactions costs, lower tax burden and with greater risk diversification and flexibility. The attempt to incorporate such features in a product led to the development of ETFs with a successful proliferation throughout the developed capital markets.

The benefits and advantages ETFs offer to investors has been analyzed in an array of developed markets like the U.S., and Australia [Gastineau (2001), Carty (2001), Gallagher and Segara (2005)]. They find that their advantages like flexibility, risk diversification, tax efficiency and lower costs have contributed to their successful proliferation. A number of other studies have focused on the ETF pricing and performance [Ackert and Tian (2000), Elton et al (2002), Poterba and Shoven (2002)] suggesting that ETF pricing does not differ from their net asset value.

Following previous research, we estimate the risk, return, and performance of 36 Swiss ETFs available in the period 2001-2006. We provide three measures of tracking

error and examine the tracking ability of ETF managers. We also attempt to assess whether risk and management expenses influence the magnitude of tracking error. Another issue examined in this paper is the assessment of ETFs trading activity and the factors which are likely to explain the growing activity of trading volume.

The rest of the paper is organized as follows: In Section 2 we discuss the institutional features that characterize ETFs, their advantages and tax considerations along with their differences from conventional index funds. We present the literature review in Section 3 and discuss the major findings on ETFs trading in world stock markets. Next we evaluate the European ETFs market in Section 4 and show that the Swiss market is the fourth most significant European ETF market. In Section 5 we develop the methodology followed in the empirical analysis and provide the rationale for regression relationships across tracking error, performance, risk management fees, and trading volume. We describe the sample and the data employed in Section 6 and proceed in Section 7 with the discussion of empirical results focusing on descriptive statistics, regression analysis, tracking error, performance, expenses, risk, and the determinants of volume. In the final section 8 we summarize the main findings of the paper and offer some concluding comments and ideas for future research.

2. Institutional Characteristics of ETFs

ETFs are found in three different forms. In the first form, an ETF is structured as a unit investment trust, which cannot reinvest the accumulated dividends and lend the underlying securities in order to enhance its performance. The second form is similar to traditional mutual funds, which can reinvest the dividends and lend the securities. The third form resembles the grantor trust structure, which contains a bundle of stocks in a specific industry that can be liquidated at the investor's discretion.

The creation and redemption mechanism of ETFs pursues a unique "in kind" process. ETFs are created in block-sized units of 25.000, 50.000 or 100.000 shares by large investors and institutions. The creator of an ETF purchases and deposits a portfolio of stocks which approximates the composition of a specific index to a trustee. A cash amount that represents the accumulated dividends of the underlying portfolio shares is also deposited. In return of these deposits, the creator receives a fixed number of ETF shares, the entirety of which then is usually traded on a secondary exchange market. The redemption of ETFs follows the reverse direction. The investor exchanges his own ETF shares for the portfolio of stocks plus a cash component, which is related to the realized dividends of these stocks.

The "in kind" process of ETFs creation and redemption distinguishes two main categories of investors. The first one refers to the large institutional investors who have the ability to deal directly with the fund. The second category involves the retail investors who are able to acquire or sell shares of ETFs only on the stock exchange. Further, considering the investment horizon of ETFs, we distinguish two different kinds of investors. The first kind refers to the long-term investors who prefer ETFs due to their low management fees. The second kind refers to the day traders who choose ETFs to gain from intraday mis-pricings. Finally, some institutional investors like pension funds use ETFs for hedging purposes due to the restrictions they face in the usage of derivative products.

The trading price of ETFs usually deviates from their corresponding net asset value providing arbitrage opportunities for big investors. If the value of the underlying portfolio of stocks is greater than the ETF price, the institutional investor will redeem the low priced units of ETF by receiving the high priced securities. In contrast, if the value of the underlying stocks is lower than the ETF price, the investor will exchange the low priced securities for a new creation unit of the ETF. This arbitrage mechanism is an on-going process which helps eliminate large and long-lasting deviations between ETF prices and their net assets values.

ETFs are assumed to be tax efficient due to their discrete creation/redemption mechanism. The buying and selling of ETF shares usually takes place among shareholders and as a result, there is no need for the ETF to sell its assets in order to meet redemptions. This advantage of ETFs restricts the realization of taxable capital gains. Furthermore, the redeeming investors are paid "in kind" by receiving securities instead of cash, so the remaining shareholders are protected from a taxable effect.

Focusing on the investing strategy, ETFs are eligible to invest either to stock indexes of major capital markets (broad or sectors) or to international stock indexes. Regarding non-equity investments, ETFs may choose to invest either in corporate bonds or in treasury bonds, both being less risky choices relative to the most common equity-linked ETFs. Since ETFs are usually fully invested in broad, sector or international indexes, they offer investors a respectable level of risk diversification. Besides, ETFs are cheap investment tools having small expense ratios as a result of their passive investment character. In fact those ETFs that track broadly diversified indexes have the lowest expenses, followed by ETFs that track sector indexes. Most expensive of all are these ETFs that invest in international markets. Lastly, ETFs have to pay commissions to brokerage companies and their shares are subject to the bid/asked spread. Like ordinary stocks, ETFs can be purchased on margin. Moreover, ETFs can be bought and sold short and they are exempted from the "up-tick" and "down-tick" rules.

Since ETFs follow the same indexes like traditional open-ended index funds, they compete one-to-one with regard to costs, tax efficiency, flexibility, and tracking ability. In general, ETFs have lower expense ratios relative to their index funds counterparts despite the fact that index funds do not pay broker commissions and they are not burdened by the bid/asked spread. Furthermore, index funds are less tax-efficient since they are disciplined by the creation/redemption of classic mutual funds that generally result in taxable events. Contrary to ETFs, index funds are less flexible since they are traded at net asset value at the end of the day and they do not offer investors arbitrage opportunities. Overall, ETFs are preferred mostly by risky equity investors in contrast to conservative investors who prefer index funds.

3. Literature Review

Academic literature has shown substantial interest regarding the behavior and performance of traditional mutual funds. Such interest has now started to spread to ETFs. A number of studies examine the trading characteristics, operating mechanisms and the benefits ETFs provide to market participants. Gastineau (2001) and Carty (2001) study ETFs trading in the U.S. Gastineau provides an influential and enlightening paper about ETFs, by tracing their origin, describing their main types and the exchanges where they are traded, analyzing their characteristics and the operating

mechanism. He also identifies the benefits from ETFs for capital markets participants paying a great attention to the importance of short selling in the determination of assets' size and fund manager's profitability. Carty offers a brief dictionary about the structural and trading characteristics of ETFs. His paper focuses on ETFs flexibility, convenience, risk diversification, tax efficiency and cost advantages, in relation to the traditional mutual funds, short selling component, marginal trading and on the nature of ETFs formation.

Looking at similar issues, Gallagher and Segara (2005) focuses on the return and trading characteristics of Australian ETFs. These authors find that classical ETFs compensate investors with returns before expenses in proportion to the benchmark's performance. Further, ETFs present lower tracking error relative to the corresponding index funds. Finally, the deviations between trading and net asset values are infrequent and not sizeable.

ETF share pricing relative to their net asset value has been the subject of a number of studies. Ackert and Tian (2000) sudied the pricing of the Standard and Poor's Depository Receipts. They claim that the trading price of SPDRs does not differ significantly from their net asset value. This slight price deviation derives from the low cost arbitrage opportunities SPDRs offer to investors. The efficient execution of arbitrage strategies by large investors eliminates the divergence between the trading price and the net asset values. Interestingly, the MidCap SPDRs trade in large discounts, a fact that reflects their higher arbitrage costs. Jares and Lavin (2004) consider the Japan and Hong Kong iShares, which trade on U.S markets but offer vital exposure to Asian markets. The authors note that the non-overlapping trading hours between the United States and many foreign markets induce the deviation of ETFs trading prices from their net asset values. Consequently, the deviations reflect potential profit opportunities for investors.

Another important area that has attracted academic interest is the performance of ETFs relative to their underlying index and to mutual index funds. Elton, Gruber, Comer and Li (2002) find that the SPDRs underperform both the S&P 500 index and their index funds and futures counterparts. They combine the underperformance with the lost income, which is caused by not reinvesting the dividends received on the underlying assets and holding them in non-bearing accounts. Further, they demonstrate that the daily trading price of SPDRs moves closely to their net asset value, as a result of the efficient arbitrage's execution.

Poterba and Shoven (2002) compare the pre-tax and after-tax returns of SPDRs and Vanguard index fund, which both track the S&P 500 Index, concluding that these funds substantially present the same performance. The authors associate the advantageous tax efficiency of ETFs to the "in kind" redemption process which eliminates the distribution of taxable realized capital gains. Kostovetsky (2003) argues that the principal comparable patterns between ETFs and index funds are management fees, transaction fees and tax efficiency. He compares the sources of underperformance in relation to the benchmarks for both ETFs and index funds demonstrating that these sources are mainly different as a result of the unequal structural and operating formation of these investment vehicles. Gastineau (2004) suggests that the pre-tax return of benchmark index ETFs generally displays inferior records in comparison to the index mutual funds which use the same indexes. He partially attributes the low return to the lack of aggressiveness for a portion of ETFs managers. In addition, the "in-kind" process of ETFs creation and redemption restricts managers' ability to follow

accurately, immediately and inexpensively the adjustments of the tracking indexes, resulting in lower returns.

Other studies deal with the advantages ETFs offer over their mutual fund counterparts that track the same indices. Dellva (2001) applies a cost comparison among the primary trackers of S&P 500 Index, SPDRs and Barclay's iShares S&P from the bundle of ETFs and the Vanguard index mutual fund. He uncovers a significant advantage of ETFs considering the annual expenses, even though they bear transaction costs and commissions and face the bid/ask spread. This advantage becomes greater if an investor holds his ETF shares for a long-lasting period. Yet, the ETF advantage may not always hold. As Bernstein (2002) argues, the tax and cost advantage of ETFs is modified or eliminated by the temptation of investors to liquidate their shares frequently. The statistics demonstrate that the average holding period for SPDRs during the first five months of 2001 was 10 days and for QQQ only 4 days. The combination of short holding periods and brokerage commissions offsets the lower expense basis of ETFs.

Other studies have attempted to assess the impact of ETF introduction to the markets on overall trading activity, global diversification strategies, and cash flow to mutual funds. Tse and Erenburg (2003) use the July 31st of 2001, a date when the NYSE began trading QQQ shares to examine the impact of the NYSE's participation to the competition for order flow, market quality and price discovery for QQQ on the AMEX, NYSE, ECNs (electronic communication networks) and regional exchanges. They find that the NYSE contributed to a reduction of bid-ask spread and pricing error for all centers and resulted in a higher market quality.

Miffre (2004) shows that the iShares which track indexes of international capital markets, enforce global asset allocation strategies. The short selling element of ETFs contributes to the global risk diversification and generates sufficient gains in a transparent and low cost manner which is not easily achievable by global index funds.

Finally, Boney, Doran and Peterson (2006) explore the magnitude of SPDRs' influence on the cash flow towards the S&P 500 index fund trackers. They discover that SPDRs negatively affect the cash flow towards index funds. Particularly, during the period 1997-2004, the examined index funds have lost more than $2.9 billion to the SPDRs. The unique exception to this finding regards the VFINX, the largest index fund that track the S&P 500 index, which has not been influenced by the SPDRs inception.

4. European ETFs Universe

U.S. ETFs grew rapidly after their initial inception on AMEX in 1993. Currently, a bundle of 216 exchange funds with various styles and investing targets is listed on U.S. stock markets. Particularly, an institutional or a retail investor has the availability to choose from a variety of 161 domestically invested ETFs, 49 ETFs which are allocated on international and global stocks and 6 bond ETFs. On April 2006 the aggregate ETF assets under management were approximately $335 billion.[1]

In parallel to the substantive ETF development in the U.S. markets, sufficient growth has been observed in European capital markets. Primarily, European ETFs trade on XTRA and Swiss stock exchange since 2000. Detailed statistics about European

[1] Source: John Spence, *MarketWatch*, 26 May 2006.

index ETFs regarding each exchange's turnover, market share, turnover growth and number of traded funds during the period 2001-2006 are presented in Table 1.

Table 1 reveals that European ETFs have experienced persistent growth during the period from August 2001 to April 2006. Considering the absolute trading turnover (Panel A), ETFs' trading value increases almost in every subsequent year. In 2001, the aggregate European ETFs turnover approximated €21 billion, while its magnitude was raised more than 4 times to €99 billion by the end of 2005. Likewise, during the first four months of 2006, turnover amounted to nearly half of that in 2005, signaling a much greater accrual in 2006.

As seen in Panel B, the major ETFs players among European exchanges are Xetra, NextTrack, London Stock Exchange, Swiss Stock exchange, MTF-ETF and Stockholmsbörsen. The entire turvover of these exchanges counts essentially for the whole European ETFs turnover with a market share of 96.22%. The residual market segment is currently distributed to seven minor exchanges. In particular, Xetra is the major ETF market, presenting an average yearly turnover equal to €30 billion and an average market share of 48.36%, twice the turnover of the second in place NextTrack. Currently, Xetra offers investors the widest range of tradable funds. London Stock Exchange comes third, MTF-ETF fourth and Swiss Stock Exchange ranks fifth.

Panel C exhibits that the total percentage growth of European ETFs' turnover reached approximately 373% during the entire period of study.[2] The turnover of ETF markets in Europe grew each year on an average rate of 71%. The absolute and mean values of turnover reflect the prominent acceptance of European ETFs as an investment choice.

Another element that confirms the rapid growth of ETFs in the European markets is the number of funds exhibiting non-zero turnover at the end of every year. Panel D shows that the average number of ETFs with positive turnover increases almost in every year during the period 2001-2006 from about 14 in 2001 to 28 in April of 2006.

5. Methodology

In this section we develop the methodology that will be followed to examine a number of issues surrounding the Swiss ETF like statistical characteristics, tracking error, performance, expenses, risk, volume, and their interactions.

5.1 Statistical Characteristics

We first calculate the average daily percentage return and risk of Swiss ETFs and their corresponding indexes. We compute the percentage return of ETFs, using equation (1):

$$R_i = \frac{TV_i - TV_{i-1}}{TV_{i-1}} * 100 \quad (1)$$

where, R_i refers to the percentage return on day i, and TV_i refers to the trading price of ETF on day i.[3]

The risk of ETFs and indexes is expressed by the standard deviation of returns:

[2] We take no account of 2006 turnover because of incomplete data.

[3] The Swiss Exchange does not report the net asset value of ETFs, a fact that forces us to use exclusively the trading prices of ETFs in return calculations.

$$\sigma^2 = \frac{\sum_{i=1}^{N}(A_i - \overline{A})^2}{N-1} \quad (2)$$

and $$\sigma_A = \sqrt{\sigma_A^{\,2}} \quad (3)$$

where, σ^2 denotes the variance of an ETF's return around the average return $\overline{A}$ and σ_A expresses the percentage risk of portfolio in terms of returns' standard deviation. We also estimate the risk/return ratio by dividing the mean standard deviation of returns by the average percentage return. This ratio calculates the risk per unit of return, a useful measure when making comparisons across ETFs.

After having estimating the risks and returns, we concentrate on the trading and expense characteristics of Swiss ETFs. Specifically, we introduce the average daily trading turnover, the number of the mean executed trades, the volume of traded shares, the percentage management fee and the trading frequency of ETFs.

5.2 Regression Analysis

In this section, we perform a simple regression in order to examine a variety of interesting issues. The single index model is presented in equation (4):

$$R_{pt} = \alpha_i + \beta_i R_{bt} + \varepsilon_{pt} \quad (4)$$

where: R_{pt} indicates the raw return of the ETF, R_{bt} presents the return of the tracking index portfolio, and ε_{pt} is the residual error. In this regression, the alpha (α) coefficient stands for the return an ETF could achieve above the return that relates to the index portfolio. However, since ETFs pursue a passive investment approach, alpha estimations are not expected to be statistically significant.

The beta (β) coefficient in equation (4) is an estimate for the systematic risk to which an ETF is exposed and reflects the aggressiveness of management strategy. Beta estimations are also viewed as indicators of ETF's replication strategy. A beta of unity suggests a full replication strategy whereby the ETF invests to all components of the tracking index in the same weights. In contrast, a beta coefficient which significantly differs from unity, represents a departure from a full replication strategy. In this case the ETF manager rather implements selection techniques choosing stocks that are likely to perform best.

5.3 Tracking Error

The deviation of the performance of index funds from the performance of corresponding indexes is defined as "tracking error" and this issue has attracted great interest in the literature. The most common issue in passive portfolio management is that fund managers usually fail to replicate accurately the return of their corresponding indexes.

Among the early studies on tracking error, Roll (1992) argued that the major challenge faced by the portfolio manager is the minimization of the tracking error. Roll argues that the derived portfolios under this strategy are efficient if the benchmark portfolio is efficient. However, such portfolios bear greater systematic risk than the benchmark's portfolio, which implies a beta greater than unity. Pope and Yadav (1994) investigate the restrictions in tracking error estimation which derive from the usage of high frequency-data like the daily or weekly returns. The major impact of high-frequent data is that they induce negative serial correlation with respect to the difference between the fund return and its benchmark. They suggest that unless the portfolio's composition

exactly replicates the components of the tracking index, the return differences would be negatively serially correlated.

The impact of a portfolio's components on its tracking performance relative to a selected benchmark's return is the focus of a study by Larsen and Resnick (1998). They apply their investigation on both high and low-capitalization portfolios, demonstrating that the high-capitalization portfolios present inferior tracking error and volatility than the low-capitalization counterparts. They also exhibit that the magnitude of tracking error approximates zero when the composition of the stocks' portfolio reaches the absolute synthesis of the index portfolio.

Frino and Gallagher (2001) present the major factors that enlarge the size of tracking error such as the dividend payments arising from the stocks of an index as well as the size and the timing of index's rebalancing. They conclude that index funds face market frictions that hurt their ability to replicate exactly the performance of the underlying indexes which do not face any frictions at all. They also discover a seasonality effect in tracking error magnitude.

Kostovetsky (2003) demonstrates that index funds and ETFs' tracking error is affected by common as well as by different elements. The main factors that induce the tracking error of index funds are the bid-ask spreads, the obligation of index funds to maintain a significant amount of money in cash to meet redemptions, the dividend policies and the transaction costs arising from index changes or corporate activity. The cash drag effect is applicable to ETFs too, even if it is much smaller. ETFs performance is affected by the dividend policies, which usually obligate the ETFs managers to keep the received dividends from the index's stocks in non-bearing accounts.

Finally, Blume and Edelen (2004) study the impact of S&P 500 composition's change to the abnormal returns of index funds. These abnormal returns are attainable if the indexer chooses to adjust his portfolio immediately at the opening price on the consequent day of the change's announcement, rather than waiting until the closure on the day of change. This strategy induces the observed tracking error.

The literature suggests a variety of methods in tracking error estimations. For example, Ammann and Zimmermann (2001) recommend the correlation coefficient between the tracking portfolio and the benchmark. In this study, we choose the three most commonly used methods of tracking error measurement. The first one, $TE_{1,P}$, is straightforward and defined as the standard error of regression (4).

The second one computes the tracking error by calculating the average of absolute differences between the returns of ETFs and the corresponding indexes. We take into account the absolute value of returns' differences because either a positive or a negative difference reflects non-similar performance. This estimation is expressed in equation (5):

$$TE_{2,P} = \frac{\sum_{t=1}^{n} |e_P|}{n} \tag{5}$$

where TE denotes the tracking error and $|e_P|$ is the absolute return differences.

Finally, the third method computes the standard deviation of return differences between ETFs and their indexes. This is the most commonly used method and, according to Pope and Yadav (1994), produces the same results in comparison to the first method only if equation's (1) beta is equal to unity. The estimation of this tracking error is presented in equation (6):

$$TE_{3,P} = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(e_{pt} - \bar{e}_p)^2} \quad (6)$$

where e_{pt} is the difference of returns in day t and $\bar{e}_p$ is the average return's difference over n days.

5.4 Performance, Expenses and Risk

After estimating ETFs risk and return and the related tracking error components, attention is turned to the management expenses and their impact on ETFs ability to accurately replicate the performance of the selected benchmarks. The literature denotes that expenses count for a big portion of ETFs tracking error.[4]

As a proxy of Swiss ETFs expenses we use the published ratio of management fee.[5] The impact of expenses on ETFs performance is assessed by cross-sectional regression analysis. In the first step, we apply a single regression of ETFs average daily return on their percentage management fee ratio. This regression is appropriate, since the managerial fees are subtracted daily on a percentage basis. We expect the coefficient of fees to be negative and statistically significant since the expenses found on ETFs are reducing their performance relatively to the benchmark's performance which does not carry any expenses.

In addition, we estimate the quantitative relation between the tracking error measurements and the management fees. We perform single regressions of tracking error on management fee ratio. We apply three distinct regressions for each one of the three methods of estimating tracking error. Since management fees apply only to ETFs and not to the underlying index, the greater the management fee the greater the tracking error is expected to be and the coefficient of management fee ratio to be positive.

In our analysis of expenses, we consider the risk as a determinant factor of the fees imposed on an ETF investor. As the related risk of an investment increases the imposed fees are expected to also increase. This influence is more evident in ETFs tracking benchmark indexes of international markets, which usually bear the higher expense ratios. We estimate the impact of risk on management fees by regressing the fee ratio on the standard deviation of ETFs returns.

In the last step, we assume the risk to be influential on the tracking ability of ETFs, meaning that the level of risk affects the tracking error's calculations. We expect risk and tracking error to be positively related. We explore this relation by regressing of the ETF tracking error estimations on the calculated risk of performance. We apply three regressions for each of the specific methods of tracking error's computation and we anticipate the coefficients to be positive.

5.5 Determinants of Volume

[4] See for example, Elton, Gruber, Comer and Li (2002).

[5] Unfortunately, we are not provided with any information on transaction costs or brokerage commissions and it is not defined if the management fee ratio used here includes any of these costs. Further, we are not supplied by data concerning the bid and ask prices of ETFs shares on Swiss Exchange. This lack of expenses' data restricts our investigation only to management fees.

In this segment, we investigate the determinants of the daily volume of Swiss ETFs. The combination of trading volume and total assets under management reflects the attractiveness of ETFs and their acceptance by the investing community.

The daily volume of ETFs shares is influenced by various factors. Elton, Gruber, Comer and Li (2002) connect volume size with market volatility and the arbitrage opportunity of ETFs. In a similar manner we treat the intraday volatility of ETFs as a determinant factor of volume in order to incorporate the inherent trading trend of ETFs. The intraday volatility of ETFs is estimated by the ratio of the difference between the daily highest and the daily lowest price on any given day to the closing ETF price on that day.

The conventional hypothesis is that the number of trades positively affects volume. Normally, both purchases and sales of ETFs induce the volume's configuration, implying a straightforward correlation among ETFs volume and the number of trades. Furthermore, one could assume that the return of ETFs on the previous trading day would probably induce the size of volume. This assumption is applicable both for short and long investors. Therefore, we expect a positive relationship between ETF volume and ETF lagged performance.

We examine the determination of Swiss ETFs volume via a time-series regression for each ETF that combines ETF volatility, the number of trades, and the lagged return. The regression is as follows:

$$\mathrm{LnV_i} = \alpha_i + \beta_i \frac{DH_i - DL_i}{IC_i} + \gamma_i \mathrm{TR_i} + \delta_i \mathrm{LagRet_i} + \varepsilon_i \qquad (7)$$

The $\mathrm{LnV_i}$ variable refers to the natural logarithm of the daily volume for the ith ETF. $\mathrm{DH_i}$ and $\mathrm{DL_i}$ denote the intraday highest and lowest price of the ith ETF respectively, and $\mathrm{IC_i}$ represents the closing price of the same ETF. The $(\mathrm{DH_i} - \mathrm{Dl_i})/\mathrm{IC_i}$ ratio estimates the ETF's intraday volatility. $\mathrm{TR_i}$ is the number of executed trades for the ith ETF. Finally, $\mathrm{LagRet_i}$ depicts the lagged return of the ith ETF.

Besides the above factors, we assume that the trading frequency also influences the volume of ETFs. We examine this issue for the overall sample's ETFs by a cross-sectional regression. The model also includes the average ETFs volatility and the average number of trades as in equation (7). However, the average lagged return is not applicable and therefore not embodied in the regression. The trading frequency is noted as FREQ and is defined as the rate of the actual trading days of ETFs to the total actual trading days of the indexes. These influences are estimated in the following regression:

$$\mathrm{LnV_i} = \alpha_i + \beta_i \frac{DH_i - DL_i}{IC_i} + \gamma\, \mathrm{TR_i} + \delta\, \mathrm{FREQ_i} + \varepsilon_i \qquad (8)$$

6. Data

In this study, we use daily data for a sample of 36 ETFs traded on the Swiss Stock Exchange during the period of August 2001 to April 2006. We note that this number does not reflect the entirety of available Swiss ETFs. Particularly, the Swiss exchange offers trading opportunities for 49 ETFs of various investment styles, like equities,

bonds or commodities. The majority of the non-included ETFs suffer from illiquid trading or were restrictions collecting the historical prices of the underlying indexes.

Beyond the listed Swiss ETFs, the sample encompasses four ETFs that do not currently trade on the Swiss exchange. These ETFs ceased their trading activity approximately at the end of 2004, but their previous history is significantly voluminous and cannot be ignored. We decided to include these non-survived ETFs, mitigating simultaneously the survivorship bias problem. Overall, the sample of this study contains 36 ETFs that are mainly equity ETFs, while two bond ETFs are also included.

The trading data of the surviving and non-surviving ETFs were available at the Swiss exchange's webpage. The dataset encompasses historical information about the daily ETFs closing values, intraday high and low prices and the volume of the traded shares. Swiss exchange's webpage also offers data about the names of ETFs, tracking indexes and their management fee ratios.

The sample ETFs track various European, US and Asian indexes in growth and emerging capital or bond markets. A large part of the sample's ETFs try to replicate the performance of Morgan Stanley's international indexes. The daily closing values of these indexes are collected from the Morgan Stanley's webpage. Further, another large part of the sample's ETFs follow the return of major regional or sector Dow Jones indexes. The Dow Jones webpage makes available the values of these indexes.

Moreover, the sample includes ETFs that track four principal equity and bond indexes of Swiss markets, the data of which are collected from the web database of the Swiss exchange. Accordingly, one ETF follows the Nasdaq 100 index, one tracks the S&P 500 index and the other two track the movements of FTSE 100 and FTSEurofirst 100 index. The closing values of the above indexes are collected from the finance.yahoo database.

7. Empirical Results

7.1 Descriptive Statistics

Table 2 presents the risk and return characteristics of the sample. Results show that the average daily percentage return of the sample's ETFs is positive and equal to 3 basis points (b.p.). The average return of the corresponding indexes is a little higher than the average return of ETFs and equals 7 b.p. This comparison suggest that the sample's ETFs underperform, on the average, the return of the underlying indexes by an amount of 4 b.p.

The lowest return relates to the iShares MSCI Brazil and it counts for -0.28%. At the same time, the corresponding index presents the poorest return equal to -0.17%. On the contrary, the best average performer is the DJ Stoxx 50 whose return amounts to 33 b.p.

Regarding the ETFs risk, we find that the daily ETFs standard deviation is 1.63% while indexes present a risk which is equal to 1.41%. The less risky ETF is the XMTCH SBI DOM GOV3-7, and the most risky is the iShares MSCI Brazil, also the one with the weakest performance. In this case, the common belief that the high risk usually compensates investors with higher returns on an ex ante basis, it does not hold ex post.

The average risk/return ratio is quantified to -7.81, while we observe a large range between the minimum and the maximum values. Specifically, the lowest

risk/return ratio is equal to -348.71, related to the UBS-ETF DJ INDU AVG. This low value of the ratio emerges as an outlier when the daily average ETF risk of 1.73% that is close to the overall average risk of the sample (1.63%) is divided by a very minimal negative return of almost zero. On the other side, the maximum risk/return ratio concerns the XMTCH SMI which tracks the general index of the Swiss exchange market.

In Table 3, we find that the average daily turnover is equal to 1,299,604.32 CHFs. The minimum average daily turnover is connected with the XMTCH DJ HEALTHCARE. We notice that this ETF does not currently exist; this termination of ETF's trading activity could well be attributed to the lack of substantial daily turnover. In contrast, the XMTCH SMI presents the greatest trading value. We note that this XMTCH SMI is an ETF that was initially introduced on the Swiss exchange.

Besides the daily turnover, the numbers of the executed orders and the volume of shares reflect the marketability of ETFs. The average values of these variables are respectively 8.87 and 22,408.20. The maximum values of these factors reconfirm the trading ascendancy of XMTCH SMI.

The mean management fee ratio of 32 existed ETFs is equal to 33 b.p. Unfortunately, the data about the fees for four ETFs that no longer exist are not available. The lowest ETF expense ratios are these of the bond ETFs whose fee ratio amounts to 8 b.p. The highest fee ratios are associated with the ETFs which track the international indexes of Morgan Stanley. Finally, regarding the percentage trading frequency, it ranges from 15.07% to 99.13%, while the average trading frequency is 65.58%.

7.2 Regression Analysis

In this section, we present the results of the time-series performance regression (4) in Table 4. The mean alpha estimate of the entire ETF sample is negative and statistically significant at the 5% level or better. However, only two of the 36 ETFs have alphas statistically different from zero at the 10% level. This finding is in accordance with our expectations, since all of the sample's ETFs are passive indexers and they do not have any material trading flexibility to produce superior returns than their indexes.

In contrast to alpha values, the estimations of all beta coefficients are economically significant and statistically differ from zero at the 1% level. The mean measurement of beta is equal to 0.88, indicating that the sample's ETFs, on average, are more conservative in comparison to their related benchmarks. Furthermore, t-statistics indicate that ETF betas are different from unity. This result suggests that almost all Swiss ETFs do not apply a full replication strategy. Possibly, this insufficient replication of indexes explains partially the underperformance of ETFs relative to the corresponding index returns which was found in the previous segment of the study.

Viewing the individual beta estimations, we see that the most substantial deviations from the unity concern mainly the ETFs which track the international capital indexes of Morgan Stanley. Moreover, the S&P 500 index, the Nasdaq 100 index and some of the Dow Jones sector indexes seem to not be fully replicated by the relevant ETFs. This fact implies that the regional, geographic and time differences between the Swiss listed ETFs and their corresponding indexes restrict ETFs from efficient replication of index portfolios.

As a last examination of ETFs replication policy, we use the value of R-square. The average R-square is 0.59, which implies a very good regression fit. On the other

hand, the difference of the average R-square from unity, statistically significant at the 1% level, indicates that Swiss ETFs are not fully invested on the assets of their underlying index portfolio. The size of the average R-square confirms the deviation of ETFs components from these of the respective index.

7.3 Tracking Error

This segment of the study presents the results of three tracking error's estimations in Table 5. The first three columns show the results of each one of the three distinct methods and the fourth column the average tracking error of Swiss ETFs. The last column exhibits the number of trading observations for each one of the sample's ETFs.

According to Table 5, the average tracking error ranges from 0.86 to 1.18 depending on the definition of the tracking error. The mean tracking error of all three types is equal to 1.02. This amount is considered to be significant, reflecting the substantial deviation among ETFs and indexes' performance.

The existence of large tracking errors is partially attributed to the insufficient replication of index components by Swiss ETFs. It may also be attributed to the trading infrequency of some ETFs.[6] Regarding individual ETFs, the minimum tracking error concerns XMTCH SBI DOM GOV3-7, which tracks the DOM GOV3-7 bond index. The mean tracking error of this ETF counts for 16 b.p. The fact that a bond ETF, in relevance to the equity ETFs, presents the minimum tracking error is reasonable, since a bond index's price does not fluctuate significantly from day to day. From the bundle of equity ETFs, XMTCH ON SMIM is the best tracker, whose average tracking error equals 28 b.p. In parallel, the percentage trading frequency of XMTCH ON SMIM (Table 3) reaches 89%, suggesting another factor that is likely to reduce the tracking error.

The maximum tracking error relates to ETFs that track non-European indexes. Specifically, the weakest tracker of the sample is the Barclay's iShares which tracks the Brazilian index of Morgan Stanley. The average tracking error of this ETF is significantly high and counts for 263 b.p. and the large trading frequency of iShares MSCI BRAZIL does not seem to assist in a better replication of the tracking index's return.

The fact that the ETFs tracking of non-European indexes is associated with large tracking error is not surprising, since the international ETFs face some restrictions that negatively influence ETF efforts to replicate their benchmark's performance. Chief among these restrictions is the time delay between the European and the US and Asian markets. The time delay results in a lag in formations' inflow, which constrains the trading ability of ETFs. Further, as we show on Table 3, the international ETFs are associated with greater management fee ratios. In the following section, we report statistical evidence that confirm the direct relationship between tracking error and expenses.

7.4 Performance, Expenses and Risk

[6] Interestingly, we applied a single cross-sectional regression of tracking error estimations on the records of trading frequency. The coefficient of trading frequency was negative, in accordance with our assumption, but the statistical significance of the estimation was weak. So we do not report the regression's results and we can not safely conclude that the trading frequency crucially influences the magnitude of tracking error.

The influence of expenses on ETF performance is crucial. At the beginning of this section, we report the results of a single cross-sectional regression of ETF percentage return on the rate of management fees. The estimations of this regression are shown in Table 6. The results show a negative impact of expenses on performance with a regression coefficient of -0.35, statistically significant at the 1% level. This finding means that an increase of expenses per one unit results in a reduction of the return by 0.35 units.

Prior literature considers that a large part of the tracking error is due to ETF expenses. To examine the magnitude of management fees' effect on ETFs tracking error, we apply a single model of tracking error's estimations on the management fee ratio. We run the regression separately for each one of the three methods of tracking error's measurement. The results in Table 6 indicate that management fees positively affect the size of tracking error with statistical significance at the 1% or 5% level. The average regression estimation is equal to 1.15, implying that the management fees count for a large slice of ETFs tracking error.[7]

Apart from the management fees, we introduce the risk of an ETF's return as a basic determinant of management expenses. We investigate the relation among risk and fees, regressing the management fee of ETFs to the return's standard deviation. According to the results, the coefficient of risk which is statistically significant at the 1% level is equal to 0.15, implying that when the risk of an investment increases the investor bears increased administrative expenses.

In the last step, we explore the relationship between ETFs tracking error and risk by regressing the three tracking error measurements to the standard deviation of ETFs returns. According to the results, the coefficients of risks are significant at the 1% level. The average estimation of beta is 0.68, suggesting that the presence of risk affects the replication ability of ETFs.

7.5 Determinants of Volume

In this section, we present the estimations of volume determinants shown in models (7) and (8). Model (7) explores the relation between volume on the one hand and intraday ETFs volatility, number of trades and lagged return, on the other. This model is applied on a time-series basis for each ETF in the sample. Model (8) examines the cross-sectional dependence of ETFs volume on the average intraday volatility, the mean number of executed orders and the trading frequency of the entire sample's ETFs.

Table 7 exhibits the estimations of regression (7). The results reveal that the "α" coefficient is positive and statistically significant at the 1% level. Its mean value is 6.60, implying that there is a significant constant proportion of shares that are traded independently of the influence of intraday volatility, the number of trades and the lagged return. This independent trading activity reflects the great interest that investors demonstrate in allocating funds on ETF products. This investing interest is likely to arise from the trading convenience, the flexibility in executed intraday orders, the tax efficiency and the liquidity of ETFs.

The mean of the "β" coefficient of regression (7) is positive and equal to 36.15, indicating a positive influence of intraday volatility on the determination of ETFs volume. Looking at the statistical importance of the estimations, we see that a sufficient

[7] The average regression coefficient of the three regressions is approximately equal to the regression estimation when we regress the average three types of ETFs tracking error.

number of the individual "β" coefficients are positive and statistically significant at the 1%, 5% or 10% level. Further, the majority of the non-significant estimations are also positive, confirming the positive influence of volatility to volume.

In accordance with our expectations, the coefficients of the number of trades are positive and statistically significant at the 1% level. The mean of "γ" coefficient of model (7) is equal to 0.27, indicating that an increase of the executed orders by one unit, on the average, could increase ETFs volume by 0.27 units.

Concerning the lagged return's coefficient, there is no statistical evidence that the previous trading day affect the magnitude of ETFs volume. The significance of the estimations is poor, suggesting that the return does not sufficiently motivate the investors to trade on an ETF. This finding does not support the common belief that the good or bad past return influences the flows to and from an investing fund, at least in the short run. Finally, the R-square of all time-series regressions are economically significant with an overall average of 0.32 implying a good regression fit. The estimations of regression (8) are presented on Table 8. Viewing the regression results of Table 8, we see that the constant coefficient of cross-sectional model (8) is equal to 6.52 and is statistically significant at the 1% level. This value is just 8 b.p. less than the average "α" on Table 7. So, we reconfirm that there is a definite trading activity of ETFs not related to other factors but due probably to their unique trading characteristics.

Further, the coefficient of ETFs mean intraday volatility is negative but insignificant at any acceptable statistical level. In contrast to the adequately positive estimations of individual ETFs in Table 7, we relate the insignificance of the cross-sectional estimation to the fact that the intraday volatility for all ETFs on Table 8 is not entirely influential.

The statistical significance for the coefficient of the average number of trades indicates that the increase of executed orders induce the overall volume of the sample's ETFs. This finding is similar to the time-series results of Table 7 although the magnitude of estimates differs. Finally, the last determinant examined in Table 8 is the trading frequency of ETFs. The coefficient of trading frequency is equal to 0.03 and it is statistically significant at the 1% level, indicating that the percentage of trading frequency is crucial to the volume's determination.

8. Summary and Concluding Comments

Most of the literature on Exchange Traded Funds focuses on US and Canadian ETFs while some also cover the Asian and Australian ETFs. This paper focuses on a European ETF market, the Swiss ETFs.

We first investigate the percentage risk and return of Swiss ETFs in relation to the return and risk of their tracking indexes. We find that ETFs underperform their benchmarks, while they burden their investors with greater risk than the risk of standard deviation of the indexes. These disparities suggest that Swiss ETFs do not adopt full replication strategies with respect to the composition of their benchmarks. In fact, lower than unity beta estimates suggest that while ETFs are protected during bear markets, they are prevented them from a full replication of benchmark's components thus contributing to their underperformance.

Regarding the magnitude of tracking error of Swiss ETFs we find that it is substantial to an approximate average of 1.02%. The value of tracking error is

statistically significant to any acceptable level and reflects the effect of incomplete replication on indexes' composition. Further, we explore that the tracking error is positively related to the management fees and the risk of ETFs.

Regarding the impact of expenses on ETFs performance, we find that expenses influence negatively ETF investor returns. Applying regression analysis, we estimate that a one unit increase in expenses produces a deduction of ETFs return by 0.35 units. Besides, we find that the level of ETFs management fee depend on the level of ETF risk. As an example of this relationship, ETFs that track non-European indexes which face the greatest risk, also experience the higher risk and tracking error.

In other regression results we found that the volume of Swiss ETFs is positively affected by the intraday price volatility, the number of trades, and the trading frequency, meaning that an increase in these factors generates a greater volume of shares. Interestingly enough, we also denote that the lagged return of Swiss ETFs is not a crucial determinant of volume. This finding contrasts the common belief that the previous performance of an investment fund motivates the assets' movement, at least in the short run.

Overall, the empirical findings on Swiss ETFs are in line with those reported in the literature for other ETF markets. Like Elton et al (2002) we find that ETFs underperform their benchmark counterparts and that management expenses count for a big portion of ETFs tracking error. Like Kostovetsky (2003) and Frino and Galagher (2001), our estimates for tracking error are large and significant and ETFs do not fully replicate their corresponding indexes.

Furthermore, our results contribute new evidence on the interactions between performance, expenses and risk. As expected, expenses have a negative impact on performance but they themselves are positively affected by the risk of ETFs. This further suggests that the conventional ex ante positive relationship between performance and risk emerges from the subtle influence that risk exerts on administrative expenses.

Another area of contribution of this paper is in identifying the factors that determine the trading volume of ETFs. We find that a significant part of volume is due to factors unrelated to the trading activity of each ETF or its price change on the previous day. We think that this part of trading volume arises from the unique characteristics that make ETFs attractive to different types of investors. Also another interesting finding is the fact that the previous day's return is not a factor that affects today's volume, a result that is not in line to the common belief of a positive relationship between funds flows and performance.

A final note is that this paper represents the first research effort on the European markets of ETFs. Further research could focus on the major European ETFs markets like XETRA, NextTrack and London Stock Exchange. An empirical investigation of the entire universe of European listed ETFs would be useful in the comparison of ETFs with their counterparts across world markets.

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www.swx.com provides data about Swiss ETFs closing values, intraday high and low prices and the volume of the traded shares. Swiss exchange's webpage also offers data about the names of ETFs, tracking indexes and their management fee ratios.

www.djindexes.com provides data about the prices of Dow Jones indexes.

www.msci.com provides data about the capital indexes of Morgan Stanley.

www.finance.yahoo.com provides data about the non Dow Jones and Morgan Stanley indexes.

www.deutsche-boerse.com provides data about European ETFs presented on Table 1.

Table 1
European Index ETFs Market Statistics

This table presents the historical data of European ETFs turnover, growth, market share and number of ETFs. The records are calculated in yearly terms.

Panel A	**Yearly Turnover (In mils. Euros)**							
Stock Exchange	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**All Period**	**Average**
XETRA[1]	9,814.81	31,726.14	37,175.21	32,012.99	46,105.32	21,994.45	**178,828.92**	**29,804.82**
NextTrack[1]	8,912.04	32,945.92	18,629.24	13,561.65	17,890.60	8,440.34	**100,379.79**	**16,729.97**
London SX[2]	1,136.68	2,245.24	3,353.21	5,647.69	10,674.49	4,920.92	**27,978.23**	**4,663.04**
SWX[1]	981.91	2,731.10	3416.81	5113.76	6187.5	2696.32	**21,127.40**	**3,521.23**
virt-X[3]	NA	325.18	464.63	405.48	879.67	440.61	**2,515.57**	**503.11**
MTF-ETF[4]	NA	205.71	1,587.01	3,227.41	9,580.34	5,872.42	**20,472.89**	**4,094.58**
Stockholmsbörsen[5]	96.50	453.03	3,170.07	3,884.11	5,973.25	1,244.73	**14,821.69**	**2,470.28**
Wiener Börse[6]	NA	NA	NA	NA	NA	220.56	**220.56**	**220.56**
HEX[7]	NA	26.06	77.81	224.87	259.27	185.61	**773.62**	**154.72**
NASDAQ Europe[8]	NA	0.17	0.61	NA	NA	NA	**0.78**	**0.39**
Istanbul St. Exch.[9]	NA	NA	NA	NA	1,343.25	532.36	**1,875.61**	**937.81**
Oslo Bors[10]	NA	NA	NA	NA	18.78	21.22	**40.00**	**20.00**
Irish St. Exch.[11]	NA	NA	NA	NA	61.48	79.16	**140.64**	**70.32**
Iceland St. Exch.[12]	NA	NA	NA	NA	7.53	45.96	**53.49**	**26.75**
Total Market	**20,941.94**	**70,658.55**	**67,874.60**	**64,077.96**	**98,981.48**	**46,694.66**	**369,229.18**	**61.538.20**
Average	**4,188.39**	**7,850.95**	**7,541.62**	**8,009.75**	**8,248.46**	**3,591.90**	**26,373.51**	
Panel B	**Market Share (%)**							
XETRA	46.87%	44.9%	54.77%	49.96%	46.58%	47.1%	**48.43%**	**48.36%**
NextTrack	42.56%	46.63%	27.45%	21.16%	18.07%	18.08%	**27.19%**	**28.99%**
London SX	5.43%	3.18%	4.94%	8.81%	10.78%	10.54%	**7.58%**	**7.28%**
SWX	4.69%	3.87%	5.03%	7.98%	6.25%	5.77%	**5.72%**	**5.60%**
virt-X	NA	0.46%	0.68%	0.63%	0.89%	0.94%	**0.68%**	**0.72%**
MTF-ETF	NA	0.29%	2.34%	5.04%	9.68%	12.58%	**5.54%**	**5.99%**
Stockholmsbörsen	0.46%	0.64%	4.67%	6.06%	6.03%	2.67%	**4.01%**	**3.42%**
Wiener Börse	NA	NA	NA	NA	NA	0.47%	**0.06%**	**0.47%**
HEX	NA	0.04%	0.11%	0.35%	0.26%	0.4%	**0.21%**	**0.23%**
NASDAQ Europe	NA	NA	0,00%	NA	NA	NA	**0.00%**	**0.00%**
Istanbul St. Exch.	NA	NA	NA	NA	1.36%	1.14%	**0.51%**	**1.25%**
Oslo Bors	NA	NA	NA	NA	0.02%	0.05%	**0.02%**	**0.04%**
Irish St. Exch.	NA	NA	NA	NA	0.06%	0.17%	**0.04%**	**0.12%**
Iceland St. Exch.	NA	NA	NA	NA	0.01%	0.1%	**0.01%**	**0.06%**
Total Market	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
Average	**20.00%**	**12.50%**	**11.11%**	**12.50%**	**8.33%**	**7.69%**	**7.14%**	
Panel C	**Yearly Turnover Growth (%)[13]**							
XETRA	NA	223.25%	17.18%	-13.89%	44.02%	NA	**369.75%**	**67.64%**
NextTrack	NA	269.68%	-43.46%	-27.2%	31.92%	NA	**100.75%**	**57.74%**
London SX	NA	97.53%	49.35%	68.43%	89.01%	NA	**839.09%**	**76.08%**
SWX	NA	178.14%	25.11%	49.66%	21,00%	NA	**530.15%**	**68.48%**
virt-X	NA	NA	42.88%	-12.73%	116.95%	NA	**170.52%**	**49.03%**
MTF-ETF	NA	NA	671.48%	103.36%	196.84%	NA	**4,557.21%**	**323.89%**
Stockholmsbörsen	NA	369.46%	599.75%	22.52%	53.79%	NA	**1,218.51%**	**261.38%**
Wiener Börse	NA	NA	NA	NA	NA	NA	**NA**	**NA**

HEX	NA	NA	198.58%	189,00%	15.3%	NA	**894.90%**	**134.29%**
NASDAQ Europe	NA	NA	258.82%	NA	NA	NA	**258.82%**	**258.82%**
Istanbul St. Exch.	NA	NA	NA	NA	NA	NA	**NA**	**NA**
Oslo Bors	NA	NA	NA	NA	NA	NA	**NA**	**NA**
Irish St. Exch.	NA	NA	NA	NA	NA	NA	**NA**	**NA**
Iceland St. Exch.	NA	NA	NA	NA	NA	NA	**NA**	**NA**
Total Market	**NA**	**237.40%**	**-3.94%**	**-5.59%**	**54.47%**	**NA**	**372.65%**	**70.59%**
Average	**NA**	**227.61%**	**202.19%**	**47.39%**	**71.1%**	**NA**	**993.30%**	
Panel D	**Number of index ETFs[14]**							
XETRA	18	48	51	53	77	114	**NAP**	**60.17**
NextTrack	33	46	44	50	66	87	**NAP**	**54.33**
London SX	10	7	8	14	29	29	**NAP**	**16.17**
SWX	10	14	19	25	32	48	**NAP**	**24.67**
virt-X	NA	14	11	10	18	19	**NAP**	**14.40**
MTF-ETF	NA	8	13	20	30	48	**NAP**	**23.80**
Stockholmsbörsen	1	1	2	2	4	4	**NAP**	**2.33**
Wiener Börse	NA	NA	NA	NA	NA	9	**NAP**	**9.00**
HEX	NA	1	1	1	1	1	**NAP**	**1.00**
NASDAQ Europe	NA	1	NA	NA	NA	NA	**NAP**	**1.00**
Istanbul St. Exch.	NA	NA	NA	NA	1	1	**NAP**	**1.00**
Oslo Bors	NA	NA	NA	NA	2	2	**NAP**	**2.00**
Irish St. Exch.	NA	NA	NA	NA	1	1	**NAP**	**1.00**
Iceland St. Exch.	NA	NA	NA	NA	1	1	**NAP**	**1.00**
Average	**14.40**	**15.56**	**18.63**	**21.88**	**21.83**	**28.00**	**NAP**	

[1] Data available from 08/2001 to 04/2006.
[2] Data available from 08/2001. The London Stock Exchange ETFs were listed on extraMARK until 09/2002.
[3] Data available from 05/2002.
[4] Data available from 09/2002. The MTF-ETFs were listed on the Milan Stock Exchange until 08/2003.
[5] Data available from 08/2001. The Stockholmsbörsen ETFs were listed on OM SSE until 05/2003.
[6] Data available from 01/2006.
[7] Data available from 02/2006.
[8] Data available from 12/2002 to 07/2003.
[9] Data available from 01/2005.
[10] Data available from 04/2005.
[11] Data available from 05/2005.
[12] Data available from 09/2005.
[13] Yearly turnovers are calculated only for ETFs markets that have for at least one year in operation. For this reason, 2001 and 2006 were excluded from the calculations. Also, the column referred to total growth reflects the percentage difference between the first year's available turnover and 2005's turnover.
[14] The number of ETFs includes the funds that present nonzero turnover at the end of the calendar year from 2001 to 2005 or April 2006.
NA means that the available data were not sufficient to make efficient calculations.
NAP means that the summation of the yearly data is not applicable in order confusing effects about the quantity of ETFs to be avoided.

Source: Author's tabulations with data collected from the webpage of Deutsche Börse.

Table 2
Percentage Daily Return and Risk of ETFs and Indexes

This table presents the calculations of ETFs and underlying indexes' average percentage return and risk. As the column of the number of observations implies the availability of ETFs data varies, reflecting the different inception day and trading activity of each one. The table also reports the risk/return ratio, which indicates the risk of one unit of return. In our estimations of return and risk we use daily data on trading days with nonzero trading volume.

		Return		Risk		Risk/Return Ratio		Obs.
ETF Name	**Underlying Index**	**ETF**	**Index**	**ETF**	**Index**	**ETF**	**Index**	
DJ EU STOXX50 EX	DJ EU STOXX50	0.07	0.07	1.17	0.93	15.85	13.36	542
DJ STOXX 50 EX	DJ STOXX 50	0.33	0.33	1.80	1.74	5.47	5.34	101
FRESCO DJ UK 50	DJ UK 50	-0.04	-0.02	2.40	1.93	-60.32	-101.07	341
ISHARES DJ EUMICAP	DJ Euro STOXX MC	0.19	0.19	1.43	1.43	7.62	7.69	136
ISHARES EUR SM CAP	DJ Euro STOXX SC	0.23	0.23	1.68	1.38	7.28	6.03	122
ISHARES DJ EUSTOXX50	DJ EUSTOXX50	0.05	0.05	0.97	0.85	17.89	15.96	681
ISHARES DJ STOXX 50	DJ STOXX 50	0.05	0.05	0.90	0.82	17.40	16.77	589
ISHARES FTSEUROFIRST 100	FTSEurofirst 100	0.20	0.20	1.24	1.26	6.12	6.27	99
ISHARES MSCI BRAZIL	MSCI BRAZIL	-0.28	-0.17	3.48	2.97	-12.49	-17.07	43
ISHARES MSCI EMG	MSCI EMERG. MARK.	-0.24	-0.07	1.50	1.57	-6.35	-24.17	43
ISHARES MSCI EST EU	MSCI EAST. EUROPE	-0.20	0.02	2.78	2.76	-13.81	125.16	44
ISHARES MSCI JAP FD	MSCI JAPAN	0.13	0.12	1.39	1.29	10.95	10.87	214
ISHARES MSCI KOREA	MSCI KOREA	-0.11	0.08	1.55	1.54	-13.79	18.39	42
ISHARES MSCI TAIWAN	MSCI TAIWAN	-0.05	0.19	1.47	1.33	-32.44	7.05	38
ISHARES MSCI WORLD	MSCI WORLD	-0.19	-0.02	1.02	0.77	-5.32	-44.24	39
ISHARES S&P 500	S&P 500	0.02	0.03	1.05	0.72	47.73	22.30	390
LYXOR DJ EUROSTOXX50	DJ EURO STOXX 50	0.17	0.17	1.41	1.32	8.07	7.84	108
NASD100 EUR TRACK	NASDAQ 100	0.03	0.05	1.47	1.14	42.26	24.39	255
SMIEX FONDS	SMI®	0.05	0.04	1.79	1.78	36.00	43.14	534
STOXX 50 LDRS	DJ STOXX 50	-0.03	-0.06	2.47	2.23	-96.62	-39.88	289
UBS-ETF DJ INDU AVG	DJ INDU AVG	0.00	0.02	1.73	1.10	-348.71	57.53	981
UBS-ETF DJ JAPAN 100	DJ JAPAN 100	0.03	0.05	1.57	1.31	52.35	28.06	1038
UBS-ETF DJ US LG CAP	DJ US LG CAP	-0.02	0.01	2.08	1.30	-123.25	92.52	740
UBS-ETF DJ US TECH	DJ US TECH	-0.02	0.00	2.53	1.99	-111.36	868.87	902
UBS-ETF EUSTOXX50 I	DJ EURO STOXX 50	0.20	0.19	1.33	1.28	6.50	6.72	128
UBS-ETF EUSTOXX50	DJ EUSTOXX50	0.03	0.02	1.67	1.53	56.75	68.45	991
UBS-ETF FTSE 100	FTSE 100	0.05	0.04	1.12	0.80	22.17	21.20	116
UBS-ETF SMI	SMI®	0.06	0.06	0.72	0.72	11.90	12.25	618
XMTCH DJ BANKS	DJ BANKS	0.14	0.26	3.42	3.32	24.35	12.80	107
XMTCH DJ TECHNOLOGY	DJ TECHNOLOGY	0.10	0.24	2.97	2.58	30.94	10.82	225
XMTCH DJ HEALTHCARE	DJ HEALTHCARE	-0.07	0.09	2.28	1.54	-33.93	17.43	167
XMTCH MSCI Euro	MSCI EURO INDEX	0.06	0.08	1.23	1.07	19.87	12.98	903
XMTCH ON SMIM	SMIM®	0.12	0.12	0.83	0.80	6.87	6.69	372
XMTCH SBI DOM GOV3-7	SBI DOM GOV. 3-7 P	0.00	-0.01	0.24	0.11	-51.67	-14.13	502
XMTCH SBI DOM GOV 7+	SBI DOM GOV. 7+ P	0.01	0.00	0.60	0.35	50.31	-186.64	233
XMTCH SMI	SMI®	0.01	0.01	1.39	1.28	124.24	141.86	1257
Average		**0.03**	**0.07**	**1.63**	**1.41**	**-7.81**	**35.04**	**387**
Min		**-0.28**	**-0.17**	**0.24**	**0.11**	**-348.71**	**-186.64**	**38**
Max		**0.33**	**0.33**	**3.48**	**3.32**	**124.24**	**868.87**	**1257**

Table 3
Trading and expense characteristics of ETFs

This table presents the average daily trading activity of ETFs, regarding the turnover, the number of trades, the number of traded shares (volume) and the trading frequency ratio. Further, the table reports the management fee ratios, which are collected from the webpage of Swiss Stock Exchange.

ETF Name	Daily Turnover (CHF)	Trades	Volume	Manag. Fee	Trading Frequency (%)
DJ EU STOXX50 EX	379,313.12	2.78	8,044.60	0.15%	74.12
DJ STOXX 50 EX	416,007.42	1.41	9,098.87	0.50%	15.81
FRESCO DJ UK 50	373,414.84	2.09	7,975.41	NA	33.66
ISHARES DJ EUMICAP	100,716.28	1.72	1,680.74	0.40 %	43.04
ISHARES EUR SM CAP	154,810.53	2.48	4,039.66	0.40 %	38.73
ISHARES DJ EUSTOXX50	3,585,222.18	17.88	78,398.99	0.35 %	93.67
ISHARES DJ STOXX 50	778,054.99	3.96	17,148.67	0.35 %	85.61
ISHARES FTSEUROFIRST 100	323,524.71	1.81	7,583.00	0.40 %	29.20
ISHARES MSCI BRAZIL	593,635.04	7.00	14,993.09	0.74 %	86.00
ISHARES MSCI EMG	444,349.20	4.91	11,910.12	0.75 %	86.00
ISHARES MSCI EST EU	479,972.48	5.86	12,448.89	0.74 %	89.80
ISHARES MSCI JAP FD	450,505.79	5.64	26,479.26	0.59 %	67.30
ISHARES MSCI KOREA	219,656.03	2.86	5,709.60	0.74 %	84.00
ISHARES MSCI TAIWAN	281,797.29	3.55	6,882.66	0.74 %	77.55
ISHARES MSCI WORLD	148,840.30	2.82	4,060.03	0.50 %	81.25
ISHARES S&P 500	799,784.15	7.43	49,657.50	0.40 %	79.11
LYXOR DJ EUROSTOXX50	442,897.25	1.62	8,561.52	0.25 %	34.95
NASD100 EUR TRACK	1,380,557.93	2.80	29,319.16	0.20 %	59.44
SMIEX FONDS	507,246.03	3.79	8,132.65	0.50 %	44.39
STOXX 50 LDRS	1,241,113.51	3.98	34,812.83	NA	86.53
UBS-ETF DJ INDU AVG	561,613.58	3.93	2,214.29	0.50 %	85.90
UBS-ETF DJ JAPAN 100	1,499,536.44	17.08	25,898.58	0.50 %	88.04
UBS-ETF DJ US LG CAP	455,105.41	2.59	6,564.00	0.30 %	50.68
UBS-ETF DJ US TECH	320,377.84	3.79	5,476.60	0.60 %	61.87
UBS-ETF EUSTOXX50 I	1,460,025.86	2.04	26.22	0.10 %	34.22
UBS-ETF EUSTOXX50	916,004.93	7.99	19,733.08	0.30 %	95.47
UBS-ETF FTSE 100	269,954.63	3.37	2,033.34	0.50 %	88.55
UBS-ETF SMI	1,625,599.56	10.21	25,518.51	0.35 %	97.63
XMTCH DJ BANKS	57,330.00	1.54	350.17	NA	15.07
XMTCH DJ TECHNOLOGY	104,561.13	2.01	574.86	NA	31.42
XMTCH DJ HEALTHCARE	52,215.82	1.57	368.84	NA	23.42
XMTCH MSCI Euro	5,314,786.63	33.26	39,727.68	0.40 %	96.17
XMTCH ON SMIM	2,782,734.69	26.00	26,226.33	0.45 %	88.78
XMTCH SBI DOM GOV3-7	1,031,769.24	4.77	10,439.64	0.08 %	77.83
XMTCH SBI DOM GOV 7+	256,252.46	1.67	2,443.80	0.08 %	36.52
XMTCH SMI	16,976,468.29	111.02	292,162.03	0.35 %	99.13
Average	**1,299,604.32**	**8.87**	**22,408.20**	**0.33%**	**65.58**
Min	**52,215.82**	**1.41**	**26.22**	**0.08%**	**15.07**
Max	**16,976,468.29**	**111.02**	**292,162.03**	**0.75%**	**99.13**

Note: The NA term refers to ETFs that have not survived.

Table 4
Performance Regression Results

$$R_{pt} = \alpha_i + \beta_i R_{bt} + \varepsilon_{pt} \quad (4)$$

This table presents the results of performance regression. Particularly, we regress the ETF's daily return on the return of the underlying index.

ETF Name	α	t-test	β	t-test	R^2	Obs.
DJ EU STOXX50 EX	0.01	0.52	1.01*	0.39	0.62	542
DJ STOXX 50 EX	0.04	0.87	0.91*	-1.47	0.80	101
FRESCO DJ UK 50	-0.01	-0.29	0.96*	-1.00	0.59	341
ISHARES DJ EUMICAP	0.01	0.50	0.95*	-1.76	0.88	136
ISHARES EUR SM CAP	-0.03	-0.78	1.05*	1.22	0.79	122
ISHARES DJ EUSTOXX50	0.00	0.06	1.01*	0.51	0.75	681
ISHARES DJ STOXX 50	0.01	0.49	0.90*	-3.85	0.58	589
ISHARES FTSEUROFIRST 100	0.02	0.64	0.92*	-1.43	0.70	99
ISHARES MSCI BRAZIL	-0.08	-0.41	0.88*	-1.42	0.48	43
ISHARES MSCI EMG	-0.19***	-1.87	0.72*	-3.34	0.64	43
ISHARES MSCI EST EU	-0.22	-1.33	0.93*	-1.14	0.84	44
ISHARES MSCI JAP FD	0.06	0.98	0.68*	-5.84	0.42	214
ISHARES MSCI KOREA	-0.17	-0.99	0.71*	-2.55	0.49	42
ISHARES MSCI TAIWAN	-0.21	-1.32	0.85*	-1.28	0.59	38
ISHARES MSCI WORLD	-0.18	-1.28	0.71*	-1.56	0.28	39
ISHARES S&P 500	0.01	0.29	0.32*	-8.42	0.52	390
LYXOR DJ EUROSTOXX50	0.01	0.35	1.03*	0.67	0.79	108
NASD100 EUR TRACK	0.00	0.03	0.71*	-4.33	0.29	255
SMIEX FONDS	0.01	1.04	0.96*	-1.87	0.78	534
STOXX 50 LDRS	0.03***	1.81	1.01*	0.43	0.77	289
UBS-ETF DJ INDU AVG	-0.02	-0.73	0.76*	-4.70	0.21	981
UBS-ETF DJ JAPAN 100	-0.04	-0.71	1.06*	1.59	0.84	1038
UBS-ETF DJ US LG CAP	-0.03	-0.81	0.80*	-2.98	0.26	740
UBS-ETF DJ US TECH	-0.03	-0.84	0.81*	-3.87	0.31	902
UBS-ETF EUSTOXX50 I	0.07	1.07	0.63*	-3.43	0.34	128
UBS-ETF EUSTOXX50	0.01	1.00	1.02*	1.16	0.76	991
UBS-ETF FTSE 100	0.02	0.63	0.82*	-2.54	0.59	116
UBS-ETF SMI	0.01	1.29	0.92*	-4.75	0.79	618
XMTCH DJ BANKS	-0.07	-0.66	0.88*	-1.63	0.79	107
XMTCH DJ TECHNOLOGY	-0.10	-1.01	0.84*	-3.01	0.48	225
XMTCH DJ HEALTHCARE	-0.14	-1.43	0.76*	-1.99	0.33	167
XMTCH MSCI Euro	-0.01	-0.29	0.84*	-4.52	0.53	903
XMTCH ON SMIM	0.00	0.49	1.00*	0.00	0.91	372
XMTCH SBI DOM GOV3-7	0.04	0.73	1.08*	1.15	0.35	502
XMTCH SBI DOM GOV 7+	0.01	0.90	1.09*	0.87	0.40	233
XMTCH SMI	0.00	0.42	0.97*	-0.78	0.81	1257
Average	**-0.03**	**-0.02**	**0.88**	**-1.87**	**0.59**	**386.94**
t-test	**-2.48****		**-7.59***		**-11.77***	

Note: The t-tests of the entire alpha and beta columns test the hypothesis whether the average alpha and beta are statistically different from zero and unity respectively. The t-test for R^2 column reflects the possibility the average R^2 to be statistically different from unity.
*Statistical significant at the 1% level. ***Statistical significant at the 10% level.

Table 5
Tracking Error Estimates

This table presents the estimations of Tracking Error, which reflects the deviation between the return of ETFs and their underlying indexes. We apply three distinct methods in tracking error estimating, labeling them as TE_1, TE_2, and TE_3.

ETF Name	TE_1	TE_2	TE_3	Average $TE_{(1+2+3)}$	Obs.
DJ EU STOXX50 EX	0.72	0.60	0.89	0.74	542
DJ STOXX 50 EX	0.81	0.70	0.80	0.77	101
FRESCO DJ UK 50	1.56	1.26	1.73	1.52	341
ISHARES DJ EUMICAP	0.51	0.44	0.60	0.52	136
ISHARES EUR SM CAP	0.79	0.62	0.88	0.76	122
ISHARES DJ EUSTOXX50	0.49	0.39	0.55	0.48	681
ISHARES DJ STOXX 50	0.58	0.50	0.67	0.58	589
ISHARES FTSEUROFIRST 100	0.70	0.64	0.84	0.73	99
ISHARES MSCI BRAZIL	2.69	2.05	3.14	2.63	43
ISHARES MSCI EMG	0.95	0.76	1.09	0.93	43
ISHARES MSCI EST EU	1.11	0.90	1.11	1.04	44
ISHARES MSCI JAP FD	1.06	0.88	1.20	1.05	214
ISHARES MSCI KOREA	1.12	0.92	1.20	1.08	42
ISHARES MSCI TAIWAN	0.95	0.83	0.96	0.91	38
ISHARES MSCI WORLD	0.88	0.69	0.90	0.82	39
ISHARES S&P 500	1.03	0.95	1.22	1.07	390
LYXOR DJ EUROSTOXX50	0.66	0.58	0.79	0.68	108
NASD100 EUR TRACK	1.24	1.10	1.40	1.25	255
SMIEX FONDS	0.82	0.70	1.10	0.87	534
STOXX 50 LDRS	1.21	1.15	1.52	1.29	289
UBS-ETF DJ INDU AVG	1.54	1.28	1.78	1.53	981
UBS-ETF DJ JAPAN 100	0.81	0.74	0.96	0.84	1038
UBS-ETF DJ US LG CAP	1.80	1.39	1.99	1.73	740
UBS-ETF DJ US TECH	2.11	1.74	2.59	2.15	902
UBS-ETF EUSTOXX50 I	1.07	0.87	1.25	1.06	128
UBS-ETF EUSTOXX50	0.81	0.71	0.97	0.83	991
UBS-ETF FTSE 100	0.74	0.71	0.93	0.79	116
UBS-ETF SMI	0.33	0.30	0.41	0.35	618
XMTCH DJ BANKS	1.60	1.36	1.75	1.57	107
XMTCH DJ TECHNOLOGY	2.13	1.91	2.44	2.16	225
XMTCH DJ HEALTHCARE	1.89	1.67	2.08	1.88	167
XMTCH MSCI Euro	0.86	0.68	0.90	0.81	903
XMTCH ON SMIM	0.26	0.25	0.33	0.28	372
XMTCH SBI DOM GOV3-7	0.19	0.08	0.20	0.16	502
XMTCH SBI DOM GOV 7+	0.47	0.24	0.51	0.41	233
XMTCH SMI	0.60	0.28	0.78	0.55	1257
Average	**1.03**	**0.86**	**1.18**	**1.02**	**386.94**
Min	**0.19**	**0.08**	**0.20**	**0.16**	**38**
Max	**2.69**	**2.05**	**3.14**	**2.63**	**1,257**

Note: TE_1 refers to the standard errors of regression (4). TE_2 is the average of the absolute return difference between ETF and index. TE_3 is the standard deviation of the return difference between ETF and index.

Table 6

Performance, Tracking Error, Risk and Management Fees of ETFs

This table presents the estimations of various cross section regressions between return, tracking error, risk, and management fees of ETFs.

Estimated Model	α	T-Test	β	t-Test	R^2	Number of funds
$R_i = \alpha_i + \beta_i MF_i + \varepsilon_i$	0.18*	3.42	-0.35*	-3.08	0.25	31
$TE_{1i} = \alpha_i + \beta_i MF_i + \varepsilon_i$	0.42***	2.03	1.18**	2.63	0.19	31
$TE_{2i} = \alpha_i + \beta_i MF_i + \varepsilon_i$	0.33***	1.99	1.00*	2.82	0.22	31
$TE_{3i} = \alpha_i + \beta_i MF_i + \varepsilon_i$	0.52**	2.09	1.28**	2.40	0.17	31
Average	**0.42**	**2.04**	**1.15**	**2.62**	**0.19**	**31**
$MF_i = \alpha_i + \beta_i RISK_i + \varepsilon_i$	0.22*	2.84	0.15*	3.44	0.46	31
$TE_{1i} = \alpha_i + \beta_i RISK_i + \varepsilon_i$	-0.08	-0.53	0.69*	5.84	0.70	31
$TE_{2i} = \alpha_i + \beta_i RISK_i + \varepsilon_i$	-0.04	-0.34	0.55*	6.34	0.68	31
$TE_{3i} = \alpha_i + \beta_i RISK_i + \varepsilon_i$	-0.09	-0.49	0.79*	5.04	0.68	31
Average	**-0.07**	**-0.45**	**0.68**	**5.74**	**0.69**	**31**

Note:
R is the average daily return of ETFs.
MF represents the management fee ratio of ETFs.
TE_1 refers to the standard errors of regression (4).
TE_2 is the average of the absolute return difference between ETF and index.
TE_3 is the standard deviation of the return difference between ETF and index.
Risk is the standard deviation of daily returns.
*Statistical significant at the 1% level. **Statistical significant at the 5% level. ***Statistical significant at the 10% level.

Table 7
The Determinants of Volume – Time Series Analysis

$$\mathrm{LnV_i} = \alpha_i + \beta_i \frac{DH_i - DL_i}{IC_i}{}_i + \gamma_i \mathrm{TR_i} + \delta_i \mathrm{LagRet_i} + \varepsilon_i \quad (7)$$

This table presents the results of the time series regression which analyzes the factors that affect the volume of each ETF.

ETF Name	α	t-Test	β	t-Test	γ	t-Test	δ	t-Test	R^2	Obs.
DJ EU STOX50 EX	6.08*	40.72	109.08*	4.29	0.35*	5.16	0.03	0.62	0.35	542
DJ STOXX 50 EX	6.30*	18.56	-179.14	-0.29	0.79*	3.29	-0.04	-0.30	0.19	101
FRESCO DJ UK 50	6.04*	30.08	36.45**	2.17	0.35*	3.76	-0.05	-1.00	0.19	341
ISHARE DJ EUMIC	4.96*	23.20	-68.86	-1.05	0.92*	7.01	-0.02	-0.26	0.35	136
ISHARES EUR SMC	5.98*	33.00	179.71*	3.08	0.22*	5.43	-0.04	-0.40	0.33	122
iSHARE DJ EU50	9.72*	98.62	70.40*	7.21	0.01*	2.93	0.05	1.23	0.12	681
ISHARES DJ STO50	7.36*	45.47	38.7***	1.82	0.24*	4.95	0.04	0.67	0.31	589
iSHARE FTSEU100	7.96*	17.03	105.38	1.37	-0.20	-0.95	0.30***	1.96	0.13	99
ISHARES MSCI BR	6.96*	15.05	-2.31	-0.15	0.26*	4.77	0.00	-0.02	0.60	43
ISHARES MSCI EM	6.76*	19.56	31.27	0.73	0.24*	3.30	-0.01	-0.09	0.39	43
ISHARES MSCI EA	7.33*	32.31	4.07	0.58	0.25*	6.64	0.05	1.10	0.62	44
ISHARES MSCI JAP	8.14*	47.90	51.39*	2.61	0.17*	6.43	0.03	0.63	0.48	214
ISHARES MSCI KO	6.13*	15.66	34.57	0.89	0.49*	3.96	-0.03	-0.21	0.37	42
ISHARES MSCI TAI	6.47*	13.15	56.59	1.11	0.34*	3.20	0.02	0.12	0.37	38
ISHARES MSCI W	5.66*	26.77	128.1**	2.63	0.39*	6.82	0.19	1.37	0.72	39
ISHARES S&P 500	8.21*	53.19	266.69*	7.70	0.02***	1.76	0.07	0.73	0.34	390
LYXOR DJ EUST50	5.11*	15.69	53.69	0.78	1.06*	6.05	-0.05	-0.33	0.34	108
NASD100 EUR TRA	6.31*	27.55	23.55	0.70	0.72*	10.56	0.00	0.02	0.40	255
SMIEX FONDS	6.96*	56.92	93.388*	4.90	0.04*	4.35	-0.03	-0.52	0.14	534
STOXX 50 LDRS	7.60*	37.16	33.41*	2.78	0.15*	2.68	0.01	0.15	0.30	289
UBS-ETF DJ IN AV	6.84*	49.88	21.34**	2.41	0.00	-0.14	-0.03	-0.99	0.08	981
UBS-ETF DJ JA 100	6.19*	24.21	1.50	0.05	0.35*	4.13	-0.08	-1.33	0.37	1038
UBS-ETF DJ US LC	5.84*	48.18	14.68	1.27	0.38*	8.85	-0.04	-1.00	0.28	740
UBS-ETF DJ US TE	6.23*	69.80	27.89*	4.05	0.23*	8.76	0.01	0.38	0.38	902
UBS-ETF EUST50 I	1.73*	12.08	39.98	0.89	0.10*	3.37	-0.25**	-2.52	0.18	128
UBS-ETF EUSTO50	7.76*	65.71	4.16	0.92	0.14*	13.43	0.03	1.32	0.33	991
UBS-ETF FTSE 100	4.79*	20.49	52.7***	1.94	0.35*	5.23	0.00	-0.03	0.36	116
UBS-ETF SMI	8.22*	57.96	-5.40	-0.65	0.10*	10.19	-0.10	-1.52	0.26	618
XMTCH DJ BANKS	5.59*	19.03	-13.97	-0.46	-0.46**	-2.45	-0.03	-0.73	0.11	107
XMTCH DJ TECH	4.62*	32.63	26.73**	2.19	0.25*	4.99	0.00	0.12	0.27	225
XMTCH DJ HEAL	4.11*	23.38	-25.55	-1.09	0.61*	5.15	0.02	0.44	0.19	167
XMTCH MSCI Euro	8.15*	49.60	4.89	0.97	0.04*	10.85	-0.02	-0.46	0.36	903
XMTCH ON SMIM	9.31*	66.53	11.33	1.02	0.01***	1.84	0.08	1.31	0.11	372
XMTCH SBI GO3-7	6.33*	37.97	68.23	0.78	0.22*	6.98	-0.32	-1.02	0.27	502
XMTCH SBI GO 7+	4.96*	24.73	6.46	0.12	0.68*	6.15	-0.25	-1.37	0.18	233
XMTCH SMI	10.88*	114.91	0.26	0.10	0.01*	18.91	-0.02	-1.64	0.57	1257
Average	**6.60**	**38.46**	**36.15**	**1.62**	**0.27**	**5.51**	**-0.01**	**-0.10**	**0.32**	**387**

Note: $\mathrm{LnV_i}$ is the natural logarithm of the daily shares volume of $\mathrm{ETF_i}$.
$\mathrm{DH_i}$ is the daily intraday high price of $\mathrm{ETF_i}$, $\mathrm{DL_i}$ is the daily intraday low price of $\mathrm{ETF_i}$.
$\mathrm{IC_i}$ is the daily closing price of $\mathrm{ETF_i}$, $\mathrm{TR_i}$ is the daily number of trades of $\mathrm{ETF_i}$.
$\mathrm{LagRet_i}$ is the one-lagged return of $\mathrm{ETF_i}$.
*Statistically significant at the 1% level. **Statistically significant at the 5% level. ***Statistically significant at the 10% level.

Table 8
The Determinants of Volume – Cross-sectional Analysis

$$LnV_i = \alpha_i + \beta_i \frac{DH_i - DL_i}{IC_i}{}_i + \gamma\, TR_i + \delta\, FREQ_i + \varepsilon_i \quad (8)$$

This table presents the results of the cross-sectional regression, which combines the factors that affect the average volume of the sample's ETFs.

Variable	Coefficient	t-Test
Constant	6.52*	10.99
ETFs Volatility	-23.82	-0.31
Number of Trades	0.03**	2.19
Trading Frequency	0.03*	3.11
R^2	0.48	
Obs.	36	

Note:
LnV_i is the natural logarithm of the daily shares volume of ETF_i.
DH_i is the average daily intraday high price of ETF_i.
DL_i is the average daily intraday low price of ETF_i.
IC is the average daily closing price of ETF_i.
TR_i is the daily number of trades of ETF_i.
$FREQ_i$ is the percentage trading frequency of ETF_i, which is expressed by the rate of trading days of an ETF to the trading days of its benchmark index.
*Statistically significant at the 1% level. **Statistically significant at the 5% level.