The Liquidity Effects of Revisions to the CAC40 Stock Index.

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Abstract:

This paper explores liquidity effects following CAC40 index revisions over the time period 1997-2001. We find evidence of a sustained increase (decrease) in the liquidity of the added (deleted) stocks. Furthermore, the improvement (reduction) in the liquidity of the stocks is due to a decrease (increase) in the direct cost of trading as opposed to a reduction (enhancement) in the asymmetric information cost of transacting. The empirical findings support the information cost, liquidity explanation. This is because investors demand a smaller (larger) risk premium for investing in stocks with more (less) available information.

JEL Classifications: G10, G14.

Keywords: Stock Index Revisions, Bid-Ask Spreads, Liquidity Effects.

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1. Introduction

The Efficient Market Hypothesis predicts that stock prices reflect all publicly available information. This implies that an investor can trade large quantities of stock at the market price as long as they do not possess any private information. This statement assumes that stocks are near perfect substitutes for each other. If this assumption is valid then the excess demand for a single security will be highly elastic, and the trading of large quantities of shares will have no impact on the price. Therefore, the Efficient Market Hypothesis predicts the stock prices are independent of whether they are listed in some index or not. This is because a stock's inclusion in (or deletion from) a stock index is an event that should be dependant on information that is public at the time.

The purpose of this paper is to provide a comprehensive analysis of changes in the liquidity of stocks as they enter (and exit) the CAC40 stock index. The French indices are of particular interest because listing changes are announced approximately four weeks before the effective date whereas revisions to the Standard and Poor (S&P) stock index are only announced on the effective day. This suggests that market liquidity effects are more pronounced in the French stock market because the longer time interval between the announcement and the effective days, the greater the demand for securities by risk arbitrageurs (Beneish and Whaley (1996)).

Vespro (2006) observes that the addition (deletion) of a stock to (from) the CAC40 index leads to larger trading volume, which, in turn leads to an improvement in the stock's liquidity. The problem with the Vespro (2006) study is that liquidity costs are encapsulated without investigating the behaviour of the bid-ask spread surrounding index revisions. Market microstructure literature shows that the bid-ask spread can be decomposed into two components: the direct cost and the asymmetric information cost of trading.

The empirical evidence on the direct cost of trading at the time of public information announcements is rather mixed. It is usually observed that during public announcements there is higher trading volume and higher volatility (Lee et al. (1993)). Increased volatility exposes the market maker to a greater risk from holding an undiversified portfolio, causing the market maker to increase the bid-ask spread. However, with higher trading volume the market maker has economies of scale, which should result in the bid-ask spread decreasing (Copeland and Galai (1983)).

Kim and Verrecchia (1994) show in a theoretical framework that during the time period surrounding public announcements, the market maker is faced with an increasing variety of opinion expressed by analysts who follow a particular stock (and therefore are seen as informed traders), realising that he will be facing an increasing number of informed traders. Therefore, in order for the market makers to protect himself against the informed traders entering the market and trading in order to realise their information advantage, the market maker protects himself by reducing the liquidity of the stock. This is achieved by increasing the asymmetric information cost component of the bid-ask spread.

In this study, we examine the directional change in the total bid-ask spread, which depends upon the relative magnitudes of the changes in the order processing, inventory and asymmetric cost components of the bid-ask spread in the period surrounding index revisions. For robustness we implement two alternative measures of liquidity costs, the relative and effective bid-ask spread. The relative spread is defined as the ask price minus the bid price, divided by the midprice (the average of the bid and ask prices). As Lee and Ready (1991) point out the problem with the relative spread is that it can be regarded as an inaccurate measure of liquidity because many trades occur at prices within the bid and ask price. Therefore, in order to obtain a more accurate measure of the market liquidity, we follow the methodology in Heflin and Shaw (2000) and Hegde and McDermott (2003) and compute the effective bid-ask spread. The effective bid-ask spread is computed as twice the absolute value of the difference between the transaction price and the midprice in effect at the time of the trade. Based on these more refined and comprehensive liquidity measures, we find that bid-ask spreads significant decrease (increase) after firms are added to (deleted from) the index. The changes in the liquidity of index revisions persist even after controlling for the effects of changes in stock prices, trading volume and the volatility of returns.

Finally, we inspect whether the improvement (decline) in liquidity is due to a reduction (enhancement) in the direct or the asymmetric cost of trading or both. Our empirical estimates, obtained from the Madhavan et al (1997) bid-ask spread decomposition model, show a significant decline (rise) in the direct cost of trading and no significant change in the asymmetric information cost of trading from the pre to post index revision period.

The rest of the paper is organized in the following way. In the following section, we discuss the previous literature concerning index revisions in both US and European equity markets. Section 3 provides details of the data used to examine the compositional changes in the CAC40 stock index. Section 4 outlines the methodology and presents the empirical results. The conclusions of the study are in Section 5.

2. Previous Literature

The stock price and trading volume reaction to changes in the categorisation of a firm, as part of a well known index has been the subject of empirical research over the last three decades that can be summarized by the following various explanations. Haris and Gurel (1986) find evidence of the price pressure hypothesis for the S&P 500 index, which predicts a temporary rise (fall) in the stock price and trading volume due to index fund purchases (sales) of the added (deleted) security. Vespro (2006) also finds evidence supporting the price pressure hypothesis associated with index fund rebalances for the CAC40 and SBF120 stock indices as well as the FTSE 100 index over the time period, 1997-2001.

However, Shleifer (1986) Dhillon and Johnson (1991) and Beneish and Whaley (1996) find that there is a permanent change in price and trading volume of S&P 500 index revisions. They attribute these findings to the imperfect substitutes hypothesis of Scholes (1972) and Shleifer (1986). Under this hypothesis securities are not close substitutes for each other, and hence, the long term demand is less than perfectly elastic. Equilibrium prices change when demand curves shift, due to entry and exit of firms to eliminate excess demand. Price and trading volume changes are permanent because they reflect a new equilibrium distribution of security holders.

The final explanation is the information cost and liquidity hypothesis. This hypothesis states that listing conveys information to the market thus increasing the attractiveness of the stock. When a firm is added to an index, this is expected to increase trading volume making the added stock more liquid and the expectations of this benefit account for the price increase. The expected increase in liquidity is as a result of listed firms receiving more attention by analysts and investors, resulting in lower bid-ask spreads. The opposite is true for firms deleted from the index. Therefore the observed price reaction is an inverse function of the bid-ask spread following listing/delisting. Erwin and Miller (1998) and Hegde and McDermott (2003) find evidence of the information cost and liquidity hypothesis for the S&P 500 index. Beneish and Gardner (1995) find further support of the information cost and liquidity hypothesis for firms removed from the Dow Jones Industrial Average stock index. In addition, the empirical findings by Gregoriou and Ioannidis (2006) are consistent with the information cost and liquidity explanation for FTSE 100 firms over the time period, 1984-2001. This is because investors hold (sell) stocks with more (less) available information, implying that they have lower (higher) trading costs.

3. Data

Data for the additions to (deletions from) the CAC40 stock index from the period of January 1997 until January 2001 were obtained from Datastream. The CAC40 index represents the 40 largest companies listed on the French stock market based on market value and liquidity. The announcement dates, i.e. the dates on which the market learned about the compositional change, were obtained via the French Bourse ('Notices and Decisions') website. There were 23 additions to and 20 removals from the CAC40 index during our sample period. We use the sample period as Vespro (2006) in order to obtain a direct comparison of the empirical results. Our final dataset consists of stock market revisions that satisfied the following criteria:

a) The company is not involved in a merger that immediately preceded the revision date.

b) The company has available historical data on the Paris Bourse indices for a period of 90 days before and after the revision date.

c) The common stock of a company does not exhibit a split in the period of 90 days before and after the revision date.

Criteria (a)-(c) are applied to minimize the impact of alternative events that may occur during the same time period. For these companies, daily stock returns, daily trading volume and daily ask and bid prices are obtained from the Paris Bourse stock exchange.

4. Methodology and Empirical Results

(a) Long Term Liquidity Analysis

In order to analyze the impact of stock index revisions on the short term liquidity of Paris Bourse stocks, we construct ratios of the daily average quoted, relative and effective bid-ask spreads over various time interval event windows in the pre and post index revision trading period. The relative bid-ask spread computed as the ask price minus the bid price divided by the midprice, is constructed because this measure of spread encapsulates the economic significance of the spread to the market-maker, (Branch and Feed, 1977). However, as pointed out by Lee and Ready (1991) the relative bid-ask spread has two potential shortcomings. First, it overstates the trading costs of a stock because it fails to account for the tendency of prices to rise following a purchase and fall following a sale. Second, it can be argued that the relative bid-ask spread is an inappropriate measure of stock liquidity due to the fact that trades frequently occur within the ask and bid prices. In our dataset, for instance, approximately 33% of trades occur within the midprice.

Therefore, in order to account for these two shortcomings we also compute the effective bid-ask spread, defined as twice the absolute value of the difference between the trade price and the prevailing midprice. There is however a potential problem with the use of either the relative or the effective bid-ask spread. The problem is that both measures of bid-ask spread will automatically increase, due to the increase in the midprice after the index revisions, witnessed in Vespro (2006). Therefore, for completeness we also compute the quoted bid ask spread defined as the ask price minus the bid price, pre and post the index revision period.

In order to provide a comparison of the liquidity of CAC40 stocks pre and post index revision, we construct ratios of daily relative, effective and quoted bid-ask spreads over various event time intervals to their equivalents in the pre revision period over trading days [0, -90]. The results of the changes in liquidity of CAC40 index stocks pre and post index revision trading can be seen in Table 1. There is clear evidence from Table 1 that spreads are significantly reduced (increased) after index additions (deletions). For example, in the [-5, +5] event window the mean and median quoted bid-ask spread ratios for additions (deletions) are 0.80 (1.12) and are highly significant. This indicates that spreads are significantly reduced (increased) over the 11 trading day period centred on the day of the index addition (deletion). For the relative and effective bid-ask spreads over the same event window, the decline (enhancement) is more pronounced given the higher (lower) stock price of the firms' (midprice) displayed in Table 2 on page 111 (113) of the Vespro (2006) study, as a result of index additions (deletions).

The significant spread reductions (enlargements) as a result of CAC40 additions (deletions) over the longer event time intervals such as, [0, +60] and [0, +90] indicate that the reduction (growth) in bid-ask spreads is permanent. This implies that the change in liquidity of the CAC40 stock index as a result of compositional change is permanent.

[INSERT TABLE 1 HERE]

(b) Multivariate Analysis of Long-Term Changes in Market Liquidity

It is possible that the univariate analysis undertaken thus far in the study are based on factors unrelated to the compositional changes in the CAC40 stock index. To control for these external factors and improve the power of the econometric analysis, we perform multivariate analysis of the bid-ask spread. The multivariate analysis is undertaken in the form of a panel fixed effects estimator. Gregoriou et al, (2005) report that the bid-ask spread increases with return volatility and decreases with stock price and trading volume, in the London Stock Exchange.[1] We estimate the following log-linear fixed effects model where the regression parameters represent elasticities:

$$Liquidity_{jt} = \alpha_j + \beta_1 D_t + \beta_2 Volume_{jt} + \beta_3 (Volume_{jt} * D_t) + \beta_4 \Pr ice_{jt} + \beta_5 StDev_{jt} + \varepsilon_{jt}$$

$$\text{for } t = 1, 2. \qquad (1)$$

Where t=1 corresponds to the pre compositional change period in the CAC40 stock index, [0, -90], and t=2 corresponds to the post compositional change period, [0, +90]. The dependant variable, $Liquidity_{jt}$ corresponds to either the quoted, relative or effective bid-ask spread for stock j at time period t. $Volume$, $\Pr ice$ and $StDev$

[1] Atkins and Dyl (1997) report a similar relationship for the NYSE and the NASDAQ.

represent the traded volume in shares, closing price and return volatility for stock j at time period t. The dummy variable, D_t is equal to 1 in the post index revision period and is equal to 0, otherwise. α_j captures the time-invariant unobserved stock-specific fixed effects. The fixed-effect is accounting for differences in the initial level of liquidity of each security in our sample.

We are mainly concerned with the change in the dummy variable, β_1, and the change in the slope of trading volume as a result of compositional change, β_3. All variables apart from the dummy, D_t, are expressed as natural logarithms.[2]

The fixed effects panel estimator, displayed in equation (1) can be estimated with the use of Ordinary Least Squares (OLS). The problem of OLS is that it does not account for the presence of endogeneity between trading volume, stock price and return volatility.[3] In order to capture endogeneity we use the Generalized Method of Moments (GMM) panel estimator. The GMM estimator established by Arellano and Bond (1991) specifies a dynamic panel model in first differences which uses internal instruments for each time period to deal with endogeneity. Therefore, the lagged (one time period or more) levels of endogenous and weakly endogenous variables of the model become appropriate instruments for addressing endogeneity. The single GMM panel estimator provides consistent coefficient estimates.

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[2] We could also include the number of analysts as an additional explanatory variable in equation (1) This variable has not been included in equation (1) because analysts' forecasts are only available on a monthly frequency, whereas all other explanatory variables are available on a daily basis. The small number of observations on the number of analysts' forecasts may result in large jumps in the data causing inaccurate results for this variable.

[3] We perform a Hausman (1978) test for the hypothesis that the explanatory variables are strictly exogenous. In our empirical estimates, the Hausman (1978) test rejects the null hypothesis at all conventional significance levels. This leads to the conclusion that we have to tackle the econometric issue of endogeneity for our explanatory variables. The result of the Hausman (1978) test is not reported by the authors but is available upon request.

The panel estimations of equation (1) with the use of GMM are displayed in Table 2. The first thing to report is that the panels pass all the relevant diagnostic tests. The fixed effect of the panels are significant with a p-value of zero, suggesting that the differences in the initial levels of liquidity of the stocks in our sample are successful captured by the panel estimator. The tests for first order residual serial correlation are insignificant, suggesting that the panels do not suffer from autocorrelation.[4] The residuals of the panels are also normally distributed signalling that the results of the panel are not due to outliers in the data. Finally the results of the Sargan test confirms the validity of the instruments in the GMM model.

The high R^2 values indicate that a significant proportion of the variation in market liquidity is accounted for in all the econometric models. The variables Price, Volume and Stdev have the predicted signs and are highly significant. A more important result is that the parameter β_1 is statistically significant whereas, the parameter β_3 is insignificant. The significance of D_t shows that as a result of index additions (deletions) the effective bid-ask spread decreases (increases) on average by 16.25% (18.25%) in the CAC40 stock index, after controlling for the impact of trading volume, share prices and volatility. Also, the insignificance of the $\left(Volume_{jt} * D_t\right)$ interaction term signals that the increase in trading volume for both additions and deletions is maintained in the compositional change period.[5]

From our findings we observe that compositional changes in the CAC40 stock index have changed trading volume and stock price liquidity permanently. This finding

[4] The serial correlation test on the GMM is undertaken on the first difference of the residuals due to the transformations involved.
[5] We re-estimated equation (1) with the GMM panel estimator using 2,3 and 4 lags of the endogenous variables as instruments. The results displayed in Table 2 do not change and are available upon request.

holds in a multivariate framework even when the impact of share prices, trading volume and volatility of the stocks has been accounted for.[6]

[INSERT TABLE 2 HERE]

(iii) Changes in direct and asymmetric information costs after index revisions

In this section of the paper we partition the total effective bid-ask spread into informed trading and liquidity motivating trading. We employ the Madhavan et al (1997), hereafter denoted as MRR spread decomposition model to isolate temporary and permanent changes in transaction prices around the event period. Liquidity-motivated trades reflect on temporary transaction changes that bounce between the ask and bid prices around the event period. Therefore, the temporary changes in transaction prices reveal direct costs of supplying liquidity unrelated to information, such as the inventory and order processing cost components of the effective bid-ask spread. On the other hand, trades made by informed traders will be correlated with future changes in transaction prices, causing permanent transaction price changes.

Therefore, the information asymmetric costs component of the effective bid-ask spread reflects permanent price changes around the event period. Our objective is to determine whether the permanent changes in liquidity in the CAC40 stock index as a result of compositional changes is due to a change in the direct cost of trading, (the order processing and inventory cost components of the bid-ask spread) or due to a change in the informed cost component of the bid-ask spread or both. We decompose

[6] It can be argued that all the endogenous variables displayed in equation (1) are jointly determined. If this was the case we should have estimated the panel in the context of the GMM system estimator established in Blundell and Bond (1998). For robustness we estimated equation (1) using a GMM system. The results displayed in Table 2 remain quantitatively similar when we apply the system estimator. These results are not reported but are available upon request.

the total effective bid-ask spread into components of information asymmetry and direct costs of trading by estimating the following regression model,

$$\Delta p_{it} = \alpha \ + \left(\psi + \lambda\right) Q_{it} - \left(\psi + \rho\lambda\right) Q_{it-1} + \mu_{it} \tag{2}$$

Where Δ denotes a change for the stock price for firm i at time period t. ψ is the is the direct transaction cost in setting a quote, λ is the anticipated price effect of an incoming trade, ρ is the first order auto-correlation of p_{it}, and stock trades can take place within the quotes with probability θ, Q_{it} and Q_{it-1} equals 1 (-1) if the trade for firm i at time t and t-1 was a sell (buy). The constant, α represents constant drift for stock prices, and μ_{it} is a random error term. As pointed out by MRR, the parameter vector $\left(\alpha, \psi, \lambda, \rho, \theta\right)$ can be estimated using the GMM proposed by Hansen (1982). The model has the following five moment conditions:

$$E\left[Q_{it}Q_{it-1} - Q^2{}_{it}\, p\right] = 0,\ E\left[\left|Q_{it}\right| - (1-\theta)\right] = 0,\ \ E\left[\Delta p_{it} - \alpha\right] = 0,$$
$$E\left[(\Delta p_{it} - \alpha)Q_{it}\right] = 0,\ \ E\left[(\Delta p_{it} - \alpha)Q_{it-1}\right] = 0 \tag{3}$$

The first moment condition defines the first order autocorrelation function in stock prices for firm i, the second defines the probability of a midprice transaction for company i, the third defines the expectation of the drift term as the average pricing error for firm i, and the last two are the normal equations in OLS estimation for firm i. In GMM estimation, the parameter vector is chosen so that the sample moments most closely approximates the population moments according to a specified weighting matrix. Since the system is just-identified, the choice of weighted matrix is irrelevant. Hansen (1982) shows that the GMM estimates of the parameter vector are consistent and asymptotically normally distributed. In the MRR model the quoted spread is given by $2(\psi_{MRR} + \lambda_{MRR})$ and the effective spread by $\left(1-\theta\right)2(\psi_{MRR} + \lambda_{MRR})$.

Dividing the absolute direct cost parameter by the average daily closing price $\left(p_{it}\right)$ yields the relative direct $\left(\psi / p\right)$ cost parameter. The relative asymmetric information cost parameter is $\left(\lambda / p\right)$.

The results displayed in Table 3 show a significant decline (rise) in the relative direct cost of transacting in both the short and long term, after index additions (deletions) in the CAC40 stock index. For instance, the mean Post/Pre ratio of the relative direct cost of transacting for the CAC40 stock index is 0.73 (1.08) over the event window [-5, 5], showing short term decreases (increases) in the cost of trading as a result of index additions (deletions). Furthermore, post index compositional changes trading over a duration of 90 trading days (event window, [0, +90]) results in a mean Post/Pre ratio of the relative direct cost of trading of 0.90 (1.05) for index additions (deletions). The significant reduction (increase) in the relative direct cost of trading 3 months after the announcement of the news, signals long term decreases (increases) in relative direct costs of trading caused by index compositional changes.

The results based on relative asymmetric information costs of transacting reveal no significant changes as a result of compositional changes in the CAC40 stock index in both the short and long term. This suggests that index revisions have no significant impact on relative information asymmetric costs.

This empirical finding suggests that the increase (decrease) in the proportion of uniformed index traders dominates the decrease (increase) in the volatility of liquidity trades due to the buy-and-hold tendency of index investors (Hegde and McDermott, 2003) for the CAC40 stock index.[7]

[7] Two further robustness tests were conducted when we decomposed the bid-ask spread into relative direct costs and relative information asymmetric costs of trading. First, following Hegde and McDermott (2003) we also analyzed the direct costs of transacting and information asymmetry in order

[INSERT TABLE 3 HERE]

5. Conclusions

In this paper we analyze the impact of index additions to (deletions from) the CAC40 stock index over the time period, January 1997 until January 2001. Our empirical findings provide support for the information cost liquidity hypothesis because they reveal that there is a long term enhancement (reduction) in the liquidity of CAC40 stocks, as a result of index additions (deletions) that persist over a 3 month trading interval. Also, our analysis reveals significant decreases (increases) in bid-ask spreads in the post index revision trading period, after controlling for the impact of stock prices, trading volume and volatility of returns. Furthermore, a decomposition of the effective bid-ask spread shows a significant change in the relative direct cost of transacting as a result of index revisions, as opposed to an adjustment in the relative information asymmetric cost of trading.

The permanent rise (fall) in liquidity of CAC40 stocks as a result of index additions (revisions) could result in increasing (decreasing) firm value. This is because it may be less (more) costly for them to borrow, issue capital or issue public equity after the increase (decrease) in liquidity resulting from index revisions. Extensions that focus on valuation of CAC40 firms after compositional changes are promising avenues for future research.

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to encapsulate any trends in stock prices subsequent to the index revisions. Second, we decomposed the bid-ask spread into relative direct costs of trading and relative asymmetric costs of trading with the use of the Huang and Stoll (1997) spread decomposition model. The results do not change and are available upon request. One possible limitation of the present study is that there are various other spread decomposition models that were not considered such as the Glosten and Harris (1998), George et al (1991) and the Lin et al (1995) model. However, as pointed out by Van Ness et al (2001) all spread decomposition models yield very similar results.

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TABLES

Table 1. Short and long term effects of CAC40 index revisions on stock market liquidity

The sample consists of 23 (20) firms that were added (deleted) to (from) the CAC40 index during the period 1997-2001. Stock market liquidity is measured by the quoted, relative and effective bid-ask spreads. Quoted bid-ask spread is defined as the ask price minus the bid price. Relative bid-ask spread is defined as the ask price minus the bid price divided by the quoted midprice. Effective bid-ask spread is defined as twice the absolute value of the difference between the transaction price and the midprice in effect at the time of the trade. All spread ratios are computed as the ratio of the average bid-ask spread of each individual stock over the indicated event time period to the average bid-ask spread measure over the pre index revision trading period of the CAC40 index, [0, -90]. The null hypothesis that the mean of the reported ratio is equal to one is tested using a standard t statistic.

(A) CAC40 Index Additions | *(B) CAC40 Index Deletions*

Event Time Interval	**Quoted Spread (%), Mean (Median)**	**Relative Spread (%), Mean (Median)**	**Effective Spread (%), Mean (Median)**	**Event Time Interval**	**Quoted Spread (%), Mean (Median)**	**Relative Spread (%), Mean (Median)**	**Effective Spread (%), Mean (Median)**
[0, 0] *T Test*	0.85 (0.86) -4.15**	0.81 (0.80) -4.23**	0.82 (0.81) -4.19**	[0, 0] *T Test*	1.09 (1.10) 2.15**	1.10 (1.11) 2.23**	1.11 (1.12) 2.19**
[-1, +1] *T Test*	0.84 (0.84) -4.01**	0.82 (0.81) -4.04**	0.83 (0.82) -3.99**	[-1, +1] *T Test*	1.17 (1.16) 2.01**	1.19 (1.20) 2.04**	1.21 (1.20) 2.99**
[-2, +2] *T Test*	0.85 (0.86) -4.31**	0.81 (0.80) -4.29**	0.82 (0.81) -4.25**	[-2, +2] *T Test*	1.16 (1.15) 2.31**	1.18 (1.17) 2.29**	1.20 (1.20) 2.25**
[-3, +3] *T Test*	0.86 (0.86) -3.87**	0.82 (0.81) -3.99**	0.83 (0.82) -3.95**	[-3, +3] *T Test*	1.13 (1.13) 2.87**	1.14 (1.15)) 2.99**	1.15 (1.15) 2.95**
[-4, +4] *T Test*	0.85 (0.86) -4.13**	0.81 (0.81) -4.09**	0.82 (0.82) -4.04**	[-4, +4] *T Test*	1.11 (1.10) 2.13**	1.13 (1.11) 2.09**	1.14 (1.13) 2.04**
[-5, +5] *T Test*	0.80 (0.80) -3.90**	0.78 (0.76) -3.92**	0.77 (0.75) -3.87**	[-5, +5] *T Test*	1.12 (1.12) 2.35**	1.14 (1.13) 2.44**	1.15 (1.17) 2.55**
[0, +10] *T Test*	0.88 (0.87) -3.84**	0.84 (0.84) -3.82**	0.85 (0.84) -3.80**	[0, +10] *T Test*	1.10 (1.09) 2.60**	1.12 (1.12) 2.41**	1.13 (1.10) 2.80**
[0, +30] *T Test*	0.89 (0.88) -3.76**	0.86 (0.85) -3.70**	0.87 (0.88) -3.72**	[0, +30] *T Test*	1.08 (1.09) 2.75**	1.10 (1.11) 2.70**	1.11 (1.13) 2.72**
[0, +60] *T Test*	0.93 (0.92) -2.31**	0.90 (0.89) -2.22**	0.91 (0.90) -2.24**	[0, +60] *T Test*	1.05 (1.06) 2.31**	1.07 (1.07) 2.24**	1.08 (1.08) 2.25**
[0, +90] *T Test*	0.96 (0.95) -2.06**	0.94 (0.93) -2.02**	0.95 (0.94) -2.00**	[0, +90] *T Test*	1.03 (1.02) 2.09**	1.04 (1.04) 2.02**	1.05 (1.05) -2.00**

** Significant at the 5% level.

Table 2. A multivariate analysis of the long-term impact on stock market liquidity.

The sample consists of 23 (20) firms that were added (deleted) to (from) the CAC40 index during the period 1997-2001. A log-linear Panel regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The Panel is used to determine whether the average market liquidity of the stocks improves (declines) following index additions (deletions) after controlling for average stock price, trading volume and volatility of stock returns. The Panel model has the following specification:

$$Liquidity_{jt} = \alpha_j + \beta_1 D_t + \beta_2 Volume_{jt} + \beta_3 (Volume_{jt} * D_t) + \beta_4 \Pr ice_{jt} + \beta_5 StDev_{jt} + \varepsilon_{jt}$$

for $t = 1, 2$.

For variable definitions of the panel specification above see equation (1) on pages 8 and 9 of the manuscript. All the variables apart from D_t are expressed as natural logarithms. α_j captures the time-invariant unobserved stock-specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan tests follow a χ^2 distribution with r degress of freedom under the null hypothesis of valid instruments. NORM (2) is the p-value for the Jarque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting $z \geq 1$. [.] are p values and (.) are t statistics.

(A) CAC40 Index Additions

Variables	**Quoted Bid-Ask Spread**	**Relative Bid-Ask Spread**	**Effective Bid-Ask Spread**
Constant	-0.773 (-12.25)**	-0.926 (-11.27)**	-0.928 (-11.33)**
D	-16.20 (-11.52)**	-16.28 (-12.98)**	-16.25 (-13.63)**
Volume	-28.31 (-8.93)**	-27.16 (-8.97)**	-27.12 (-8.94)**
(Volume*D)	0.024 (1.04)	0.025 (1.05)	0.026 (1.03)
Price	-2.361 (-70.21)**	-2.357 (-70.23)**	-2.350 (-70.33)**
StDev	0.782 (17.23)**	0.791 (18.21)**	0.790 (18.26)**
α_i	[0.00]	[0.00]	[0.00]
R^2	0.871	0.874	0.869
NORM (2)	[0.231]	[0.234]	[0.237]
AR(1)	[0.421]	[0.424]	[0.427]
Sargan $\chi^2(r)$	[0.458]	[0.510]	[0.513]

(B) CAC40 Index Deletions

Variables	**Quoted Bid-Ask Spread**	**Relative Bid-Ask Spread**	**Effective Bid-Ask Spread**
Constant	-0.886 (-10.23)**	-0.923 (-11.24)**	-0.925 (-11.26)**
D	18.30 (11.52)**	18.40 (12.98)**	18.25 (13.68)**
Volume	-26.30 (-8.32)**	-27.00 (-8.77)**	-27.33 (-9.23)**
(Volume*D)	0.030 (1.07)	0.021 (1.02)	0.030 (1.09)
Price	-2.475 (-62.31)**	-2.304 (-60.44)**	-2.456 (-59.77)**
StDev	0.743 (19.76)**	0.733 (17.55)**	0.755 (14.76)**
α_i	[0.00]	[0.00]	[0.00]
R^2	0.8431	0.8446	0.866
NORM (2)	[0.234]	[0.238]	[0.244]
AR(1)	[0.433]	[0.431]	[0.420]
Sargan $\chi^2(r)$	[0.466]	[0.519]	[0.522]

** Significant at the 5% level.

Table 3. Short and Long Term Effects of index revisions on Direct and Information Asymmetric Costs of Trading.

The sample consists of 23 (20) firms that were added (deleted) to (from) the CAC40 index during the period 1997-2001. The direct and information costs of trading are derived using the MRR spread decomposition model. The absolute direct cost (ψ) and the absolute asymmetric cost (λ) parameters for each stock in the sample are estimated separately for the pre and post index revision trading periods. Relative direct and information cost parameters are obtained by dividing ψ and λ by the average daily closing price (p). The Post/Pre ratios for each stock in the sample are computed by dividing the estimate of each parameter in the post index revision trading period by its equivalent in the pre index revision trading period. A standard t-test is used to test the null hypothesis that the spread components are unchanged over the test period.

(A) CAC40 Index Additions

	Direct Cost of Trading	**Asymmetric information Cost of trading**		
Event Time Interval	**Post/Pre Ratio Mean, (Median)** (ψ / p)	**Post/Pre Ratio Mean, (Median)** (λ / p)	**T Test** (ψ / p)	**T Test** (λ / p)
[0, 0]	0.87 (0.88)	1.05 (1.07)	-3.84**	1.07
[-1, +1]	0.86 (0.86)	1.09 (1.10)	-3.00**	1.05
[-2, +2]	0.83 (0.81)	1.10 (1.10)	-3.11**	1.13
[-3, +3]	0.81 (0.82)	1.07 (1.08)	-4.11**	1.10
[-4, +4]	0.82 (0.80)	1.13 (1.12)	-4.33**	1.20
[-5, +5]	0.73 (0.73)	1.07 (1.06)	-4.41**	1.15
[0, +10]	0.78 (0.78)	0.99 (0.98)	-3.00**	1.27
[0, +30]	0.83 (0.83)	1.00 (1.00)	-2.16**	1.10
[0, +60]	0.88 (0.88)	1.02 (1.01)	-2.18**	1.22
[0, +90]	0.90 (0.90)	0.96 (0.96)	-2.05**	1.23

** Significant at 5% level.

(B) CAC40 Index Deletions

Direct Cost of Trading **Asymmetric information Cost of trading**

Event Time Interval	**Post/Pre Ratio Mean, (Median)** (ψ / p)	**Post/Pre Ratio Mean, (Median)** (λ / p)	**T Test** (ψ / p)	**T Test** (λ / p)
[0, 0]	1.16 (1.15)	1.05 (1.05)	-2.76**	1.21
[-1, +1]	1.15 (1.16)	1.04 (1.04)	-3.00**	1.15
[-2, +2]	1.14 (1.13)	1.03 (1.03)	-3.11**	1.18
[-3, +3]	1.13 (1.13)	1.01 (1.00)	-4.11**	1.20
[-4, +4]	1.10 (1.11)	1.00 (1.00)	-4.33**	1.14
[-5, +5]	1.08 (1.08)	0.98 (0.98)	-4.41**	1.18
[0, +10]	1.07 (1.08)	0.95 (0.95)	-3.00**	1.30
[0, +30]	1.06 (1.05)	0.92 (0.92)	-2.16**	1.22
[0, +60]	1.06 (1.06)	0.90 (0.90)	-2.18**	1.20
[0, +90]	1.05 (1.05)	0.88 (0.88)	-2.05**	1.05

** Significant at 5% level.