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# Is there Information Leakage around Business Combinations on the French Market?

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## Abstract

Recent theoretical and empirical contributions seem to indicate that (anti) insider trading laws (ITL) lowers the cost of capital in countries where they are enforced. This result should imply that ITL enforcements limit the trading activities of insiders. First this paper studies informed trading around business combinations on the French market to provide evidence of information leakage. We then propose a first empirical test of the deterrence effect hypothesis. Our sample is composed by 126 business combinations covering the 1995-2000 period. Results confirm that, prior to public announcement dates, information is significantly leaking in the market, even in the absence of rumours in the financial press. We show that these pre-bid effects are clearly anticipations of what should have been happening on the announcement date. We finally confirm the deterrence effect hypothesis, putting into light a significant negative relation between the *Commission des Opérations de Bourses* monitoring activities (as publicly announced) and the importance of pre-bid information leakage in the absence of rumours in the financial press.

JEL classification: G14; G34

Key words: Mergers and Acquisitions, hidden order, informed trading, bid-ask spread, information leakage

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## 1. Introduction

The analysis of the effects of insider trading laws (ITL) on the behavior of investors and stock markets is a very active field in finance during the last fifteen years.<sup>1</sup> One of the main questions is whether or not we have to forbid insider trading activities. There are both theoretical and empirical contributions to this debate.

The main argument in favour of free insider trading is the speed of price discovery. Meulbroek (1992) find some empirical support to this argument. The seminal work of Kyle (1985) can be used to give a theoretical support of information incorporation through insider (informed agents) trading. Arguments in favour of a strict regulation (not to say forbidding) of trading by insiders are more numerous. The first one is of ethical order: every investor should be on an equal footing when trading on the stock market. As the U.S. Security Exchange Commission recall it, "*The laws and rules that govern the securities industry derive from a simple concept: all investors should have access to certain basic facts about an investment prior to buying it*".<sup>2</sup> But, beyond the defence of this fairness among investors principle, trading by insiders is thought to impose costs on all investors.

Kyle (1985) shows the link between market liquidity and the presence of private information. The theoretical contribution of Easley and O'Hara (2001) shows, in a rational expectations setting with risk adverse investors and imperfect information, that an information risk premium appears in the firm's cost of capital. This premium is a function of the ratio of private to public information. These theoretical arguments find a serious empirical support in Battacharya and Daouk (2002). The authors study the relation between the presence and the effective enforcement of ITL and the cost of capital in a sample of more than 100 countries. They find that "*the cost of equity in a country, after controlling for a number of other variables, does not change after the introduction of insider trading laws, but decreases significantly after the first prosecution*". This is a key empirical result, in particular in the debate of pro and con insiders trading regulation.

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<sup>1</sup> Insider trading is defined as trading by traditional officer or director of the firm, as well as others principal shareholders (who owns more than 10% of total stock outstanding) and trust (e.g. lawyers, investment bankers), based on non-public information and outside the limited set of operations authorized by the COB.

<sup>2</sup> See <http://www.sec.gov>, presentation of the U.S. Security Exchange Commission activities.

If it is really the effective enforcement of ITL, through cases prosecutions, that matter, we should observe a deterrence effect of ITL enforcements on the level of illegal insider trading activities. In other words, insiders should be afraid by *la peur du gendarme*: when the regulatory authorities effectively scan the market and pursue insiders, the importance of their activities should lower. We study here this hypothesis. If we validate the deterrence effect, it will strongly reinforce the Battacharya and Daouk (2002) results. Indeed, it will put into light the direct link between the level of the ITL enforcements and insider trading activities, while the Battacharya and Daouk evidence is based on the increase of the cost of capital, a supposedly indirect consequence of insider trading. This deterrence effect of ITL is moreover a clear motivation put forward by legislators. As underlined by Garfindkel (1997), the quoted purpose of the Insider Trading and Securities Fraud Enforcement Act adopted in 1988 by the Congress is to “*enhance deterrence against insider trading*”.

A direct empirical test of the ITL enforcement deterrence effect is however difficult to realize. Illegal insider trading activities being illegal, there is no hope to obtain the full record of such activities. This generates two difficulties:

- it is difficult to make the difference between normal market anticipations and illegal insiders trading. This point is already put into light by Jarrell and Poulsen (1989). The authors show that the observed pre-bid price run-up in the context of mergers and acquisitions (M&A) operations is frequently associated with rumors in the Financial Press. So, per se, abnormal behavior of market variables (such as prices, volumes, spread, ...) are not sufficient evidence to prove the presence of illegal insider trading;

- going one step further in the reflection, even if we identify abnormal behaviors of market variables prior to public information release without any rumors in the financial press, it is insufficient to be sure that we are faced to insider trading activities. It could be that the concern investors have legally acquired costly information or developed internal models (for example, forecasting models of the probability of being a target in a acquisition process) giving them an informational advantage.

Proving that the abnormal trading is realized by insiders using illegally obtained information is therefore a hard task.<sup>3</sup> Faced to those difficulties, we develop a methodology, based on the French context particularities, which allows a joint test of the illegal insider trading activities and the deterrence effect hypothesis. While ITL exist for a long in France, the main feature of the French context is the quite infrequent public announcements by the market regulatory authority (the *Commission des Opérations de Bourse – COB*) of either inquiries opening or cases sending to courts. From 1994 up to 2000, scanning in detail the French financial press, we only identify 38 such announcements. Although the COB identified 148 merger and acquisition on the French market in 1999, only 3 investigations put into light the illegal use of private information around these operations.<sup>4</sup> First this rather exceptional nature of public COB interventions is an attractive feature as what concern a test of deterrence effect. As it is not frequent that COB comes into play to pursue illegal insider activities, when it is the case, it should be a significant news and, under the deterrence effect hypothesis, it should have an impact on the level of insider trading activities.

Second, is this marginal informed trader behavior permit to conclude that French firms' correctly master their financial communication? If the event information leakage occurs, implying disclosure of some private information to a limited set of investors, informed traders will adopt a strategic profit maximizing behavior. This information leakage hypothesis around M&A is a well-investigated phenomenon since the significant impact of the announcement of M&A on the price is a well-established fact, particularly for target firms (e.g., Keown. and Pinkerton, 1981; Jensen and Ruback, 1983; Arshadi and Eysell, 1993; Jabbour et al., 2000). Two main explanations have been proposed for these run-ups: the market anticipation of the takeover and the corporate insiders' activities. In this context, private information strategy can be very rewarding and therefore, very tempting. Our approach is therefore based on to response to three questions:

- do market variables exhibit abnormal behavior before public news release even in the absence of rumors in the financial press?

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<sup>3</sup> The recent contribution of Griffin and Grandfest (2002) leads to the same conclusion, showing that abnormal net insider selling is insufficient to be a “strong inference” of fraud.

<sup>4</sup> These operations are Carrefour – Promodes, Dexia Belgium – Dexia France and Suez Lyonnaise – Sita.

- are those abnormal behaviors anticipations of what will happen when the news is released?
- is the level of abnormal observed behavior lowered when the probability of COB intervention is higher?

To validate both the deterrence effect hypothesis and the presence of illegal insider trading activities, we have to obtain significant result for the three questions. On the last and crucial point, we must stress that it is well the presence of illegal activities that our test allows to validate. If indeed an increase of the COB probability of intervention lowers the observed abnormal market variables behaviors (for example, the pre-bid price run-up), it is because investors generating those behaviors wish to limit the risk to be pursued. Another interesting feature of the French context is the availability of hidden orders quantities (the part of the order quantity which is not displayed to other investors), which offer us a kind of model free estimator of the asymmetry on the market.

Numerous papers have investigated the insider trading problem. Meulbroeck and Hart (1997) show that the presence of insider trading activities increases premiums paid by bidders in takeover. Chakravarty and McConnell (1997) analyze the well-know Carnation-Nestlé case and find that, while stock prices seems to be affected by illegal trades done by Yvan Boesky, neither the spread nor the depth seems to be affected. Garfinkel (1997) presents evidences that the threat of legal sanctions significantly affects the trading behavior of insiders: following ITL enactment, insiders are more likely to postpone liquidity sales until after negative earnings surprises. Insiders also increase their relative emphasis on post-event based trading. These results based of officially reporting trading activities by insiders, contradict those of Battacharya and Daouk (2002), who establish the importance of ITL enforcement and not enactment. Chung and Charoenwong (1998) put into light that the spread established by market makers is systematically larger for stocks with a higher probability of insider trading. Eckbo and Smith (1998), analyzing trading officially reported by corporate insiders, do not find evidence of abnormal returns for those investors. Following Jabbour and al. (2000), in the case of takeover operations, early stage abnormal returns is attributed to corporate insider trading while the run-up immediately prior the announcement date is due to market anticipation. Friederich et al. (2002), still on sample of trades officially reported by insiders, put into light some short-term market timing ability of corporate insiders. Hillier and Marshall (2002) find, yet in a sample of official reported trading transaction by corporate insiders, that

trading bans affect the timing of their trading but not their relative performance. Carter et al. (2002) confirm that insider trading activities have an impact on price. The authors also show that the importance of insider trading price impact is a positive function of the reporting period (the time delay between the transactions and their official declaration to the SEC).<sup>5</sup>

Our paper differs from previous research in several respects. First, we propose at our knowledge, the first systematic analysis of this question on the French market, over a significant period of six years and a sample of 141 firms. Our sample was constructed using all the quoted French firms involved in business combinations for which the European Commission (EC) has intervened as a regulatory authority.<sup>6</sup> Another distinctive feature of our work is that we do not focus only on target companies, but we take a broader approach to the problem and analyse also bidder companies and joint ventures.

Furthermore, by comparing merger and acquisition announcements, with or without rumours in the financial press during a 6-month period prior to the announcement date, we are able to analyse the different strategies adopted by informed traders when facing diverse information sets. Hence, if a value destruction is expected by traders (resp. a value creation), they will adopt a bearish strategy (resp. a bullish strategy) during the period prior to the announcement in order to benefit from the inside information.

Finally, we use intraday market data on hidden orders' quantity. Euronext, similarly to the Toronto Stock Exchange, allows traders to display only a portion of their orders. The remaining size is hidden in the order book. Hidden orders are a classic way for investors who possess some private information to profit from it on the market without diffusing it (too quickly at least) to other investors. Two solutions are usually available to informed traders: either to reduce their order exposure by using hidden quantity or to diffuse false information to the market by submitting orders that, given their information, should lie on the opposite side of the book.

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<sup>5</sup> Under the Section 16(a) of the Securities Exchange Act of 1934, corporate insiders who trade in their company's stock must report such transactions by the tenth of the month following the month of the transaction.

<sup>6</sup> Since the promulgation of the EEC n°4064/89 regulation, all mergers and acquisitions of European size are to be notified to the Directorate General of Competition (DGC) of the European Commission with a delay of one week after the official signing of a deal agreement (see Winckler and Brunet, 1998). For an extensive analysis of the financial dimension of European Commission activities the reader can consult Aktas et al. (2001a, 2001b and 2001c).

Using a sample of 141 firms announcements from 1995 to 2000, our main results are the following.<sup>7</sup> First, on the full sample, we observe statistically significant abnormal behaviors of our market variables prior to the official business combination announcement. These markets indicators are cumulated abnormal average volume, the spread and the adverse selection component of the spread. When we focus on the no rumors sub sample, we identify statistically significant cumulative average abnormal returns, cumulative average abnormal volume and increase of the spread. Tests of differences between the rumors and the no rumors sub samples put into light significant differences for the cumulative average abnormal returns, the cumulative abnormal volume, cumulative average abnormal hidden volume and its repartition between buying and selling order. Second, abnormal reactions of market variables before the announcement date verify the anticipation hypothesis. And finally the joint test of deterrence effect hypothesis and illegal trading activities is validated for the abnormal volume variable.

This paper consists of five sections. Section 2 describes the French legal context. Section 3 focuses on the research design. We will explain how our variables are measured, present the criteria used to split our sample and the methodology. Section 4 presents and interprets the results. Section 5 concludes.

## **2. The French legal context**

In France, Insider Trading is regulated both by a criminal and by a regulatory regime. The criminal regime is defined in article L. 465-1 of the Monetary and Financial Code and the regulatory one is based upon principles set out in COB n°90-08 regulation. The two regimes are independent but, in practice, criminal prosecutions are most generally initiated at the COB request.

The criminal insider dealing statute applied where an insider, in possession of privileged information, relating to one or more quoted financial instruments, deals in the relevant instrument(s), and/or discloses the relevant “privileged information”. The terms “financial instruments” includes most equity securities, debt instruments, shares or units in investment funds, most derivative products, ... traded on regulated market. The notion of

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<sup>7</sup> It is important to note that our sample encompasses mergers, acquisitions and joint ventures. Since business combination is a broader concept than merger and acquisition we will be using it in the remaining of the

privileged information has been clearly defined by the *Cour de Cassation* (case *La Ruche Méridionale – 26 June 1995*): the information must be precise, confidential, of a nature that would influence the quoted price of the relevant financial instrument and it must be the determining reason behind the transaction(s) giving rise to the prosecution. The French Law creates two types of insiders: those who are insiders by statute (chairman, directors, general directors, ...) and those who acquire privileged information in the exercise of their profession (financial journalist, liquidator of company, civil servant aware of take-over, ...).<sup>8</sup>

The COB n°90-08 regulation defines inside information in the case of insider trading violation as “*a non public, precise information, concerning one or several issuers, one or several financial assets, one or several negotiable forward contracts, one or several quoted securities, which, if public, would have an incidence on the price of the concerned asset, contract or quoted security*”. The range of financial instruments to which it applies and the definition of privileged information is closed to the one found under the criminal regime. In surplus of the two categories of insiders identified under the criminal regime, the COB regulation concerns persons in possession of privileged information by reason of their involvement in the preparation or the carrying out of a financial transaction (employees of an issuer, advisors, brokers, ...) and those who have knowingly received privileged information directly or indirectly.<sup>9</sup>

The COB sanction power is relative important (and parallels, as what concerns fines, the one of the criminal regime). It goes from administrative sanctions (fines either up to 1.5 million € or up to 10 times the fraudulent profits) to disciplinary ones (e.g., forbidding to continue to exercise professional activities for investment professionals). As in the U.S. context where the Security Exchange Commission (SEC) must pass the case to Department of Justice for criminal prosecution, the COB must pass the case in such circumstances to the *Tribunal de Première Instance de Paris*.

But in practice, if we consult the French financial press (essentially *Les Echos* in our case but COB officials confirm us that if an insider trading inquiry or pursue is publicly announced, it is to all French financial newspapers), we only find 38 such announcements

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paper.

<sup>8</sup> A third category of insiders has introduced since November 2001. They are persons not concerned by the two first categories but knowingly in possession of privileged information.

<sup>9</sup> This last category corresponds to the one introduced in November 2001 in the criminal regime.

during the period 1994 – 2000. Moreover, on this period there has been a quite high variance in the number of announcements by year, going from 2 in 1996 to 10 in 1994 and 7 in 1999.<sup>10</sup>

How can we explain this limited number of interventions? A first explanation could be that the COB deters so well insider trading on the French stock market that it is really infrequent. This seems however to be too optimistic. Following the newspaper *La Tribune* (11/13/2000), the number of inquiries realized by the COB amounts to 567 during this period. But, due to the *secret de l'instruction* principle, only very few cases are publicly announced. While as what concerns the deterrence effect hypothesis, it is important to understand that we are only interested in publicly announced interventions (only these can impact the investors' behaviors), this shows that insider trading remains a real problem on the French market. A second explanation is the strict application of the above quoted principle of the *secret de l'instruction*: normally an inquiry can only be made public after effective sanctions against the suspected investors. A third explanation, which must be combined to the previous one, lies in the difficulties for the COB to bring the proof of illegal sources of used information. Two noteworthy differences between the COB and SEC are the possibility for the latter to realize direct search without first obtaining the authorization of a judge and to enter in a bargaining process with the suspected investors in order to obtain the necessary proofs of the illegal nature of used information. None of these possibilities are offered to the COB and therefore, it is in such circumstances very difficult to prove the illegal nature of information used by the investor.<sup>11</sup> As it is simultaneously illegal to publicly announce the inquiry opening before an effective condemnation, in practice, they are very few such announcements.

### **3. Research design**

#### 3.1. Data

To test the deterrence effect hypothesis of ITL, we use a sample of business combinations. This is a classical choice in the literature (see Jennings (1994), Meulbroek and Hart (1997), Chung and Charoenwong (1998) among others) and intuitively easy to

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<sup>10</sup> This significant time variation of the number of publicly reported cases is one of the key attractive dimension of the French context to test the deterrence effect hypothesis. It indeed reflects a high variation of pressure put by the COB to control (and limit) insider trading activities, at least as perceived by the investors.

<sup>11</sup> Moreover, under the criminal regime, the French criminal law requires the proof of both the criminal act (*l'élément matériel*) and the will to commit the relevant crime (article 121-3 of the New Criminal Code). The

understand. As such operations have a well know high impact on the prices of involved firms (at least of targets – see Jensen and Rubacq (1983)), they represent an opportunity for informed investors to have significant profits. Moreover, incumbent managers are (almost by definition for the bidders) informed prior to the market.

As we wish to use several market indicators requiring high-frequency data, the analyzed sample of business combinations has been constrained by the time coverage of the Euronext BDM database. As it starts in January 1995 and as we need a few months of data for our estimation window, the first selected operation is in April 1995. Our study ends in December 2000. The identification of operations has been realized using the information available on the Directorate General for Competition (DGC) of the European Commission web site.<sup>12</sup> This allows us to focus on a sample of significant operations (only business combinations of European dimension must be reported to the DGC) for which we do have at our disposal the DGC reports.<sup>13</sup> We select the operations including at least one French firm included in the SBF 250 stock market index.<sup>14</sup> This leads us to a sample of 126 operations, involving 141 French quoted firms (see Table 1). Among those, 60 firms are identified as bidders, 33 as targets and 48 as participating in joint ventures.

As indicated above, for intraday data, we rely on the Euronext BDM database. This database contains the reference information, all orders and trades for all securities traded on the Paris Bourse. To account for abnormal trading patterns and procedures around the start of each day and the close of the trading day, the pre-opening and pre-closing periods of trading are excluded (Biais et al., 1999). We also exclude application transactions (block trades). Hence, only trade and quotes data lying between 10:00 a.m. and 5:00 p.m. are examined. To cover our sample and analyzed windows, we use about 30 millions of trades and 50 millions of best quotes.

Daily stock price and volume data are obtained from Datastream. For announcement dates, two separate sources are checked: the financial press (Les Echos and Financial Times)

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burden of the proof lies with the Public Prosecutor who must convince the court that all elements of the offence are present in the evidence.

<sup>12</sup> See [http://europa.eu.int/comm/competition/index\\_en.html](http://europa.eu.int/comm/competition/index_en.html).

<sup>13</sup> For each operation, the DGC publishes on its web site a downloadable report who contains on a almost systematic basis the necessary set of basic information : identification of the parties, date of notification, sector, stock markets, ...

<sup>14</sup> The aim of the last condition is to ensure that minimal requirements of liquidity are met.

and the above mentioned DGC reports. We also use the SDC Mergers database, edited by Thomson Financial, to identify features of the deal such as the size of the operation, ownership of the firm (state owned or private), the number of investment banks and lawyers involved in the transaction and the nationality of the parties.

### 3.2 Methodology

To attempt to detect the trading of informed investors, we will analyze the behavior of several market variables prior to the public announcement of the business combination: the cumulative abnormal returns, the cumulative abnormal volumes, the spread and its adverse selection component, the hidden order volume. We first briefly present them in this section. We then describe the sub-samples that we have composed and the way in which we will use them. We finally summarize some other methodological aspects such as the chose windows of analysis and the used statistical tests.

#### a. Market variables

##### *Cumulative average abnormal returns (CAAR)*

As classically since Fama et al. (1969), we adopt the event study framework. We use continuously compounded returns. The simple market model is used as return generating process:

$$r_{i,t} = \alpha + \beta r_{m,t} + \varepsilon_{i,t} \quad (1)$$

Where  $r_{i,t}$  is the return of asset  $i$  at time  $t$ ,  $r_{m,t}$  is the return of the market index at time  $t$ ,  $\alpha$  and  $\beta$  are the market model coefficients and  $\varepsilon_{i,t}$  are the residuals. The SBF 250 Market Index is used as a proxy of the market portfolio. The estimated abnormal returns are computed as usual:

$$CAAR_T = \sum_{\tau=-n}^T \frac{1}{N} \sum_{j=1}^N \hat{\varepsilon}_{j,\tau} \quad (2)$$

They are then averaged across the time and the sample:

$$\hat{\varepsilon}_{i,t} = r_{i,t} - (\hat{\alpha} + \hat{\beta} r_{m,t}) \quad (3)$$

We finally use the Boehmer et al. (1991) approach to build a cross-sectional test of significance in order to control for the event-induced variance present in the context of business combination operations.

If informed investors trade before the public announcement of the business combination, their activities should progressively reveal their information (more rapid price discovery is the most often quoted argument in favor of legalizing insider trading activities). In such circumstances, we should observe significant CAAR.

The summary statistics for the estimated parameters of the regressions for the sample firms are presented in Table 4. These regressions do not depart too much from the spherical Gaussian specification. In fact, at a significance level of 10%, the rejection rate of the “normal disturbances” hypothesis is 53.8 %, and the levels of heteroscedasticity and autocorrelation, although not very large, are significant. The explanatory power of the regressions is quite good with an average R-square of more than 34%, somewhat higher than in the usual market model regression for an individual firm. This probably reflects the larger firm sizes stipulated by EEC regulations for examination.

#### *Cumulative average abnormal volumes (CAAV)*

The return approach is extended to the volume analysis with two adaptations:

- volumes are measured as the natural logarithm of daily traded volume expressed in Euro;
- following the advices of Ajinkaya and Jain (1989) and, in the French context, Mai and Tchameni (1996), the constant mean model is used as generating process.

CAAV is a basic but important market variable to track. As noted by Garfinkel (1997) and DeMarzo et al. (1998), abnormal volumes is one of the primary indicator looked by market authorities to detect suspect activities on the market.

#### *Spread and adverse selection component (SPREAD, ASYM)*

On a quote driven market such as the French one, limit orders play the role of liquidity provider. The spread at time  $t$  is therefore the difference between the best ask and bid limit order prevailing at that time and measures liquidity providers' revenue. We have decided to

work with the percentage spread in order to control for the price level and to follow McInish and Wood (1992) by adopting a time-weighted average scheme. Our definition of the spread is therefore the following:

$$Spread_i = \sum_{t=1}^T w_t \frac{Ask_{i,t}^* - Bid_{i,t}^*}{\frac{Ask_{i,t}^* + Bid_{i,t}^*}{2}} \quad (4)$$

$$where \ w_t = \frac{sec_{t,t-1}}{\sum_{t=1}^T w_t}$$

$Ask_{i,t}^*$  ( $Bid_{i,t}^*$ ) stands for the best ask (bid) limit order for asset  $i$  at time  $t$ .  $\frac{Ask_{i,t}^* + Bid_{i,t}^*}{2}$  is the mid quote, used to control for the price level impact, and  $w_t$  is the time-weighting coefficient.

As in Lee et al. (1993) and Jennings (1994), we use a cross-sectional regression approach to test the statistical significance of the difference in the behavior of the spread between the estimation window and the event window. Note that in this context, it is more correct to speak of control period rather than of estimation window. Three different sub-periods of the event window are considered as event periods. These are the following: [-60;0[, [-15;0[ and [0;30[. The considered regression is the following:

$$SPREAD_j = \alpha_0 + \alpha_1 EVT_j + \alpha_2 MV_j + \alpha_3 VALUE_j + \alpha_4 RUMOUR_j + \varepsilon, \quad (5)$$

where  $SPREAD_j$  is firm  $j$  average time-weighted percentage spread on the considered sub-periods. The explanatory variables are  $EVT$ , which identifies the event or the control period;  $MV$ , which is the natural logarithm of the firm's market capitalization at the announcement day; and  $VALUE$  and  $RUMOUR$  which identify the considered sub-samples.<sup>15</sup> All regressors except for  $MV$  are dummy variables.  $EVT$  equals 1 (resp. 0) if the spread of firm  $j$  is estimated on the event (resp. control) period.  $VALUE$  equals 1 (resp. 0) if the firm belongs to the value creating (resp. destroying) sub-sample.  $RUMOUR$  equals 1 (resp. 0) if the firm belongs to the rumour (resp. rumour-less) sub-sample.

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<sup>15</sup> We expect a strong negative correlation between the firm size and the spread (Petersen and Fialkowski, 1994).

Numerous spread decomposition models have been proposed up to now. As shown in Clarke and Shastri (2000), they do not agree on the relative importance of spread components. Moreover, some of them lead to serious econometric difficulties. The choice of a model is in these conditions a difficult task. As we wish to investigate the variations through time of the adverse selection component, the potential bias in the estimation of the adverse selection level is not a main problem in our case. We therefore have chosen first of all to focus on a robust model from the econometric point of view. Among the possible choices, the Lin et al. (1995) has kept our attention. This model allows the identification of two components: the order processing cost and the adverse selection component. In an order driven market as the French one, the inventory holding costs is probably less relevant (the spread is defined on the basis of the best limit order quotes). The Lin et al. (1995) model seems therefore more appropriate to our context from this point of view than models including three components. The central equations of the model are the following:

$$Q_{t+1} - Q_t = \lambda z_t + e_{t+1} \quad (6)$$

$$z_{t+1} = \theta z_t + \eta_{t+1}$$

$$\gamma = 1 - \lambda - \theta$$

where :

$$Q_t = \frac{Ask_t + Bid_t}{2}$$

$$z_t = P_t - Q_t$$

$Q_t$  is as before the quote mid-point.  $z_t$  is one-half the effective signed spread. It is positive for a buy and negative for a sell.  $\lambda$  measures the adverse selection component and  $\theta$ , the order persistence. The order processing cost is estimated by  $\gamma$ . Intuitively, the  $\lambda$  parameter captures the impact of an order (recall that  $z_t$  is signed) on the quote mid-point or, in other words, its impact on the true value. It is therefore well an indicator of the information content of the order. The model is simply estimated by ordinary least square.

We might expect a positive impact of the presence of informed investors on the spread and its adverse selection component. In particular, a spread increase (and especially of its adverse selection component) before the public announcement will be clear signal of the presence of private information in the market. Previous results incite however to cautiousness. Chung and Charoenwong (1998) find that on a cross sectional basis that the spread is higher for stocks with a higher risk of insider trading but that, when looking stock by stock in time-

series, the spread does not seem to increase when the probability of insider trading increase. Chakravarty and McConnell (1997) find not apparent reaction of the spread to the illegal activities of Yvan Boetsky. Using experimental methodology, Schnitzlein (2002) shows that, when the number of insiders is unknown, dealers have difficulties identifying insider traders and that, in these conditions, liquidity patterns do not appear to be affected by the number of insiders. These results stress that the absence of spread or adverse selection component reactions before the announcement is not be sufficient to infer the absence of informed investor in the market.

#### *Hidden Order (AHV, AHBP, AHSP, BS)*

The BDM database published by Euronext gives us access the part of order quantity which is not displayed to other investors. On this basis, we have build three indicators:

- CAHV: the abnormal hidden order volume, in Euro, expressed in percentage of the total order volume;
- CAHBP: the proportion of CAHV which is due to buying order.
- CAHSP: the proportion of CAHV which is due to selling order.

To identify buying and selling order, we have matched transaction data to their corresponding best limits using the Lee and Ready (1991) algorithm, slightly adjusted to the French context. This allows us also to track the evolution of the ratio of the number of buys to the number of sells (BS).

Considering that hidden orders are a way for informed investor to take advantage of their information without revealing it to quickly to other market participants, we expect to see them increase before the public announcement of the business combination in case of trading by informed investors. We could however object to this line of thought that, in particular for investors using illegally obtained information, such a strategy will not be used to avoid to be detected. Again, as for the spread and its adverse selection component, a abnormal behavior of the hidden order indicators can be interpreted as a sign of private information presence on the market but a lack of it is not a sufficient proof to exclude it.

b. Sub-samples

We analyze the behavior of our market variable across three kinds of sub-samples: rumors versus no-rumors cases, targets versus bidders, value creating versus value destroying operations.

*Rumors versus no-rumors cases*

As already pointed out by Jarrell and Poulsen (1989), abnormal behaviors of market variables before the public announcement date can be due to normal market anticipations. Rumors can circulate in the financial press and investors can be trading on this basis. This is nothing to do with insider trading and we must control for it. We have therefore, for each business combination, systematically scanned the financial press (both *Les Echos*, which the leading French financial newspaper) and the Financial Times for rumors on the operation in the six months prior to the public announcement. On this basis, we have identified 51 firms in the rumors sub-sample and 90 firms in the no-rumors one. It will be essential in the analysis of our empirical results to focus on the market variables abnormal behavior in the no rumors sub-samples and to test the significance of the difference of observed behavior between the two sub-samples.<sup>16</sup>

The presence of abnormal trading in the rumour-less sub-sample by comparison to the rumour one will be used as an indicator of the presence of informed trading making this split an important one. Comparing the behavior of the selected variables (see section below) in the sub-samples will enable us not only to put into light abnormal trading in the rumour-less sub-sample but also to check if this abnormal trading is linked to the presence of private information. If it is the case, this will constitute a clear indication of the presence of informed trading.

Let us finally stress that the role of rumors in the anticipations formation process must be assess with great care. As shown recently by Van Bommel (2002), rumors can be used by

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<sup>16</sup> We have also collect data on toeholds using the legally imposed official declarations at the *Conseil des Marches Financiers*. Toeholds are known since Grossman and Hart (1980) to be a potential solution to the free-riding problem in the field of M&A. Shleifer and Vishny (1986) show that toeholds should be associated with a higher probability of takeovers. Bris (2002) gives interesting insights concerning the relations between the pre-bid price run-up, the bid premium and the toehold size. The public announcement of toeholds, through official declarations at the *CMF*, could therefore be one of the elements at the basis of rumors among the investors. We do however have found only 3 cases in our samples for which there has been such a declaration

informed investors to try to manipulate the market, leading uninformed investors to wrong anticipations.

### *Targets versus bidders*

It is well-known (see e.g. Jensen and Rubacq (1983)) that targets capture the major part of the wealth creation at the announcement date. We could therefore expect that, if informed investors are trading before the public announcement, it will be more aggressively on targets than on bidders. As our sample includes both M&A and joint ventures, we have decided to put firms involved in joint ventures in the sample sub-sample as bidders. Joint-ventures are indeed known to have far less important impact at the announcement date as M&A (see e.g. McConnell and Nantell (1985) and Aktas et al. (2002) who confirm this result in the European context).

### *Value creating versus value destroying business combinations*

We follow Garfinkel (1997) by creating a split between value creating and value destroying operations. The author indeed dissociates, in the context of earning announcements, trading strategies depending on good or bad unexpected news. Informed investors should buy (sell) before unexpected good (bad) news. Splitting our sample between value creating (see table 2) and value destroying (see table 3) operations plays the same role. The public announcement of the operation is the unexpected news and informed investors should adapt their trading strategies depending on the news content (value creation or value destruction). On the one hand, if the insider expects a value creation, his strategy will be a bullish one, consisting for example, in the simplest case, in buying the considered shares prior to the announcement and selling them after the announcement. On the other hand, if he expects value destruction, his strategy will be a bearish one, consisting in selling or shorting the considered shares.<sup>17</sup> We classify business combinations as value creating (destroying) when the CAAR are positive (negative) during the EVENT window.

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prior to the operation without rumors simultaneously finding rumors in the financial press. Being too marginal, we have decided not to take this into account.

<sup>17</sup> These are the basic trading strategies; it is also possible to consider more sophisticated strategies by using for example derivatives. Cao et al. (1999) give a few examples of bullish strategy using options for an informed trader: (i) purchasing a call; (ii) shorting a put option; (iii) purchasing the stock and shorting a call option; (iv) closing a previous short call position, etc. The analysis of these strategies is well beyond the scope of this study, mainly because of the data at our disposal. However, interested readers can consult Frye et al. (2001), where the authors study the informed trading around merger announcements with US data by considering eight bullish strategies using option.

c. Independent variables, windows and statistical tests

*Independent variables*

To test the deterrence hypothesis, our main independent variables will be indicators of the degree of COB market monitoring. Using market variables to build a model of the probability of intervention, which would appear as a natural way to proceed as the regulators are known to scan these variables (see Garfinkel (1997) and DeMarzo et al. (1998)), raises a serious problem of endogenous relation. We therefore have built two variables as proxy of the COB monitoring intensity:

- the number of days between the beginning of the BEFORE window and the last COB intervention (either inquiries or enforcements) published in the financial press. We will notate this variable ITLI\_DAY;
- the same as the previous one but keeping only enforcements announcements. We will notate this variable ITLE\_DAY.

In an effort to identify other potential determinants of the level of insider trading activities, we have also collected other control variables:

- GOV: a dummy variable taking the value one if the French state is (partial) owner of one of the involved firms. The intuition is that in this case, negotiations with state officials will multiply the number of informed intermediaries and the risk of information leakage;
- NBR\_BNK: the number of involved financial intermediaries (investment banks, financial advisors, ...) in the deal. The intuition is the same as for GOV;
- DEAL\_SIZE: the size of deal evaluated in million of dollars. More important business combinations might generate more important insider trading activities;
- FOREIGN: a dummy variable taking the value one if one of the parties is a French firm. In this case indeed, part of the insider trading activities might occur on the home stock market of the foreign firm.

## Windows

The CONTROL window (from -180 to -66) is used either to estimate the normal model coefficients or as reference period of tests of differences of means. The BEFORE window (from -65 to -6) is the period of interest. It is there that we will investigate the behavior of our market variables. The EVENT window is the one around the public announcement date. It is the window used to identify value creating and value destroying operation. Let us finally note that we do not investigate what is happening after the EVENT window. This period is not directly relevant as what concerns the test of the deterrence effect hypothesis. It is moreover known to be affected by the trading activities of arbitrageurs and to display very specific trading patterns (see Cornelli and Li (2002), Mitchell et al. (2002)).

## Statistical tests

Our univariate analyses rely on classical student tests on means (or differences of mean). Our multivariate analyses use the classical OLS estimators. The presented p-values are all two-sided bootstrap ones. Working with a limited sample size and analyzing variables for which the normality assumption is not met, we have adopted a bootstrap procedure for estimating all the presented p-values. The chosen one is the percentile t bootstrap, following the recommendation of Horowitz (2003).

If we observe any significant abnormal behavior of our variables, is it an anticipation of what will happen during the EVENT window? To answer to this question, we rely on two tests. With the first one, we regress the target variable in the event period on the before period (Bhattacharya et al., 2000).

$$INDIC_{EVENT,i} = \alpha + \beta INDIC_{BEFORE,i} + \varepsilon_i \quad (7)$$

To validate the anticipation effect, we need that  $\beta < 1$ . The regression is however a little bit ambiguous. If  $\beta < 1$ , when  $INDIC_{BEFORE}$  is high then  $INDIC_{EVENT}$  is lower. This is exactly what we want to capture. However if  $\beta < 1$  with a low  $INDIC_{BEFORE}$ , then  $INDIC_{EVENT}$  is even lower. This result makes not a lot of sense. As a consequence we run an alternative regression:

$$\begin{aligned} & |INDIC_{EVENT,i} - INDIC_{CONTROL,i}| = \alpha \\ & + \beta \frac{|INDIC_{BEFORE,i} - INDIC_{CONTROL,i}|}{|INDIC_{BEFORE,i} - INDIC_{CONTROL,i}| + |INDIC_{EVENT,i} - INDIC_{CONTROL,i}|} \end{aligned} \quad (8)$$

The interpretation is clearer: if  $\beta < 0$  we validate the anticipation hypothesis. In this case, the more important is the impact during the BEFORE period in proportion of the total impact, the lower is the reaction (in level) during the EVENT period. The point here is that the regression is maybe a little bit too mechanical.

For indicators which pass the two conditions (abnormal behavior and anticipation), if any, we need to perform a joint test of the insider trading and the deterrence effect hypotheses. To do this test we run the following regression:

$$INDIC_{BEFORE,i} = \alpha + \beta CONTR OL_i + \varepsilon_i \quad (9)$$

where *CONTR OL* is

– *ITLI \_ NBR*

– *ITLI \_ DAY*

– *ITLE \_ NBR*

– *ITLE \_ DAY*

Under the joint hypotheses of insider trading and deterrence effect, the  $\beta$  coefficient should be positive for *DAY* control variables and negative for *NBR* variables. Finally we also have completed the regressions by the *GOV*, *NBR\_BNK*, *DEAL\_SIZE*, *FOREIGN* additional variables.

## 4. Empirical results

This section is devoted to the presentation and analysis of the empirical results. Our analysis is done in two steps. First, we present the pre-announcement and announcement price movements and market activities using the cumulative average abnormal return (CAAR) and volume (CAAV). Then, using the other explanatory variables, i.e. the spread and the hidden order, we analyse the 60-day period prior to the announcement in order to see whether it is possible to infer the presence of information leakage.

### 4.1. Pre-announcement price movements and market activities

Table 5 Panel A presents the announcement effect on price for the value creating sub-sample. Panel B reports the aggregate results for the value destroying sub-sample. For Panel

A firms, the cumulative abnormal return is positive by construction (about 5.73%).<sup>18</sup> For these same stocks the CAAV is 3.599.<sup>19</sup> For the value destroying combinations, the CAAR is about -4.16% (again negative by construction). For these companies, the CAAV is about 0.237, which is around only 7% of CAAV in the value creating sub-sample.<sup>20</sup> Therefore, Table 5 shows that the level of abnormal trading is more important for value creating combinations than for value destroying ones. This will motivate the inclusion of the VALUE dummy in the regression model explaining the level of CAAV (see Table 6, Panel B, commented below in this section).

Figure 1 presents the plots of the CAAR for Panel A and Panel B firms for the event window  $t=-60$  to  $t=+30$ . For the two sub-samples, the most sizeable price movement occurs between day -2 and +2. However, the analysis of the CAAR raises questions concerning the eventual presence of some information leakage. For the value creating sub-sample, the CAAR starts to increase beginning day -30, and it reaches 2.5% between days -15 and -10. The CAAR between days -15 and -12 is 1.5%, and is significant at the level of 1% with a p-value of 0.0098. For the value destroying sub-sample, the figure puts forward a decreasing pattern of the CAAR prior to the announcement date, the most significant decrease occurring between days -38 and -30. The CAAR over this period is -2.75%, and is statistically significant at the level of 5%. The corresponding p-value is 0.024. The early occurrence of these expected trends in the event window reinforces the hypothesis of information leakage against the one of market anticipation.

Figure 2 plots the cumulative abnormal volume (CAAV) for the four sub-samples. The CAAV shows the same increasing pattern for the four panels. High trading volumes being associated with information arrivals in the market microstructure literature (see, e.g., Morse, 1980; Kyle, 1985), this is clear evidence of information incorporation in stock prices. Another important result suggested by Figure 2 is that value creating business combinations generate more volume than value destroying ones (this is the visual confirmation of results presented in Table 5). We also see that the abnormal volume associated to the rumour-less

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<sup>18</sup> We do not perform statistical significance test of the CAAR and the CAAV because the t-statistic would be biased by the classification procedure adopted to construct the value creating and value destroying sub-samples.

<sup>19</sup> Since we have used the log of the volume, which is expressed in thousand of Euro, we have to take the exponential of the CAAV in order to get the abnormal volume in value. The cumulative average abnormal volume for the value-creating sample is 36.562 thousand of Euro.

<sup>20</sup> This CAAV expressed in value gives 1.267 thousand of Euro.

sub-sample is more important than the rumour sample. A possible interpretation of this very important result is that trading turns out to be unattractive as soon as information becomes public. It also clearly leads us to suspect the presence and the exploitation of private information in the rumour-less sub-sample.

Table 6 presents the significance test of the pre-announcement price movements and market activities after controlling for the presence of rumours in the financial press. The results of this table seem to confirm the most important conclusion drawn from Figure 2: the coefficient of the RUMOUR dummy variable in Panel B (results for the cumulative abnormal volume) is negative for 5 out of 6 time-periods. It is even significant at a 10% level in the [-60,-46] time period. It seems that more trading occurs when there are no rumours to be found in the Financial press. Panel A presents the result for the cumulative average abnormal return (CAAR). We see in Panel A that the coefficient of the VALUE dummy variable is positive and significant at the 5% level for the [-45,-31] and [-15,-3] event windows, confirming the visual inspection of Figure 1, and showing an anticipation effect. The RUMOUR dummy variable is significant for the [-60,-3] event window at the 10% level, with a positive coefficient, so the behavior of the CAAR for the global pre-announcement event window is statistically higher in the rumour sub-sample. Surprisingly, results obtained for the [-45,-31] and [-15,-3] event windows are not statistically different between the rumour and rumour-less sub-samples. Again, this result seems to suggest the presence and the exploitation of private information in the rumour-less sub-sample during the [-45,-31] and [-15,-3] event windows, at least in our sample of cases.

In the next sub-section we will address in more detail the issue of information leakage by looking at the pre-announcement level of private information.

#### **4.2. Pre-announcement level of private information**

Figure 3 shows the behavior of the time-weighted percentage spread. Panel A compares the spread of firms involved in a value creating business combinations with those involved in a value destroying ones. The spread is more important during the period prior to the announcement date for both the four sub-samples. In fact, the percentage spread increases between the control and the event period prior to the announcement. The culminant point is located between days -45 and -30. Another important result is that the spread is more important for firms involved in value creating business combinations. If we assume that the

order processing cost and the inventory holding costs remain, on average, constant between the two periods through the sample of firms, this result suggests that the problem of asymmetric information is more important in this case. The informed traders seem to be more active before value creating corporate events. In Figure 3 Panel B, we compare the spread for the rumour and the rumour-less sub-samples. Again, the spread is more important during the period prior to the announcement date for both the two samples. However, the spread is more important for the rumour-less sub-sample. This suggests that the presence of information on the market tends to reduce the problem of asymmetric information between investors.

The analysis of these figures gives an important insight on the different behavior of the spread in the different sub-periods and sub-samples. But is it statistically significant? In order to address this issue we have also performed statistical significance tests by using the cross-sectional regression approach. Table 7 presents this investigation. We have considered different Panels and different event windows. In Panel A, we test if the spread variation between the control and event period is significant after controlling for the size effect. The coefficient of the variable EVT, which identifies if we are in the event period or not, is positive and significant at the level of 1%. This means that the increase of the spread between the control period and the four sub-periods prior to the announcement day is significant. With the announcement, the spread decreases to its initial level. Indeed, the coefficient EVT is not significant when we compare the control period and the first 30 days following the announcement. This is also a clear evidence of information arrival to the market. The negative MV coefficient, statistically significant at the 1% level for the three periods, clearly suggests that there is a size effect on the spread. As expected, the spread is negatively correlated to the firm size.

In Table 7 Panel B, we add an additional variable to the regression in order to see if the difference between the value creating and value destroying sub-samples is significant after controlling for the size effect. The coefficient of the variable VALUE is positive and significant at the level of 1% for both the three studied sub-periods. The value creating sub-sample firms are more confronted to asymmetric information. In Table 7 Panel C, we compare the behavior of the spread for the rumour and rumour-less sub-samples after controlling for the size effect. The coefficient of the variable RUMOUR is negative and significant at the level of 5% for the first sub-period, and the level of 1% for the two last sub-periods. The spread of the rumour sub-sample firms is significantly lesser than the spread of the rumour-less ones. Note that the difference in the spread between these two sub-samples

holds after the announcement of the operation. We see in this result a clear sign of the presence of private information in the rumour-less sub-sample before the event date.

In Table 7 Panel D, after controlling jointly for the value creation and the presence of rumours, the previous findings hold in a great extent. Moreover, informed traders seem to be significantly more active during the 15 days preceding the announcement. The coefficient of the RUMOUR variable is significant at the 1% level for this time period. For the first 45 days of the event window, even if the asymmetric information problem is more important for the value creating sub-sample, the presence of rumours leads to an insignificant decrease in the level of the spread. The spread analysis suggests the presence of asymmetric information especially for the rumour-less sub-sample when compared to the rumour one. This phenomenon seems to be present in particular during the 15 days before the announcement. The value creating business combinations are in general more subject to the presence of informed trading, regardless of the existence of rumours in the financial press, than the value destroying one. Now, the next step of our investigation consists in the study of the hidden volume so as to see if these findings hold.

### **4.3. Pre-announcement behavior of the abnormal hidden order**

Figure 4 plots the cumulative average abnormal hidden volume between days  $-60$  and  $30$  relative to the announcement date. CAAHBV and CAAHSV refer to the hidden buying and selling volume, respectively. We also plot the cumulative average abnormal return. In Panel A, we present the result of the value creating sub-sample, and in Panel B we report the result of the value destroying one. The hidden volume is expressed in log of the number of shares.<sup>21</sup> Thus, we have to keep in mind that the secondary y-axis is in log scale. In Panel A, the CAAHBV and CAAHSV have the same increasing pattern. These two curves are confounding between days  $-60$  and  $-40$ . Beginning in day  $-40$ , the buying hidden volume is systematically greater than the selling one, moreover the difference between these two curves increases with time. This is a clear indication that some investors possess information and are able to exploit it, since the moving up of the CAAHBV precedes the one of the CAAR. In Panel B, we have also the same increasing pattern for both variables. However, the selling hidden volume is greater than the buying one. In this case, investors seem to anticipate value

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<sup>21</sup> Recall that we have not used the hidden volume in value since market orders have no price limit.

destruction, but the difference between the two curves seems not to be so significant than in the previous case.

In Figure 5 we carry on the investigation by adding one more dimension. Panel A presents the result of the firms involved in a value creating business combination and for which rumours has been reported in the financial press. In this case, the CAAHBV and CAAHSV have also the same increasing pattern, but the difference between them increases exponentially from the beginning of the event window. Figure 5 Panel B considers firms involved in value creating business combinations of the rumour-less sample. When no rumour is reported in the financial press, the two curves are identical and have an increasing pattern between days  $-60$  and  $-10$ . Between days  $-10$  and  $0$ , the buying volume continues to increase while selling one decreases, this clearly suggests the presence of informed trading in this time period. However, the level of the buying and selling volume are lesser than in the case of rumours.

In Panel C of Figure 5 we report the CAAR, CAASHV and CAABHV of the rumour sub-sample firms involved in a value destroying combination. The evolution of the CAAR put into light a very interesting feature. We are confronted here to cases where the anticipations due to the rumours seem to lead to a deceptive announcement. All positive CAAR registered before the announcement date are washed in the 4 days time interval around the announcement. Hidden buying volumes are higher than the selling ones along the whole event window and this phenomenon starts well before the announcement date due to the rumours.

Panel D of Figure 5 shows the CAAR, CAABHV and CAASHV of the rumour-less sub-sample firms involved in a value destroying business combination. In this case, the pattern of the three curves is more striking. The decrease of the CAAR is followed by an important increase of the abnormal selling hidden volume. Moreover, the selling volume is greater than the buying one. The difference between the two curves increases also with time. All these findings suggest the existence of informed traders pursuing a bearish strategy at early stage of the event window.

Table 8 proposes a significance test of the difference between the rumour and rumour-less sub-samples after controlling for the value creation. Panel A and Panel B present the results, respectively, for the buying and the selling hidden volume. In Panel A, the coefficient of the VALUE dummy variable is not significant, except for the  $[-30,-16]$  event window. For

this time period the cumulative abnormal buying hidden volume is positive and significant at the level of 5%. This result suggests the presence of informed trading on the market. However, the coefficient of the RUMOUR dummy variable is also significant at a level of 10% for this time period. As a consequence the rumour sub-sample firms generate more abnormal hidden trading than the rumour-less ones. This result mitigates a little bit the previous conclusion (or is the trace of hidden order trading strategies not directly used to exploit private information). The INTERCEPT identifies the average abnormal buying hidden volume for the value destroying business combinations without rumour. It is only significant for the [-15,-3] event window. This result is compatible with the pattern observed in Figure 5 Panel C.

In Panel B, the coefficient of the VALUE dummy variable is not significant for the considered event windows. This result confirms the fact that investors seem not to use (abnormally) selling hidden volume previous to value creating business combinations. The INTERCEPT identifies the average abnormal selling hidden volume for the value destroying and rumour-less sub-sample. It is always positive without being statistically so significant. However, for the [-60,-3] and [-30,-16] event windows the coefficient is significant at a level of 15%. This result is compatible with the findings in Figure 5 Panel D and suggests the presence of some information leakage before value destroying operation on the French Market. Moreover, this conclusion is also supported by the fact that the RUMOUR dummy variable is only significant for the [-2,2] and [-15,-3] event windows. In fact, for the other considered event windows, the behavior of the abnormal selling volume is not statistically different between the rumour and rumour-less sub-samples.

#### **4.4. Determinants of the cumulative abnormal volume**

The abnormal volume increase on the market being a rather unambiguous signal of information arrival, we try to identify determinants of private information on the market. The cumulative abnormal volume is calculated on the window [-60,-10]. The explanatory variables are: the five following dummies VALUE, RUMOUR, BIDDER (equals to 1 if the firm is bidder), NONFR (equals to 1 if at least one of the parties is not a French firm) and GOV (equals to 1 if at least one of the parties is a (partially) State owned firm), SIZEOP, the size of the deal in million of dollars and NBRBK, the number of investment banks and lawyer associations involved in the operations. The tested regression equation is the following:

$$\begin{aligned}
CAV_{j,K-L} = & \alpha_0 + \alpha_1 VALUE_j + \alpha_2 RUMOUR_j + \alpha_3 BIDDER_j + \alpha_4 NONFR_j \\
& + \alpha_5 GOV_j + \alpha_6 SIZEOP_j + \alpha_7 NBRBK_j + \varepsilon_j, \quad (10)
\end{aligned}$$

P-values have been estimated by bootstrap following the same approach used up to now. Given the data availability limitations (the Thomson Mergers database does not include joint ventures), the analysis has been realized on a rather limited sub-sample of 43 firms. Moreover, an involved party partially owned by the State (GOV=1) is found in only two cases.

The results are presented in Table 9 Panel A. The most striking result is the highly negative and significant coefficient for the NONFR dummy variable: the cumulative abnormal volume is higher when operations are between French firms. Is this evidence of more important information leakages on the French stock market? To answer to this question, we have inserted in our model a new variable, INTER, which is the product of the RUMOR and NONFR dummies. Table 9 Panel B presents the results of this new regression. The coefficient of INTER is largely negative and significant. Thus, the CAV is significantly lower when we both have an operation involving at least one foreign firm and rumours concerning the operation in the financial press. We have to be cautious when drawing such a conclusion since our sample is very small (only 43 firms) and, maybe most importantly, there might be significant information leakage on the home stock market of the foreign firm.

We can also see in Table 9 Panel A that the coefficient of GOV is positive and significant at the 10% level. However, we must bear in mind that this result concerns only two firms. Finally, Table 9 panel A shows that the coefficient of NBRNK is positive but only significant at the level of 13%. A possible explanation for this coefficient seems to be that the multiplication of the number of intermediaries increases the risk of information diffusion (either public or private).

#### **4.5. Operations overlapping and statistical significance of our results**

If we take into consideration the number of analysed operations (126), the study period (5 years) and the length of the event window (60 days before the announcement date), it is clear that we must have overlaps between operations (i.e. operations for which the announcement of another operation is to be found in the event window). To test if our results are biased by the phenomenon, we perform the following test. First, we construct a variable

OVERLAP that represents, for each firm, the number of announced operations in the event window. We then run the regression of CAV on RUMOUR, VALUE and OVERLAP and compare it with the results of the regression without OVERLAP. The results are presented respectively in Table 10 Panels A and B. We find that the variable OVERLAP has no significant impact on CAV and does not change the estimated coefficients of RUMOUR and VALUE.<sup>22</sup>

#### **4.6. What happens for the anticipation and the deterrence effect hypothesis?**

To summarize we obtain significant abnormal return and volume even if there is no rumor in the financial press. Actually, in this latter case there is significantly more volume. The bid-ask spread and its asymmetric information component increase before the public announcement. The hidden quantity use is more difficult to interpret because results report no significant difference between rumors and no rumor sub-samples, but no significant increase for no rumor. All these results together are clear indicator of information leakage before public news release even in the absence of rumors in the financial press.

Consequently we have now to test if these results are due to market participants anticipation. Table 11 panel A and panel B report clear evidence of market anticipation of the news release. The average abnormal volume and the asymmetric information component of the spread are significantly inferior to one for the rumor and the no-rumor sub-samples (see equation 8). The abnormal average return is significantly inferior to one for the rumor sub-sample but not for the no-rumor sub-sample. All these results are strengthened by the second methodology (see equation 9), as all coefficients are negative and highly significant except for the CAAV when there are rumors.

Finally the cumulative average abnormal volume validates the joint test when using as indicator the number for days between the last COB announced intervention and the first day of the BEFORE period, especially for enforcement (table 12). In other words, the level of insider trading activities are lowered by the COB interventions. To test the robustness of our results, we added additional control variables (the size of the deal, the number of investment

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<sup>22</sup> In unreported results, we have run the same test on the Cumulative Average Abnormal Returns (CAAR). The coefficient of OVERLAP is positive, significant but its inclusion does not change significantly the estimation of the coefficients of VALUE and RUMOR.

banks involved in the transaction and a dummy variable equals to 1 if one firm is state-owned). Nothing is significant in the regression on CAAV. Nevertheless sample size becomes very small and ITLE\_DAY and ITLI\_DAY remain significant.

## **5. Conclusion**

One of the prime qualities of a financial market is to ensure to all investors the access to a common set of facts and information prior buying or selling assets. Our work addresses this question in the framework of business combinations on the French stock exchange. More specifically, do French firms involved in business combinations master their financial communication to the market and successfully avoid informed trading?

It has been known for a long time that business combinations have a large impact on the asset prices of the involved firms. They are the typical case where informed trading activities can be expected to occur. However, official statistics published by the *Commission des Opérations de Bourses* (COB), the French Market Supervision Authority, seem to give no reasons to worry about this phenomenon. In 1999, out of 148 operations, the COB mentions only 3 cases of illegal insider trading in its annual report.

To get more scientific evidence, we study a sample of 126 operations, involving 141 French firms, on the 1995-2000 period. Our results present clear evidence of information leakage before the public news release. This is due to significant insider trading activities. The least ambiguous indicator of insider trading is a significant increase of transactions volume in the BEFORE period. And finally we demonstrate that the COB have a deterrence effect on this behavior.

Now we have to improve the methodology to test the anticipation hypothesis, to check the robustness of the result on the deterrence effect and to look at insider trading activities' determinants.

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Table 1

**Summary statistics about sample operations**

Table 1 presents the composition of our sample of business combinations. Taking into account the availability constraint of high-frequency data on the French stock market, the covered period goes from April 1995 to December 2000. The sample selection has been realized on the basis of the information published on the the Directorate General for Competition (DGC) of the European Commission web site. We keep all operations involving at least one French firm included in the SBF 250 stock market index. This last condition is retained in order to ensure minimal conditions of liquidity. All of this leads us to a sample of 126 operations, involving 141 French quoted firms. Table 1 also put into light the significant increase in the number of operations through time as well as the split by firm role (bidder, target, joint venture).

<i>Year</i>	<i>Bidder</i>	<i>JV</i>	<i>Target</i>	<i># Firms</i>	<i># Operations</i>
1995	4	1	2	7	7
1996	3	7	3	13	11
1997	11	2	9	22	20
1998	12	5	5	22	19
1999	13	6	6	25	23
2000	17	27	8	52	46
<b>Firm Type</b>	<b>60</b>	<b>48</b>	<b>33</b>	<b>141</b>	<b>126</b>

**Table 2**  
**Firms classified as value creating at the announcement day**

Name	Role	Firm	Announcement date	Market Value (10 <sup>6</sup> EUR)	Value 2,+2)	CAR (-	Rumour
Carnaudmetalbox		Target Joint	24/05/95		17867	15.20%	No
Rhone Poulenc	Venture		21/09/95		4953	3.88%	No
Thomson-CSF		Bidder Joint	05/01/96		2041	8.70%	No
Havas	Venture	Joint	10/01/96		25444	0.46%	No
Thomson-CSF	Venture		25/03/96		2163	3.06%	No
Saint-Gobain		Bidder	08/05/96		8113	7.31%	No
Poliet		Target	08/05/96		2232	5.93%	No
UAP		Target Joint	12/11/96		39622	21.61%	Yes
Rhone Poulenc	Venture	Joint	20/12/96		8857	4.69%	No
Accor	Venture		31/01/97		3736	7.32%	Yes
Vallourec		Target	11/02/97		390	8.48%	No
de France		Dexia - Crédit Local Bidder	25/02/97		3090	8.01%	No
Suez		Bidder	26/03/97		5118	1.46%	Yes
Casino Groupe		Target	09/09/97		3285	10.65%	Yes
Worms et Cie		Target	09/10/97		3762	10.96%	Yes
Vivendi		Target	31/10/97		13754	5.07%	Yes
AXA		Bidder	27/11/97		21507	0.58%	No
Bertrand Faure		Target	11/12/97		1148	6.75%	No
Pinault Printemps		Bidder	23/01/98		11963	2.51%	No
Elf Aquitaine		Bidder	28/01/98		28243	3.17%	No
Alcatel Alsthom		Bidder	15/04/98		28611	3.84%	No
AXA		Bidder Joint	05/05/98		37078	1.94%	Yes
Renault	Venture		07/05/98		10956	7.87%	No
AGF		Bidder	17/07/98		9851	3.72%	No
Eaux		Suez Lyonnaise des Target Joint	17/07/98		24977	2.40%	No
BNP	Venture		14/09/98		11487	0.73%	No
Peugeot SA		Bidder Joint	16/10/98		6891	1.73%	No
Thomson-CSF	Venture		19/11/98		4910	5.21%	No
Synthelabo		Target Joint	02/12/98		8827	5.18%	Yes
Pechiney	Venture		13/12/98		33	0.65%	No
BNP		Bidder Joint	14/01/99		14470	1.05%	No
Paribas	Venture		22/01/99		12855	1.36%	No
Rhodia		Bidder Joint	16/03/99		2270	10.20%	Yes
Thomson-CSF	Venture	Joint	07/05/99		5218	4.62%	No
Vivendi	Venture		08/06/99		37988	2.75%	Yes
eaux		Suez Lyonnaise des Bidder	28/06/99		24441	3.80%	No
AXA		Target	13/08/99		40274	9.66%	Yes

**Table 3**  
**Firms classified as value destroying at the announcement date**

	<b>Name</b>	<b>Form Role</b>	<b>Fi</b>	<b>Annoucem ent date</b>	<b>Market Value (10<sup>6</sup> EUR)</b>	<b>Value 2,+2)</b>	<b>CAR (- our</b>	<b>Rum</b>
	Thomson-CSF	dder	Bi	24/04/95	2408		-1.96%	No
	UAP	dder	Bi	21/07/95	37973		-2.05%	No
Lyonnaise des eaux	Suez	dder	Bi	23/11/95	4386		-2.21%	Yes
	Lagardere	rget	Ta	05/12/95	1287		-0.04%	No
Alsthom	Alcatel	dder	Bi	20/12/95	9226		-2.43%	No
	CCF	nt Venture	Joi	29/03/96	2494		-7.30%	No
	Thomson-CSF	nt Venture	Joi	05/04/96	2304		-2.43%	Yes
	Suez	rget	Ta	29/04/96	5397		-2.64%	No
	Saint Gobain	nt Venture	Joi	27/06/96	8676		-0.64%	No
Allibert	Sommer-	nt Venture	Joi	09/07/96	416		-2.95%	No
	AXA	dder	Bi	12/11/96	9377		-4.49%	Yes
	Bis	rget	Ta	07/01/97	381		-14.00%	No
	Paribas	dder	Bi	01/03/97	7279		-4.00%	No
Lyonnaise des eaux	Suez	rget	Ta	26/03/97	7285		-0.12%	Yes
	Paribas	rget	Ta	26/05/97	7362		-2.43%	No
	Thomson-CSF	nt Venture	Joi	16/06/97	2843		-3.05%	No
	L'Oreal	dder	Bi	18/08/97	22978		-0.64%	No
	Promodes	dder	Bi	09/09/97	6175		-1.68%	Yes
	Lafarge	dder	Bi	14/10/97	5987		-5.38%	Yes
	Promodes	dder	Bi	18/10/97	5864		-2.37%	No
Lyonnaise des eaux	Suez	dder	Bi	08/11/97	11372		-1.38%	No
	AGF	rget	Ta	17/11/97	6219		-1.76%	Yes
	Promodes	dder	Bi	08/12/97	6695		-2.30%	No
	Vivendi	dder	Bi	10/12/97	15720		-2.13%	No
	ECIA	dder	Bi	11/12/97	658		-0.23%	No
	Thomson-CSF	rget	Ta	15/04/98	4350		-2.59%	No
	Valeo	dder	Bi	26/06/98	6865		-1.10%	Yes
	Elf Aquitaine	dder	Bi	14/07/98	35297		-2.32%	No
Dubois	Castorama	nt Venture	Joi	25/09/98	2593		-2.64%	Yes
	Vivendi	dder	Bi	07/10/98	25236		-0.95%	No
	Usinor	dder	Bi	15/10/98	2336		-3.45%	Yes
	Renault	rget	Ta	10/11/98	8591		-8.04%	No
	Total	dder	Bi	30/11/98	26261		-4.56%	Yes
Poulenc	Rhone	rget	Ta	01/12/98	14934		-4.24%	Yes
	Sanofi		Bi	02/12/98	15336		-6.68%	Yes

	dder						
		Ta					
Danone	rget	Bi	16/01/99	17292	-1.87%	No	
AXA	dder	Ta	01/02/99	44347	-2.76%	Yes	
Usinor	rget	Bi	03/03/99	2666	-2.26%	Yes	
Renault	dder	Ta	18/03/99	7674	-11.60%	Yes	
Pinault	dder	Bi	20/03/99	16911	-4.42%	Yes	
Printemps	dder	Bi	20/03/99	16911	-4.42%	Yes	
Havas	dder	Bi	22/03/99	1251	-3.72%	No	
Advertising	dder	Bi	22/03/99	1251	-3.72%	No	
Vivendi	dder	Joi	23/03/99	36467	-2.10%	No	
Paribas	nt Venture		06/08/99	16174	-5.08%	No	

Table 4

**The simple market model: summary statistics (80 individual firm regressions)**

	$\alpha$ (X10 <sup>3</sup> )	$\beta$	R <sup>2</sup>
Mean	0.12	98	34
Std. Dev.	1.	0.	0.
Minimum	3.65	34	02
1st quartile	1.34	73	22
Median	0.18	00	31
3rd quartile	13	19	46
Maximum	19	78	74

The R-square is unadjusted. The following tabulation gives percentages of individual regressions various null hypotheses are rejected. For the JB test (Jarque-Bera) the null hypothesis is “normal disturbances”; for the ARCH test the null hypothesis is “homoscedasticity”; and for the Ljung-Box statistic of order 1, Q(1), the null hypothesis is “no autocorrelation”.

p-level	Hypothesis Rejected (%)				
	=0	=0	B	RCH	A (1)
1%	.3	2.5	0.0	.5	.5
5%	.0	7.5	8.8	.8	.5
10%	.5	8.8	3.8	.8	7.5

Table 5

**Price and volume movement around the initial announcement  
of sample business combinations**

This table presents the cumulative average abnormal return (CAAR) and volume (CAAV) of the sample firms around the announcement day. Panel A encompasses firms involved in a value creating combinations, and Panel B encompasses firms involved in value destroying combinations. The used value criterion is measured by using the abnormal return (AR) cumulated from day -2 to day 2 relative to the announcement day. The AR are estimated using the simple market model, and the abnormal volume (AV) are estimated using a mean-adjusted method. The unit of the CAAV is the log of the monetary volume (thousand). Thus, the exponential of the CAAV gives de Abnormal Volume in thousand of Euro. Recall that we do not present statistical significance test of the CAAR and CAAV because the t-statistic would be biased by the classification procedure adopted to construct the value creating and value destroying sub-samples.

<b>Panel A. Value creating business combinations</b>												
<b>N=37</b>												
	<b>T</b>	<b>-5</b>	<b>-4</b>	<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
AAR	C	0.	0.	0.	0.	2.	3.	4.	5.	5.	5.	5.
		05%	45%	42%	37%	07%	20%	41%	89%	52%	65%	73%
AAV	C	0.	0.	0.	0.	0.	1.	1.	2.	2.	3.	3.
		157	398	396	400	776	243	850	514	877	277	599
<b>Panel B. Value destroying business combinations</b>												
<b>N=43</b>												
	<b>T</b>	<b>-5</b>	<b>-4</b>	<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
AAR	C	-	-	-	-	-	-	-	-	-	-	-
		0.61%	0.96%	1.10%	1.56%	1.56%	2.63%	3.59%	4.38%	4.04%	4.29%	4.16%
AAV	C	-	-	0.	0.	-	-	-	-	-	-	0.
		0.027	0.001	0.95*	1.39**	0.012	0.149	0.085	0.067	0.097	0.069	2.37**

Table 6

**Significance test of the pre-announcement price movements and market activities**

To test the significance of the pre-announcement price movements and market activities, we have performed a cross-sectional regression approach. The methodology being the same for all the considered variables, we will only present the regression equation for the cumulative abnormal return. The following equation is estimated by OLS:

$$CAR_{j,K-L} = \alpha_0 + \alpha_1 VALUE_j + \alpha_2 RUMOUR_j + \varepsilon_j,$$

where  $CAR_{j,K-L}$  is the cumulative abnormal return for firm  $j$  accumulated between  $K$  and  $L$ ;  $VALUE_j$  takes value 1 if firm  $j$  belongs to the value creating sub-sample, 0 otherwise;  $RUMOUR_j$  takes value 1 if firm  $j$  belongs to the rumour sub-sample, 0 otherwise. P-values are estimated using a Bootstrap methodology. We have considered six sub- periods of the event window. One, two and three asterisks denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

**Panel A. Cumulative Abnormal Return**

	[K-L]	Event windows					
		[-60, -3]	[-60, -46]	[-45, -31]	[-30, -16]	[-15, -3]	[-2, +2]
INTE		-	-	-	0.0	-	-
RCEPT		0.035	0.007	0.019	07	0.017	0.037***
(p-value)		(0.247)	(0.651)	(0.105)	(0.654)	(0.183)	(0.000)
VAL		0.0	-	0.0	-	0.0	0.0
UE		32	0.002	25**	0.019	28**	89***
(p-value)		(0.212)	(0.836)	(0.029)	(0.154)	(0.040)	(0.000)
RUM		0.0	0.0	0.0	0.0	0.0	0.0
OUR		83**	31*	00	41**	11	11
(p-value)		(0.018)	(0.059)	(0.993)	(0.030)	(0.314)	(0.137)
R <sup>2</sup>		0.059	0.033	0.040	0.059	0.039	0.603

**Panel B. Cumulative Abnormal Volume**

	[K-L]	Event windows					
		[-60, -3]	[-60, -46]	[-45, -31]	[-30, -16]	[-15, -3]	[-2, +2]
INTE		3.3	1.8	0.0	0.4	1.0	0.2
RCEPT		89	87*	19	74	09	46
(p-value)		(0.332)	(0.069)	(0.984)	(0.755)	(0.347)	(0.755)

UE	VAL	3.600	0.187	0.021	1.944	1.448	1.424*
value)	(p-	(0.216)	(0.796)	(0.982)	(0.142)	(0.155)	(0.061)
OUR	RUM	-	-	1.0	-	-	-
value)	(p-	3.192	1.925*	0.29	2.005	0.291	0.033
		(0.286)	(0.097)	(0.246)	(0.192)	(0.705)	(0.951)
	R <sup>2</sup>	0.017	0.027	0.009	0.029	0.016	0.027

Table 7

**Significance test of the time-weighted percentage spread for the sample firms**

A cross-sectional regression approach is used in order to test the significance of the difference in the behavior of the spread between the control period,  $[-180; -90]$ , and the event period. As event period we have considered different sub-periods of the event window. These are the followings: (1)  $[-60;0[$ ; (2)  $[-15;0[$  and (3)  $[0;30[$ . The dependent variable is an individual firm time-weighted percentage spread on the considered sub- periods. Explanatory variables are EVT, which is a variable identifying if we are in the event or the control period; MV, which is the natural logarithm of the firm's market capitalization at the announcement day; VALUE and RUMOUR which are variables identifying the considered sub-sample. All regressors except MV are dummy variables. EVT is 1 if the spread of firm  $j$  is estimated on the event period. If EVT is 0, the spread of firm  $j$  is estimated on the control period. VALUE is 1 if the firm belongs to the value creating sub-sample. If VALUE is 0, the firm belongs to the value destroying sub-sample. RUMOUR is 1 if the firm belongs to the rumour sub-sample. If RUMOUR is 0, the firm belongs to the rumour-less sub-sample. Thus, the following regression has been estimated by OLS for the considered three event periods:

$$\text{SPREAD}_j = \alpha_0 + \alpha_1 \text{EVT}_j + \alpha_2 \text{MV}_j + \alpha_3 \text{VALUE}_j + \alpha_4 \text{RUMOUR}_j + \varepsilon_j.$$

One, two and three asterisks denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

**Panel A. Global Sample**

		Control Period $\Leftrightarrow$ Event window					
		$[-180;-90] \Leftrightarrow [-60;0[$		$[-180;-90] \Leftrightarrow [-15;0[$		$[-180;-90] \Leftrightarrow [0;30[$	
$(x10^3)$	INTERCEPT	11.	***	12.	***	11.	***
		93		24		78	
	(p-value)	(0.		(0.		(0.	
		000)		000)		000)	
	EVT ( $x10^3$ )	0.2	***	0.2	***	0.0	
		7		7		1	
	(p-value)	(0.		(0.		(0.	
		000)		000)		897)	
	MV ( $x10^3$ )	-	***	-	***	-	***
		1.01		1.05		0.99	
	(p-value)	(0.		(0.		(0.	
		000)		000)		000)	
	R <sup>2</sup>	0.3		0.3		0.2	
		1		1		9	

Table 7 (continued)

**Panel B. Value creating vs. Value destroying business combinations**

		Control Period $\Leftrightarrow$ Event window					
		[-180;-90] $\Leftrightarrow$ [-60;0]		[-180;-90] $\Leftrightarrow$ [-15;0]		[-180;-90] $\Leftrightarrow$ [0;30]	
(x10 <sup>3</sup> )	INTERCEPT	11.	***	12.	***	11.	***
	(p-value)	83		14		70	
		(0.		(0.		(0.	
		000)		000)		000)	
	EVT (x10 <sup>3</sup> )	0.2	***	0.2	***	0.0	
	(p-value)	7		7		1	
		(0.		(0.		(0.	
		000)		000)		881)	
	MV (x10 <sup>3</sup> )	-	***	-	***	-	***
	(p-value)	1.01		1.05		0.99	
		(0.		(0.		(0.	
		000)		000)		000)	
	VALUE (x10 <sup>3</sup> )	0.2	***	0.2	***	0.1	***
	(p-value)	0		0		7	
		(0.		(0.		(0.	
		000)		000)		000)	
	R <sup>2</sup>	0.3		0.3		0.2	
		1		1		9	

**Panel C. Rumour vs. rumour-less business combinations**

		Control Period $\Leftrightarrow$ Event window					
		[-180;-90] $\Leftrightarrow$ [-60;0]		[-180;-90] $\Leftrightarrow$ [-15;0]		[-180;-90] $\Leftrightarrow$ [0;30]	
(x10 <sup>3</sup> )	INTERCEPT	11.	***	12.	***	11.	***
	(p-value)	93		23		77	
		(0.		(0.		(0.	
		000)		000)		000)	
	EVT (x10 <sup>3</sup> )	0.2	***	0.2	***	0.0	
	(p-value)	7		7		0	
		(0.		(0.		(0.	
		000)		000)		968)	
	MV (x10 <sup>3</sup> )	-	***	-	***	-	***
	(p-value)	1.01		1.04		0.99	
		(0.		(0.		(0.	
		000)		000)		000)	
(x10 <sup>3</sup> )	RUMOUR	-	**	-	***	-	***
	(p-value)	0.07		0.14		0.13	
		(0.		(0.		(0.	
		000)		002)		003)	
	R <sup>2</sup>	0.3		0.3		0.2	
		1		1		9	

**Panel D. Joint Test**

		Control Period $\Leftrightarrow$ Event window					
		[-180;-90] $\Leftrightarrow$ [-60;0]		[-180;-90] $\Leftrightarrow$ [-15;0]		[-180;-90] $\Leftrightarrow$ [0;30]	

(x10 <sup>3</sup> )	INTERCEPT	11.83	***	12.14	***	11.70	***
	(p-value)	(0.000)		(0.000)		(0.000)	
	EVT (x10 <sup>3</sup> )	0.27	***	0.27	***	0.00	
	(p-value)	(0.000)		(0.000)		(0.934)	
	MV (x10 <sup>3</sup> )	-	***	-	***	-	***
	(p-value)	(0.000)		(0.000)		(0.000)	
	VALUE (x10 <sup>3</sup> )	0.19	***	0.19	***	0.16	***
	(p-value)	(0.000)		(0.000)		(0.000)	
(x10 <sup>3</sup> )	RUMOUR	-		-	***	-	**
	(p-value)	(0.191)		(0.010)		(0.013)	
	R <sup>2</sup>	0.31		0.31		0.29	

Table 8

**Significance test of the difference in abnormal hidden volume between the rumour and rumour-less sub-samples after controlling for the value creation**

To test if the behavior of the cumulative abnormal hidden volume between the rumour and rumour-less sub-samples is statistically different, we have performed a cross-sectional regression approach. The following equation is estimated by OLS:

$$CAHV_{j,K-L} = \alpha_0 + \alpha_1 VALUE_j + \alpha_2 RUMOUR_j + \varepsilon_j,$$

where  $CAHV_{j,K-L}$  is the cumulative abnormal (buying or selling) hidden volume for firm  $j$  accumulated between  $K$  and  $L$ ;  $VALUE_j$  takes value 1 if firm  $j$  belongs to the value creating sub-sample, 0 otherwise;  $RUMOUR_j$  takes value 1 if firm  $j$  belongs to the rumour sub-sample, 0 otherwise. P-values are estimated using a Bootstrap methodology. We have considered six sub-periods of the event window. One, two and three asterisks denote significance at the 0.10, 0.05 and 0.01 levels, respectively.

**Panel A. Cumulative Abnormal Buying Hidden Volume**

[K-L]	Event windows						
	[-60, -3]	[-60, -46]	[-45, -31]	[-30, -16]	[-15, -3]	[-2, 2]	
INTE	3.5	-	0.1	0.1	3.4	1.1	
RCEPT	44	0.156	36	08	55**	99	
(p-value)	(0.443)	(0.934)	(0.937)	(0.934)	(0.047)	(0.173)	
VAL	2.6	0.2	-	3.6	-	-	
UE	52	39	0.462	27**	0.753	0.020	
(p-value)	(0.386)	(0.851)	(0.684)	(0.026)	(0.530)	(0.971)	
RUM	8.8	0.7	2.5	2.9	2.5	2.0	
OUR	52*	82	49*	84*	37	67*	
(p-value)	(0.074)	(0.602)	(0.088)	(0.081)	(0.101)	(0.057)	
R <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	
	28	01	18	86	19	41	

**Panel B. Cumulative Abnormal Selling Hidden Volume**

[K-L]	Event windows						
	[-60, -3]	[-60, -46]	[-45, -31]	[-30, -16]	[-15, -3]	[-2, 2]	
INTE	6.7	1.8	1.0	1.9	1.9	0.1	
RCEPT	87	32	46	66	43	11	
(p-value)	(0.128)	(0.196)	(0.429)	(0.105)	(0.372)	(0.903)	
VAL	-	-	-	0.2	-	0.6	
UE	2.342	0.969	0.720	07	0.860	30	

value)	(p-	(0.	(0.	(0.	(0.	(0.	(0.
		453)	343)	459)	808)	547)	352)
	RUM	4.6	-	1.8	0.3	3.3	1.9
OUR		38	0.885	56	05	61*	39**
value)	(p-	(0.	(0.	(0.	(0.	(0.	(0.
		224)	441)	156)	726)	071)	041)
	R <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
		11	06	18	01	20	35

Table 9

### Determinants of the cumulative abnormal volume

In order to put forward the determinants of the cumulative abnormal volume we have estimated a cross-sectional regression by OLS. The dependent variable is firm  $j$  abnormal volume accumulated between days  $-60$  and  $-10$ . The explanatory variables are the following dummy variables: VALUE, RUMOUR, BIDDER, NONFR and GOV. More precisely, VALUE equals to 1 for the value creating sub-sample firms; RUMOUR equals to 1 for rumour sub-sample firms; BIDDER takes value 1 if the firm is a bidder; NONFR equals to 1 if at least one of the parties is not a French firm; GOV equals to 1 if at least one of the parties is a (partially) State owned firm. We have also considered two other variables: SIZEOP, the size of the deal in million of dollars; and NBRBK, the number of investment banks and lawyer associations involved in the operations. P-values are estimated using a Bootstrap methodology. Panel A presents the result of this regression. In Panel B we take into account the interaction between RUMOUR and NONFR by included in the regression the variable INTER, which is the product of the RUMOUR and NONFR dummy variables.

#### Panel A – Results without taking into account the interaction between RUMOUR and NONFR dummy variables

Variables	Coefficients	t-stat	p-value
INTERCEPT	1.98	0.24	0.55
BIDDER	4.37	0.78	0.29
VALUE	0.39	0.07	0.91
RUMOUR	-6.55	-1.02	0.18
NONFR	-10.98	-1.94	0.03
GOV	5.51	0.31	0.10
SIZEOP	0.00	0.14	0.77
NBRBK	1.41	1.33	0.13
R <sup>2</sup>	0.16		

Table 9 (Continued)

**Panel B – Results with taking into account the interaction between RUMOUR  
and NONFR dummy variables**

<b>Variables</b>	<b>Coefficients</b>	<b>t-stat</b>	<b>p-value</b>
INTERCEPT	-1.53	-0.18	0.64
BIDDER	4.46	0.81	0.26
VALUE	-1.04	-0.19	0.76
RUMOUR	6.72	0.64	0.29
NONFR	-2.06	-0.26	0.52
INTER	-17.97	-1.58	0.10
GOV	0.45	0.03	0.54
SIZEOP	-0.00	-0.17	0.74
NBRBK	1.02	0.95	0.20
R <sup>2</sup>	0.22		

Table 10

**Impact of operations overlapping on the cumulative abnormal volume**

To test the impact of operations overlapping on the cumulative abnormal volume, we have performed a cross-sectional regression approach. The following equation is estimated by OLS:

$$CAV_{j,K-L} = \alpha_0 + \alpha_1 VALUE_j + \alpha_2 RUMOUR_j + \alpha_3 OVERLAP_j + \varepsilon_j,$$

where  $CAV_{j,K-L}$  is the cumulative abnormal volume for firm  $j$  accumulated between  $K$  and  $L$ ;  $VALUE_j$  takes value 1 if firm  $j$  belongs to the value creating sub-sample, 0 otherwise;  $RUMOUR_j$  takes value 1 if firm  $j$  belongs to the rumour sub-sample, 0 otherwise; and  $OVERLAP_j$  corresponds to the number of announced operations in the event window of firm  $j$ . P-values are estimated using a Bootstrap methodology.

**Panel A – Results without taking into account the overlapping**

Variables	Coefficients	t-stat	p-value
INTERCEPT	3.65	1.22	0.22
VALUE	1.74	0.46	0.65
RUMOUR	-3.78	-0.95	0.34
R <sup>2</sup>	0.015		

**Panel B – Results with taking into account the overlapping**

Variables	Coefficients	t-stat	p-value
INTERCEPT	4.49	0.98	0.12
VALUE	1.72	0.45	0.34
RUMOUR	-3.79	-0.95	0.20
OVERLAP	-0.19	-0.25	0.60
R <sup>2</sup>	0.016		

Table 11

### Market anticipation hypothesis

To test this hypothesis, we first regress the target variable in the event period on the before period (Bhattacharya et al., 2000). In Panel A, we run the following regression:

$$INDIC_{EVENT,i} = \alpha + \beta INDIC_{BEFORE,i} + \varepsilon_i \quad (7)$$

To validate the anticipation effect, we need that  $\beta < 1$ . The regression is however a little bit ambiguous. If  $\beta < 1$ , when  $INDIC_{BEFORE}$  is high then  $INDIC_{EVENT}$  is lower. This is exactly what we want to capture. However if  $\beta < 1$  with a low  $INDIC_{BEFORE}$ , then  $INDIC_{EVENT}$  is even lower. This result makes not a lot of sense. As a consequence in Panel B we run an alternative regression:

$$\begin{aligned} & |INDIC_{EVENT,i} - INDIC_{CONTR OL,i}| = \alpha \\ & + \beta \frac{|INDIC_{BEFORE,i} - INDIC_{CONTR OL,i}|}{|INDIC_{BEFORE,i} - INDIC_{CONTR OL,i}| + |INDIC_{EVENT,i} - INDIC_{CONTR OL,i}|} \end{aligned} \quad (8)$$

The interpretation is clearer: if  $\beta < 0$  we validate the anticipation hypothesis.

#### Panel A – Results with the first methodology

Regression	coeff	p-value
<b>All Sample</b>		
CAR	0.277	0.017
CAV	0.130	0.000
SPREAD	0.901	0.068
ASYM	0.611	0.000
CAHV	0.930106	0.243
CAHBP	0.86589	0.146
CAHSP	0.852736	0.112
<b>Rumor</b>		
CAR	-0.765	0.008
CAV	0.170	0.000
SPREAD	0.735	0.062
ASYM	0.551	0.040
CAHV	0.627301	0.019
CAHBP	0.631252	0.019
CAHSP	0.500843	0.049
<b>No Rumor</b>		
CAR	0.927	0.395
CAV	0.105	0.000
SPREAD	0.950	0.234
ASYM	0.627	0.006
CAHV	1.057276	0.637
CAHBP	0.981561	0.433
CAHSP	0.999225	0.445

**Panel B – Results with the second methodology**

<b>Regression</b>	<b>coeff</b>	<b>p-value</b>
<b>All Sample</b>		
CAR	-0.134	0.000
CAV	-6.001	0.002
SPREAD	-0.001	0.002
ASYM	-0.084	0.000
CAHV	-0.091	0.000
CAHBP	-0.101	0.000
CAHSP	-0.125	0.000
<b>Rum or</b>		
CAR	-0.096	0.008
CAV	-3.204	0.170
SPREAD	-0.001	0.083
ASYM	-0.081	0.015
CAHV	-0.079	0.001
CAHBP	-0.079	0.001
CAHSP	-0.127	0.000
<b>No Rum or</b>		
CAR	-0.151	0.000
CAV	-9.345	0.003
SPREAD	-0.002	0.005
ASYM	-0.085	0.000
CAHV	-0.095	0.000
CAHBP	-0.114	0.000
CAHSP	-0.123	0.000

Table 12

**Deterrence effect hypothesis**

To test this hypothesis, we perform a joint test of the insider trading and the deterrence effect hypotheses. To do this test we run the following regression:

$$INDIC_{BEFORE,i} = \alpha + \beta CONTR OL_i + \varepsilon_i \quad (9)$$

where *CONTR OL* is

– *ITLI\_NBR*

– *ITLI\_DAY*

– *ITLE\_NBR*

– *ITLE\_DAY*

Under the joint hypotheses of insider trading and deterrence effect, the  $\beta$  coefficient should be positive for *DAY* control variables and negative for *NBR* variables.

Regression	ITLE_NBR		ITLE_DAY		ITLI_NBR		ITLI_DAY	
	coeff	p-value	coeff	p-value	coeff	p-value	coeff	p-value
All Sample								
CAR	-0.023	0.378	0.000	0.549	-0.009	0.495	0.000	0.181
CAV	-3.293	0.234	0.031	0.000	-1.457	0.331	0.023	0.134
SPREAD	0.000	0.517	0.000	0.617	0.000	0.623	0.000	0.988
ASYM	0.004	0.528	0.000	0.749	0.001	0.903	0.000	0.563
No Rumor								
CAR	-0.009	0.781	0.000	0.558	0.017	0.294	0.000	0.244
CAV	-1.124	0.772	0.019	0.102	-0.033	0.990	0.032	0.091
SPREAD	0.000	0.757	0.000	0.494	0.000	0.918	0.000	0.689
ASYM	-0.004	0.687	0.000	0.450	-0.002	0.805	0.000	0.617

Figure 1. Cumulative average abnormal return of sample firms

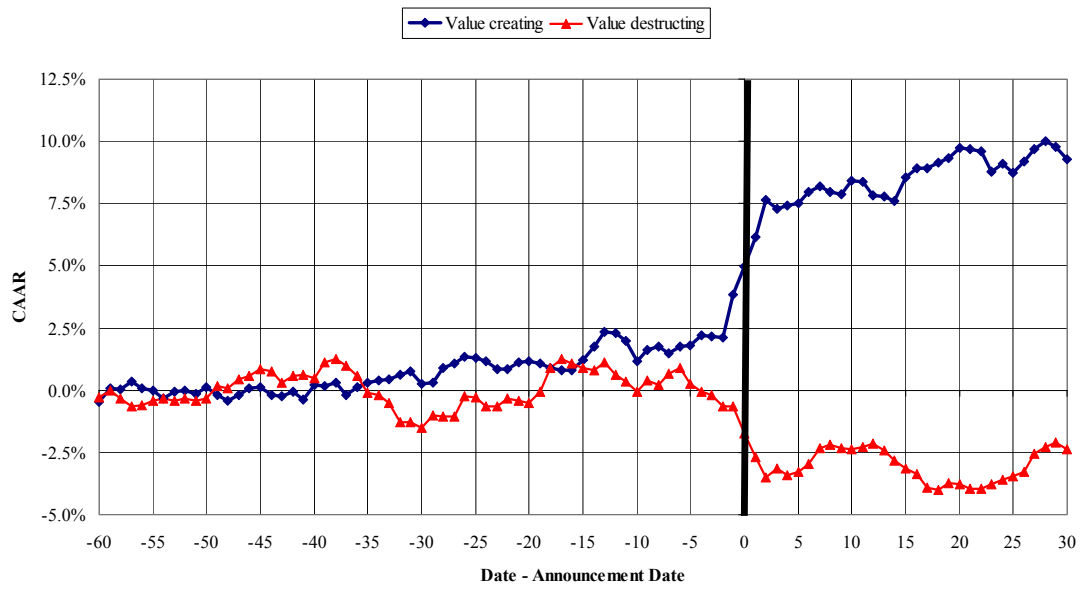


Figure 2. Cumulative average abnormal volume of sample firms

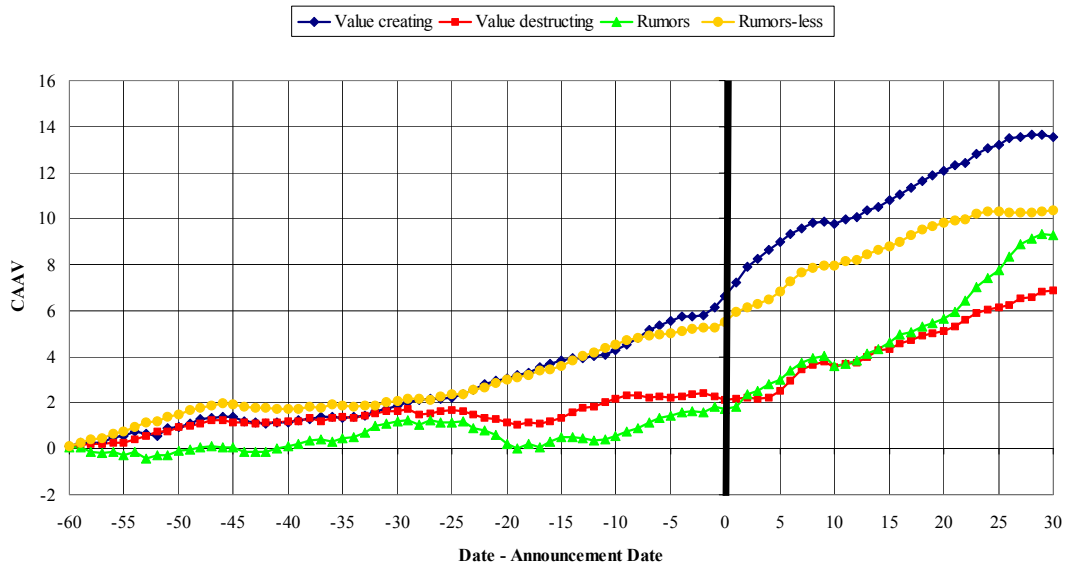


Figure 3, Panel A. Time-weighted percentage spreads of sample firms

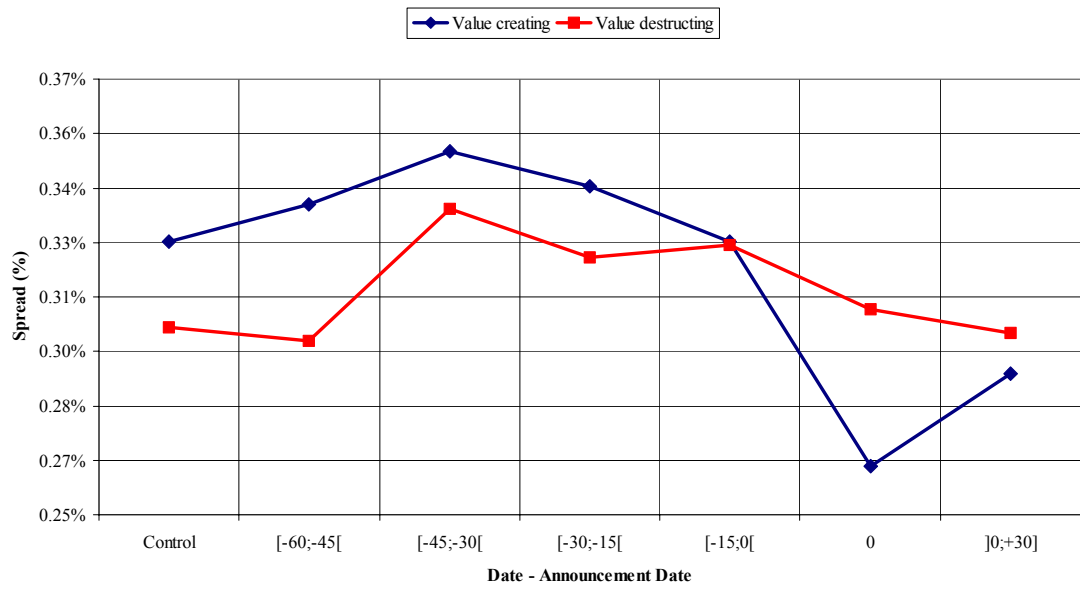


Figure 3, Panel B. Time-weighted percentage spread of sample firms

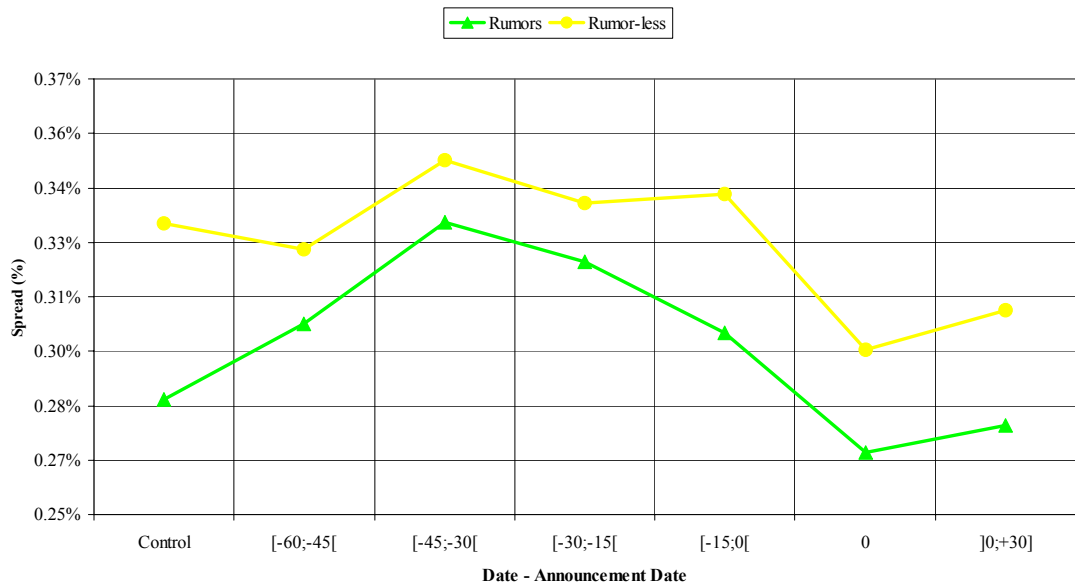


Figure 4, Panel A. Firms involved in value creating business combinations

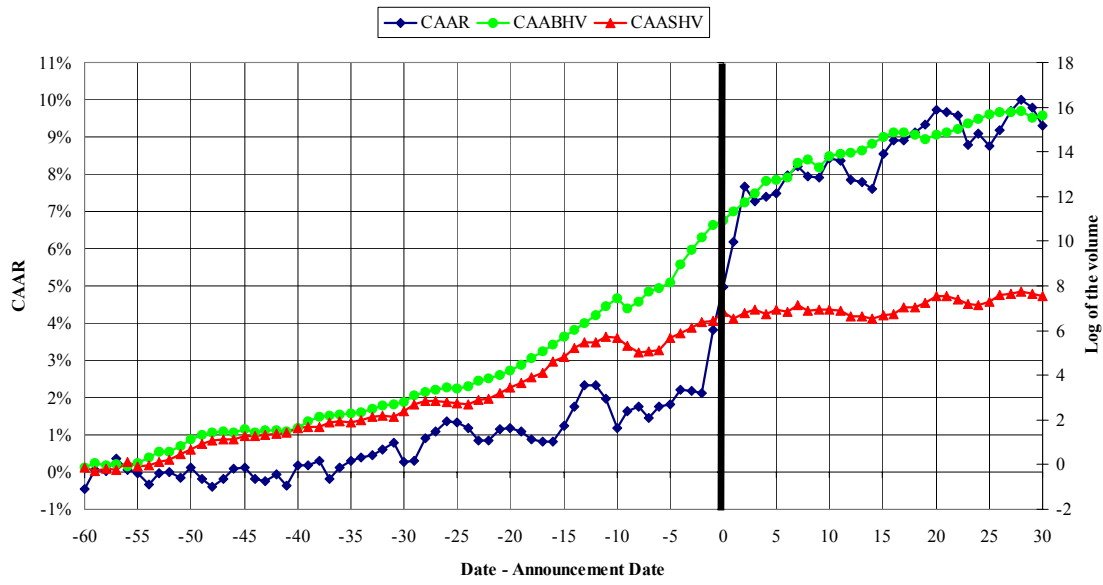
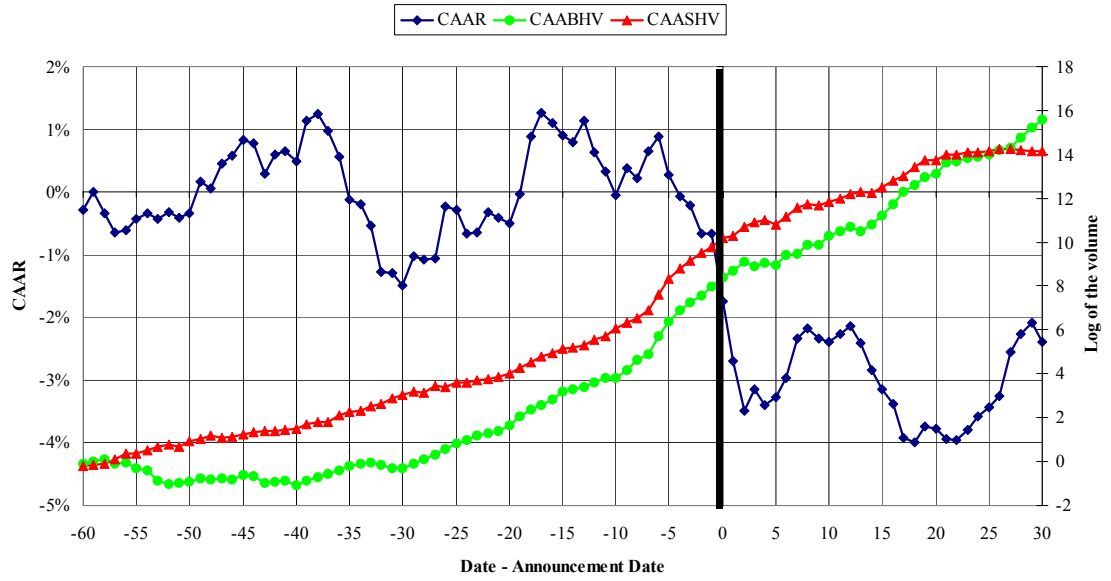
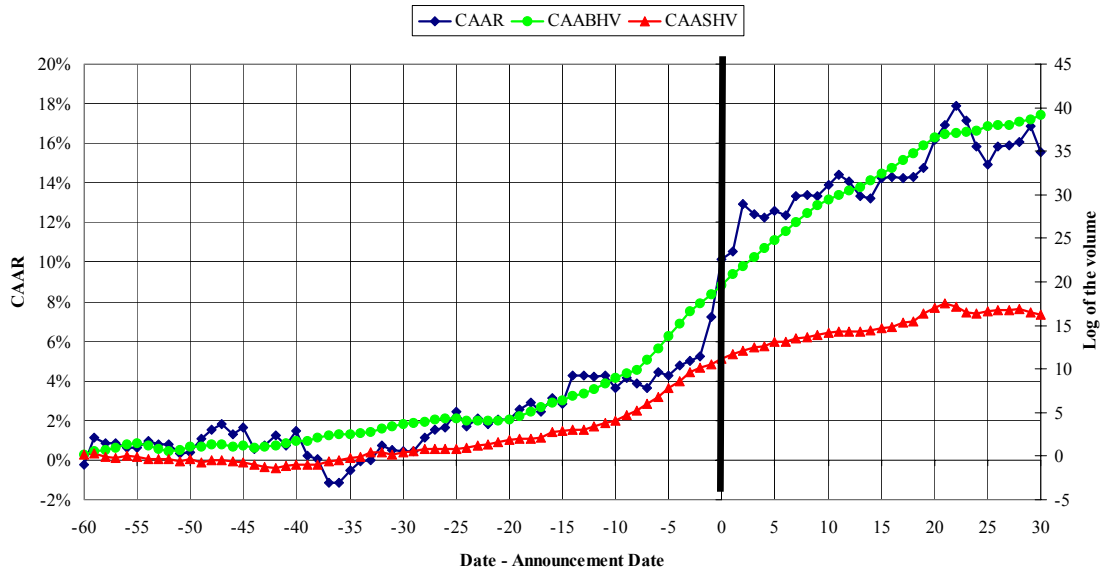


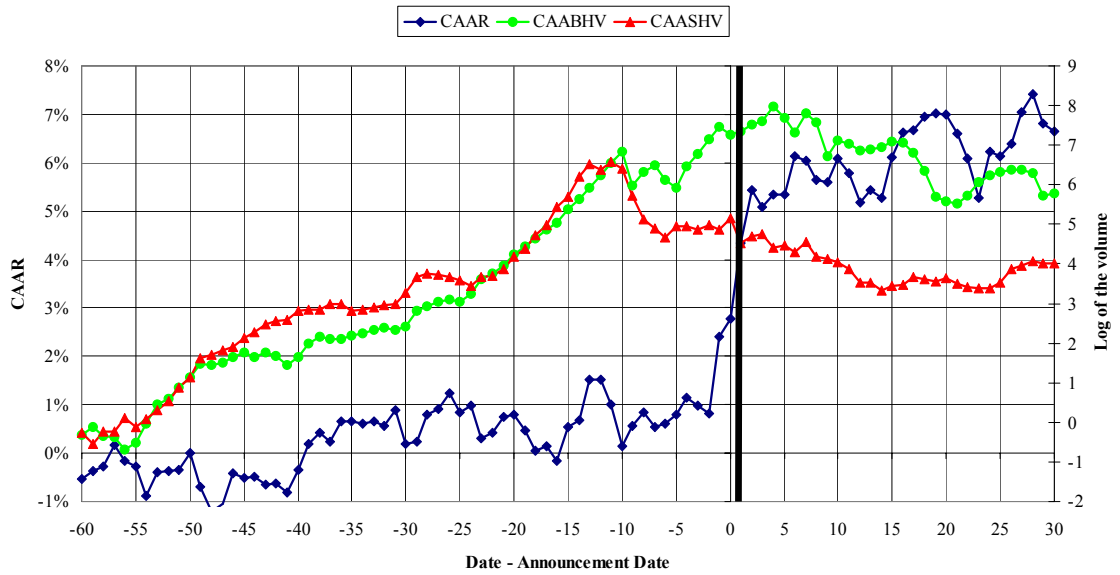
Figure 4, Panel B. Firms involved in value destructing business combination



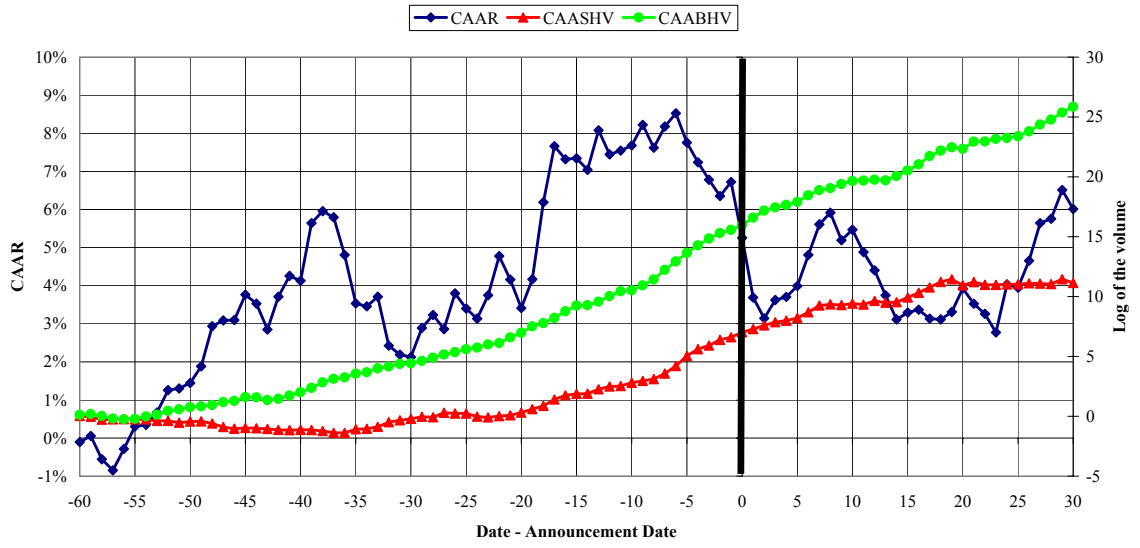
**Figure 5, Panel A. Firms involved in value creating business combinations**  
**Rumors**



**Figure 5, Panel B. Firms involved in value creating business combinations**  
**No Rumors**



**Figure 5, Panel C. Firms involved in value destructing business combinations  
Rumors**



**Figure 5, Panel D. Firms involved in value destructing business combinations  
No Rumors**

