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"SUNSHINE TRADING AND ITS IMPACT ON MARKET TRANSPARENCY"

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Introduction

The impacts on the markets are one of the key points in the analysis of several factors for those who operate in financial markets.

Through impacts we can capture the market trends, and consequently also the structure, the transparency and the prevalence of traders that operate inside a specific market.

Transparency is a fundamental element in the design and regulation of a market. It can be interpreted in different typologies and, it can often be associated with a market capacity to bring stock values as possible to what we know as fundamental value. All the markets around the world have decided to apply regulation in order to stabilize the markets and make them more efficient and transparent. The ability of participants to observe information is the principal point for a transparent market. An important aspect of transparency concerns the effect of widely publicizing information about investors latent demands present in the limit order book. The typologies of transparency regulations, however, are not always the same in all the markets of the world, and this may cause some difficulties from a valuation point of view. Transparency strategies have a great influence in relation to the regulation stabilized, for example transparency has a great influence on debates as floor versus automated trading systems, informational advantages of market-makers, and intermarket competition between trading systems with different levels of transparency.

A solution seems to be associated in favor with a particular strategic trading form, sunshine trading.

Sunshine traders are traders who announce to the market who they are, what they intend to do, the full extent of their orders, and why they intend to trade[1]. Sunshine trading works well when sunshine

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[1] Larry Harris, 2002. Trading and Exchanges: Market Microstructure for Practitioners. Oxford University Press.

traders are well known and are known to be uninformed and honest. In large markets, sunshine trading at best works only for the largest traders, since only those traders will be able to acquire credible reputation.

The strategy of sunshine trading does not work if traders suspect that the sunshine trader may be well informed or dishonest. If traders could always obtain more liquidity merely by revealing their identities, all traders would do so.

Despite several studies and traders sharing the opinion that sunshine trading could be a real solution for the great number of problems affecting the trading market, principally related to the informativeness, sometimes it could be a strategy not so efficient given the fact that to support a strategy like that, there should be some optimal conditions that in some markets are not realistically possible. Starting from this point of view, it is clear that sunshine trading before being implemented needs special interpretive rating based on associating this strategy with particular markets and particular actions.

Therefore, the study of impacts, becomes a good element; in my analysis they are studied in order to be split into temporary and permanent impacts, in this way we can understand how sunshine trading, or any other market strategy, moves the market itself, making it more transparent, and thus more informative because of its ability to reveal the fundamental value, or contrarily, more chaotic due to its ability to cause actual values from what is the fundamental-value.

Based on these comments, I decided to structure the thesis as follows.

The next section describes the transparency and its implication on the financial markets around the world, the historical evolution of capital markets and how they are organized today. Followed by a

detailed analysis of past studies dealing with the subject of transparency with appropriate personal impressions, and a study of the phenomenon of insider trading.

In chapter 2, I'm going to discuss the phenomenon of sunshine trading, who they are and what they intend to do in the markets. It follows a detailed analysis of all past studies with appropriate critical view of past literature.

In chapter 3, I examine a personal study which is based on the valuation of the equity market impact, through a trajectory cost model that divides the impacts into permanent and temporary. The dataset on which the analysis is based is composed by the last two years movement of the most common stock in the S&P 500, from January 2014 to December 2015. The data is downloaded from Google-finance and is a variation measurement of one minute's time.

 In chapter 4, connecting us to the analysis of the previous chapter, I use the feed-back of permanent and temporary impact to assess how sunshine trading effects the markets, and how this strategy might modify the same markets with a greater or lesser transparency. I try to determine how a specific drift and a particular characteristic can influence the choice of a trader. My goal is to find out a linear and clear result in order to be able to make comparison and consideration. With this analysis I will try to get a final result where a trader choose his actions giving is acceptable level of risk, the strategy adopted, the market where he/she operates and the stocks selected. This could be a good starting point to analyze all the possible strategies and all the possible scenarios that can be presented, and at the same time a good analysis to understand how operations can influence the transparency of a market.

At the end of the chapter, I made a small extension linked to other hypothetical market strategies that can occur within a market in order to make a comparison with our focal topic of the thesis, sunshine trading.

1 Transparency and its implications

Transparency is a fundamental issue in the design and regulation of markets. All the markets around the world have decided to apply regulation in order to stabilize the markets and make them more efficient and transparent. In the United States, the most important trade market, is regulated by the Securities and Exchange Commission (SEC), and its point of view is very clear: "The Commission has long believed that transparency, the real time, public dissemination of trade and quote information plays a fundamental role in the fairness and efficiency of the secondary markets.[…] Transparency helps to link dispersed markets and improves the price discovery, fairness, competitiveness and attractiveness of U.S. markets"[2].

The ability of participants to observe information is the principal point for a transparent market. An important aspect of transparency concerns the effect of widely publicizing information about investors latent demands present in the limit order book. The trading markets around the world have a lot of controversial debates, where transparency strategies have a great influence in relation to the regulation stabilized, for example transparency has a great influence on debates as floor versus automated trading systems, informational advantages of market-makers, and intermarket competition between trading systems with different levels of transparency.

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[2] *De Frutos, M.A., Manzano, C., 2002. Risk Aversion, Transparency and Market Performance. Journal of Finance.* SEC Market 2000 Study.

1.1 Capital Markets Contest and History

From a market structure we can understand many things, and sometimes we can understand why there are determined trends in respect to other markets, or why there are more trading in one market in respect to another. We can say that market structures give the big picture and focus on how and why securities trade. Today's market structure is certainly different from security traders working in 1934, a world were shouts, gestures and the floor was the essence of trading. The Securities Act Amendments of 1975 provided a significant regulatory push to create a national market system (NMS) where computers, new telecommunications tools, and the advent of information systems began to have a deep and lasting impact on the security markets. The principal points were obviously clear: higher transparency of market information, higher speed and efficiency of the market, fair trading and ensuring that orders get the best price. The last three decades have seen a lot of progress on those fronts[3]. The securities trading infrastructure was rebuilt. In a very short time, it became better, stronger and faster. However, on the other hand, it also became darker and more opaque.

The important step in understanding the transparency characteristic of a market is related to the regulation of the markets in relation to the actual contest and history, in fact every market has a different level of regulation and in many aspects they can be different and change the view and drift of a market.

Consistent with this view, all the U.S. market centers must immediately report trade price and volumes, as well as provide the best outstanding bid and ask quote to traders. Centralized exchanges

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[3] Kara M. Stein - Market Structure in the 21st Century: Bringing Light to the Dark, 2015. U.S. Securities and Exchange Commission.

are required to report all such information immediately.[4] The U.S. market based their structure on three hallmarks: competition, innovation, and growth; but, today it is really hard to say that US securities markets is the best structure.

Financial markets have resulted in an improvement of security systems, making markets stronger and, in a certain aspect, more resilient. Trades are executed in less than half a millionth of a second and, in respect to the past, markets are undoubtedly faster, providing a level of service that many could not have imagined thirty years ago.

On the contrary, today's markets are also complicated, interconnected, and fragmented. Too often the hidden parts of the market eclipse the lit parts and, complex products and strategies operate within the market which is often not well understood by investors, by the public and by regulators. This is in large part a function of the incredible technological changes that have transformed security trading. Practices and regulations that had been well-defined in the "human era" of our markets now seem obsolete, as humans have been replaced with machine-to-machine interactions. The current environment sometimes feels closer to a massive computer game than a system dedicated to allocating capital efficiently and serving investors[5].

As well as the US securities markets, it is also interesting to analyze the U.K. market. For the U.K. regulatory body the beneficial view of transparency is not universally accepted. The securities and Investment Board (SIB) has argued that there is an important difference between quote transparency and trade transparency. Of

[4] For a dispersed dealer market such as the NASDAQ, the rules are somewhat different. Before 1982, the SEC required that the NASDAQ report all equity traders within 90 seconds of occurring (Regulating Exchanges and Alternative Trading Systems: A Law and Economics Perspective 1999).

[5] Kara M. Stein - Market Structure in the 21st Century: Bringing Light to the Dark, 2015. U.S. Security and exchange commission.

particular importance is their view that there is "a tradeoff between liquidity and trade transparency". This presumed trade-off arises because knowledge of trades may expose market makers to undue risk as they unwind positions, and consequently "transparency should be restricted if this is necessary to assure adequate liquidity"[6].

The debate in the U.K. is still open and some think that restricting transparency provides major benefits to large traders and less to small traders. Still others, for example, the Office of Fair Trading (OFT) in the United Kingdom, have questioned whether restricting transparency may also reduce the speed with which market makers adjust prices, thereby reducing market efficiency[7]. Another complication is introduced by the role of quote transparency, the SIB has suggested that the dissemination of quotes may, probably, substitute for post trade information "by providing traders with sufficient information to make informed trading decisions". Currently, in the U.K. the debate is still very active and the role of quote transparency remains conjectural, and this emphasizes the general lack of knowledge surrounding the effects of transparency on market behavior.

Written in both the London Stock exchange and the Paris bourse the availability of post trade information is a subject of intense debate, where transparency issues are seen as fundamental to the competitiveness of the market. The Paris bourse was affected by many difficulties in relation to the transparency effects: the Paris market required full trade transparency, but it lost trading volume compared to the London Stock exchange where transparency was restricted. Paris changed from a transparent to a less transparent regime for large trades in attempt to resume trade quantity[8].

 Regarding the Paris Bourse, trade takes place anonymously for many stocks. According to exchange officials concealing trader

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[6] SIB discussion paper feb.1994
[7] Franks and Shaefer 1995
[8] Gemmil 1996.

identity reduces the opportunity for the market to identify the transactions of liquidity providers and engage in trading practices that make it more costly to unwind inventory positions.

However, a more anonymous market structure protects the identities of informed traders. By increasing the effective amount of noise in the market, anonymity may permit insiders to better exploit their private information. Equally, in the case of Paris bourse (but also for the other markets that decided to make these decisions), this results in larger adverse selection risk and wider bid-ask spreads.

1.1.1 Financial Markets today

Looking at the past we can see without uncertainty that the US market was the most important market in the world, but given the fact that the market quality, uncertainty and of course transparency has a crucial role for the actual efficiency something has changed compared to the past.

London has dethroned New York as the world's top financial center, according to an index released by the Geneva-based World Economic Forum (WEF)[9].

The most interesting data is given by the WEF Financial Development Index where 55 countries are ranked taking into account the technological development and the stability of their financial systems and markets. The nations were studied according to more than 120 criteria, ranging from the favorableness of their institutional and business environments to the size of their equity and bond markets, and from their technology infrastructure and human capital to the ease of obtaining consumer and commercial loans.

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[9] Tim Wallace, 2015. Telegraph, finance, banks and finance.

Perhaps the biggest surprise in this study, was that Britain take the N°1 position even if it has its economic problem. Britain's problems are not principally related to the finance structure but from a division structure, many people think that Britain give too much power to London as epicenter and low consideration around the big city, but, as a matter of fact the financial sector is based on London and in particular is buoyed by the relative strength of its financial markets, particularly in foreign exchange and derivatives, and by its world-beating insurance coverage.

The relevant news, perhaps not as surprising, was that the U.S. goes down from N° 1 to N° 3. USA are still far from the wealthiest, taking into account the financial instability, the transparency problem and an alarming weakened banking. As a matter of fact, the Britain position has a weak stability. The country continues to be weighed down by recession, principally given by a structural unbalanced economy, while the U.S. reported a return to growth in gross domestic product.

Other aspects can explain the prediction above, for example the Britain government has been criticized in recent months for excessive intervention in the financial sector, and there is rising concern over increased regulation and higher tax rates, which could encourage London-based hedge funds and other financial intermediaries to move elsewhere. To be clear, the evaluation of the top developed nation goes down critically, principally because of the effects of the credit crisis, hence the first places that suffered the most from lowered financial stability was the largest industrialized economies. On the contrary, emerging economies have a good position, they can improve their markets in order to destroy the gap, and with an optimal structural base they can do it, considering the transparency and their consequences as a crucial element that is the reason why the crisis is so strong in the top countries. The principal problems for these countries are underdeveloped infrastructures, murky legal and regulatory regimes, or weak corporate governance; only a few countries have good financial

access for consumers and small businesses, as measured by the availability of credit and the penetration of retail banking services such as savings accounts, microcredit, branch offices, and point of sale financial services.

Top nations still hold a vast edge aside from the relative strengthening achieved by developing countries, the most intriguing result for the researchers who put together this study was that Australia leapfrogged over the U.S. The Australian market is in greater expansion principally thanks to the great possibility of investment and a relative new strong financial structure that gives the opportunity to consider this country as one of the best performers in the world. "While we expected the relative stability of the Australian banking system to strengthen the country's ranking, we were surprised at just how significantly its overall ranking jumped[10]".

Apart from Australia, all of the countries in the top 10 saw significant declines in their overall scores, registering a strong decline. This shows how badly the economic crisis impacted on most major financial systems. What allowed countries such as Britain and the U.S. to remain near the top of the list, despite big hits to their financial stability, was the breadth of other factors taken into consideration in the most important rankings. However, their markets have been volatile, these and other top-ranked countries still offer deeper pools of capital, more financial transparency, and a host of other institutional and infrastructural advantages that will likely keep them among the leaders in financial development for years to come[11].

The drop in scores for both the U.K. and the U.S. indicate that their leadership is clearly unstable, the alarming discovery is the facility of how scores have dropped and their relative distance to other countries has diminished.

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[10] James Bilodeau of the World Economic Forum, who co-authored the study with Roubini
[11] Leona Liu – Global Finance: Britain is No. 1. Bloomberg Business.

1.2 Transparency and market quality

One important question is if the transparency is really so important for the market quality and in which way affects market behavior.

Transparency can be viewed in different ways but from our analysis it is centralized on the ability of market participants to observe the pending trading interests of other participants, or in other words, the content of the limit order book, and then of course the possibility to share the intention in a certain time, later or before.

Knowledge about buying and selling, taking into account our intention and others' intentions, can be used both to refine one's inference about the value of a security and to strategically plan the execution of a trading goal to minimize transaction costs.

A lot of authors have tried to analyze these aspects but in any case no definitive answer has emerged, this is likely to be related to the heterogeneity of the markets around the world with different characteristics and ways to do trade.

Generally, everyone accepts the concept of a better quality market in relation to transparency, but maintaining market transparency is problematic. Publicly available quote and trade data are certainly characteristics of transparent markets, but so too much data on trade size, their identity, order type, and the size and distribution of any limit orders, on the other side restricting the transparency debate to trade and quote data could report wide disparity in predicted effects. Past studies found that transparency matters because patterns in trades, such as imbalances of buying or selling orders across the market, may be more easily discerned in trans-

parent markets. This allows market makers to learn any information from trades more quickly, and thereby set their price more efficiently.

There are a lot of important points to analyze and various hypothesis to observe the transparency and the quality result in consequence to its application; we generally expect that the transparency increase the informational efficiency and, as a consequence of that, the bid-ask spread decrease, which is an important element to say that the efficiency of information is really strong.

Transparency, as a consequence of what I mentioned previously, affect also the gain and loss of traders, the reduced ability of informed traders to trade on their information in transparent markets should translate into lower rents for informed traders and higher rents for uninformed traders. There are also other points of view, for example the trading strategies of uninformed traders may differ between transparent and nontransparent settings, dictating a complexity to predicting their actual trading rents in each setting. However, while greater informational efficiency dictates that the midpoint of the spread is closer to the true value, this does not necessarily mean that the spread is smaller.

In relation to these aspects, the characteristics of the other traders in a specific market might be important. From an uninformed point of view it could be more effective a less transparent venue, as it facilitates their ability to hide the liquidity they need from the market. This reflects another problem related to the market quality, if a market maker knows that a large uninformed trader is buying this may set higher prices to take advantage of these trading needs[12].

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[12] Roell 1990

1.3 Who benefits from transparency? Literature review

In reference to the past studies we are not able to make a strong decision in relation to transparency, many times the research gives an ambiguous result and takes a position in relation to that is really difficult. However, I will try to explain the most interesting studies taking from pro-research and con-research.

De Frutos and Manzano in "Market transparency, market quality, and sunshine trading" have examined the effects disclosing information about the price-insensitive component of the order flow on the market quality, analyzing first a fully transparent market and then a fully opaque market.

For the tractability of the analysis, they focus the analysis on the symmetric linear rational expectation equilibrium (SLE), the results are the following:

If there exist a SLE, then:

$$\mu = \frac{2a}{\rho \sigma_v^2 (N - (N-1)\alpha)} \bar{v} - \frac{\frac{N-2}{N-1}\alpha}{N - (N-1)\alpha} \bar{z},$$

$$\beta = \frac{\alpha}{\rho \sigma_\epsilon^2},$$

$$and$$

$$\gamma = \frac{\alpha}{\rho \sigma_\epsilon^2}\left(1 + \frac{2\sigma_\epsilon^2}{(N - (N-1)\alpha)\sigma_v^2}\right). \qquad (1)$$

If there exists a SLE, $\alpha \in (0, (N-2)/(N-1))$. In addition, this coefficient is a root of a polynomial of third degree $Q(a) = aa^3 + ba^2 + ca - d$, whose coefficients are given by $a = (\phi + 1)(N-1)2$, $b = (N - \phi(N-2))(N-1)$, $c = (N-1)\varphi$, and $d = \varphi(N-2)$, with $\phi = \rho^2 \sigma_\varepsilon^2 \sigma_w^2$ and $\varphi = \rho^2 \sigma_\varepsilon^2 \sigma_z^2$. When $\sigma_z^2 \neq 0$, there exists a unique SLE iff $N \geq 3$, on the other side when $\sigma_z^2 = 0$, there exists a unique SLE iff $N < (N-2)\phi$.

Under the opaque market $\sigma_z^2 > 0$, meanwhile in the transparent market $\sigma_z^2 = 0$. Substituting this value in the equations above:

A SLE in an opaque market exists iff $N \geq 3$. If it exists, then:

$$\mu^0 = \frac{2\alpha^0}{\rho(N - (N-1)\alpha^0)\sigma_v^2}\bar{v}, \quad (2)$$

$$\beta^0 = \frac{\alpha^0}{\rho\sigma_\varepsilon^2},$$

$$and$$

$$\gamma^0 = \frac{\alpha^0}{\rho\sigma_\varepsilon^2}\left(1 + \frac{2\sigma_\varepsilon^2}{(N - (N-1)\alpha^0)\sigma_v^2}\right), \quad (3)$$

Where α^0 is the unique real root belonging to $(0, (N-2)/(N-1))$ of the polynomial of degree three $Q(\alpha)$.

A SLE in a transparent market exists iff $N < (N-2)\phi$. If it exists, then:

$$\mu^T = \mu_0^T - \mu_1^T z = \frac{2\alpha^T}{\rho(N - (N-1)\alpha^T)\sigma_v^2}\bar{v} - \frac{\frac{N-2}{N-1}\alpha^T}{N - (N-1)\alpha^T}z,$$

$$\beta^T = \frac{\alpha^T}{\rho\sigma_v^2}, \quad (4)$$

And

$$\gamma^T = \frac{\alpha^T}{\rho\sigma_\epsilon^2}\left(1 + \frac{2\sigma_\epsilon^2}{(N - (N-1)\alpha^T)\sigma_v^2}\right)$$

Where $\alpha^T = \phi(N-2) - N)/((\phi + 1)(N-1))$.

Using the expression of α^T, it follows that the coefficient associated with z, i.e., $-\mu_1{}^T$, is equal to $-1/(N+\phi)$. The negativity of this coefficient indicates that in the transparent market, strategic traders place orders that partly accommodate the noise demand.

Next the model analyzes the impact of transparency on the strategic behavior of investors, as it influences the existence of equilibrium, as well as the price intercept and slope of trades' demands.

If a SLE exists for a transparent market, it exists also for the opaque market. The condition for existence in the former, $N < (N-2)\phi$, must meet $N > 2$ but, as N is natural number, then it requires $N \geq 3$. The result is that trading is more robust in the opaque market than in the transparent market (transparency may induce a form of market failure).

Transparency has two main effects: firstly an increment in the price of the risk asset makes agents more optimistic about its liquidation value, which leads to a smaller reduction in the individual demands as compared to the opaque market; secondly, demands become less sensitive to traders' liquidity shocks and private signals. As a consequence of that, transparency in a market makes demands less sensitive to private information and anonymity.

Hence, transparency reduces endogenous liquidity trading making less risk sharing ($\alpha^T < \alpha^O$), makes orders less responsive to private information about the liquidation value ($\beta^T < \beta^O$), and reduces demands' price-responsiveness ($\gamma^T < \gamma^O$).

Even more interesting is the analysis in relation to market quality. The precision of the information taken by informed traders is very important on this point in this model is measured by var$^{-1}(\tilde{v}|p,I_n)$, another important element is the informational content of the equilibrium price, which captures the information revealed by prices to uninformed traders, measured by var$^{-1}(\tilde{v}|p)$. These two measures are measured at the time in which the trade is made and z is realized, if there is uncorrected transparency the informed traders take more precision from their private information.

Prices are more informative in the transparent market iff the following inequality holds:

$$\alpha^0 < \frac{\alpha^T}{1 - N\mu_1^T} = \frac{(N + \phi)(\phi(N - 2) - N)}{\phi(\phi + 1)(N - 1)}. \qquad (5)$$

Notice that from the expressions of the market clearing price, given by:

$$\widetilde{\rho^0} = \frac{1}{N\gamma^0}\left(N\mu^0 + \beta^0 \sum_{j=1}^{N} \widetilde{s_j} - \alpha^0 \sum_{j=1}^{N} \widetilde{w_j} + \tilde{z}\right) \qquad (6)$$

And

$$\tilde{p}^T = \frac{1}{N\gamma^T}\left(N\mu_0^T + \beta^T \sum_{j=1}^{N} \widetilde{s_j} - \alpha^T \sum_{j=1}^{N} \widetilde{w_j} + (1 - N\mu_1^T)\tilde{z}\right), \qquad (7)$$

It follows that

$$var^{-1}(\tilde{v}|p^0) = var^{-1}\left(\tilde{v}\left|\frac{1}{\rho\sigma_\epsilon^2}\sum_{j=1}^{N} s_j - \sum_{j=1}^{N} w_j + \frac{z}{\alpha^0}\right.\right) \quad (8)$$

And

$$var^{-1}(\tilde{v}|p^T) = var^{-1}\left(\tilde{v}\left|\frac{1}{\rho\sigma_\epsilon^2}\sum_{j=1}^{N} s_j - \sum_{j=1}^{N} w_j + \right.\right.$$
$$\left.+ \frac{(1-N\mu_1^T)z}{\alpha^T}\right) \quad (9)$$

From these studies they derived that prices are more informative in the transparent market if $\alpha^O < \alpha^T/(1-N\mu_1^T)$.

The information given by the price is affected by transparency in a different way, first it reduces endogenous liquidity trading ($\alpha^O > \alpha^T$), hence the price is less informative; transparency also facilitates noise trading ($\mu_1^T > 0$), leading prices to instances when transparency increases price revelation.

If σ_z^2 is small enough, then α^O approaches α^T making the first effect insignificant. As the second effect is independent of σ_z^2 transparency increases the informational content of prices. Similarly, if ϕ is large enough, then transparency increases the information given by the prices. The first effect is not very significant as $\alpha^O - \alpha^T$ is small when ϕ is large. The second effect, despite being small as well, becomes the dominant one.

Other aspects considered in order to measure the impact of transparency on market liquidity is to compare market depth in the two market structures.

Market depth is given by:

$$\left(\frac{\partial \tilde{p}^0}{\partial \tilde{z}}\right)^{-1} = N\gamma^0 \quad and \quad \left(\frac{\partial \tilde{p}^T}{\partial \tilde{z}}\right)^{-1} = \frac{N\gamma^T}{1 - N\mu_1^T}. \quad (10)$$

From the equation of Kyle(1989) where in a SLE the optimal demand function for trader n is given by:

$$q_n(p; I_n) = \frac{E(\tilde{v}|p, I_n) - p - \rho var(\tilde{v}|p, I_n)w_n}{\frac{1}{(N-1)\gamma} + \rho\, var(\tilde{v}|p, I_n)} \quad (11)$$

And the market clearing condition, it follows that

$$p = \frac{\sum_{n=1}^{N} E(\tilde{v}|h_n^M, s_n) + \left(\frac{1}{(N-1)\gamma^M}\right)z + \left(z - \sum_{j=1}^{N} w_n\right)\rho var(\tilde{v}|h_n^M, s_n)}{N} \quad (12)$$

With

$$h_n^M = \beta^M \sum_{j=n} s_j - a^M \sum_{j=n} w_j + \delta_{\{M=0\}}z, \quad M = 0, T \quad (13)$$

Noise trading affects market price through three aspects captured by three terms shown in the equation above: an adverse-selection effect, a strategic-behavior effect, and a risk-bearing effect.

The adverse-selection effect is captured by the first term via h_n^M. And increases in z increases h_n^O without affecting h_n^T.

Speculator *n* can understand that an increment could be done through receiving favorable signals of his competitors about the payoff of the risk asset. As a consequence of that way of thinking, speculator adjusts his forecast upwards, which generates a price boost.

The strategic-behavior effect, the second term $z/((N-1)N\gamma^M)$, measures the competitiveness of the market or its size via N, as well as price sensitivity of strategic traders' demands. As in a transparent market traders are less price-sensitive, this effect is deeper in the transparent market. The market-clearing price induces risk-averse speculators to trade (there is a risk-bearing effect). As speculators are better informed in the transparent market, this third effect is more important in the opaque market.

When N converges to infinity, the strategic-behavior effect vanishes. The equilibrium price is unambiguously more sensitive to changes in the noise demand in the opaque market. The transparent market is deeper.

Sufficient condition for obtaining a larger market depth in a transparent market are given by:

$$\frac{\sigma_\epsilon^2(1+\phi)}{N\sigma_v^2} + \left(1 - \phi\frac{(N^2 - 4N + 2)}{N^2}\right) < 0, \qquad (14)$$

This equation suggests that the comparison of the market liquidity between the two market structures is ambiguous and depends on the parameter specification. When σ_z^2 is small enough, α^O is close to α^T, making γ^O-γ^T very small, so that transparency increases market depth. Regarding the sufficient condition in the proposition above, its intuition is less clear. When N converges to infinity, it simplifies to $1<\phi$. This inequality coincides with the condition that guarantees the existence of the SLE in very competitive markets.

Thus, transparency increases market liquidity if the market is sufficiently competitive. Also the analysis of liquidity is important, on the research DL, which represents the difference in liquidity between the two markets:

$$DL = \left(\frac{\partial \tilde{p}^0}{\partial \tilde{z}}\right)^{-1} - \left(\frac{\partial \tilde{p}^T}{\partial \tilde{z}}\right)^{-1} = N\gamma^0 - \frac{N\gamma^T}{1 - N\mu_1^T}. \quad (15)$$

The figure shows the difference in liquidity, DL, in terms of σ_z^2 for different value of N. The solid curve corresponds to N=10, the dashed one to N=20, and the dotted one to N=30. A negative value of DL indicates that the transparent market is deeper. In the limit when N goes to infinity, the transparent market is more liquid for all σ_z^2.
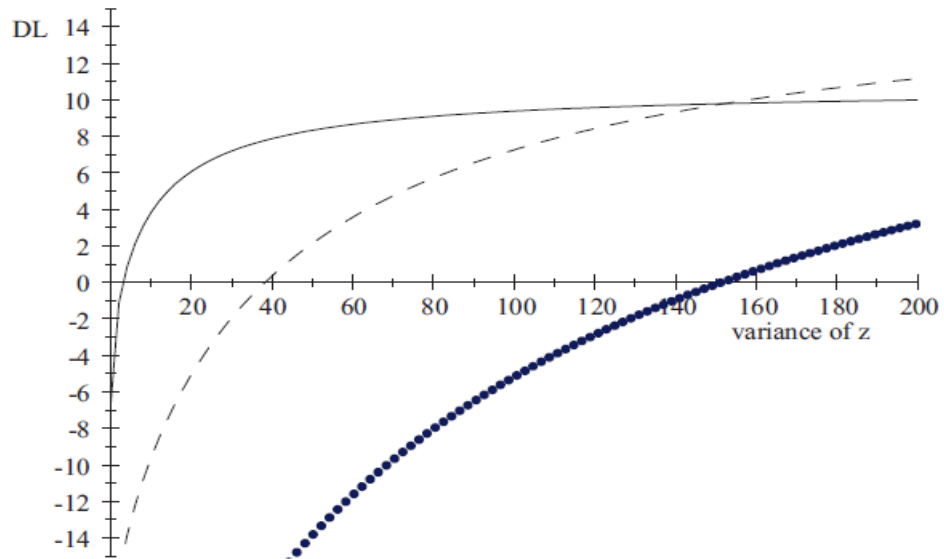

Figure 1

In order to analyze transparency, volatility is also crucial. It is measured by var($\tilde{v}$-p^M). Straightforward computations yield:

$$\tilde{v} - \tilde{p}^0 = \tilde{v} - \frac{\mu^0}{\gamma^0} - \frac{\beta^0}{\gamma^0}\frac{\sum_{j=1}^N \tilde{s}_j}{N} + \frac{\alpha^0}{\gamma^0}\frac{\sum_{j=1}^N \tilde{w}_j}{N} - \frac{1}{N\gamma^0}\tilde{z} \quad (17)$$

And

$$\tilde{v} - \tilde{p}^T = \tilde{v} - \frac{\mu_0^T}{\gamma^T} - \frac{\beta^T}{\gamma^T}\frac{\sum_{j=1}^N \tilde{s}_j}{N} + \frac{\alpha^T}{\gamma^T}\frac{\sum_{j=1}^N \tilde{w}_j}{N} + \frac{1 - N\mu_1^T}{N\gamma^T}\tilde{z} \quad (18)$$

Therefore

$$var(\tilde{v} - \tilde{p}^M) = \left(\partial\frac{\tilde{p}^M}{\partial\tilde{z}}\right)\sigma_z^2 + g(\alpha^M, r) \quad (19)$$

With

$$g(\alpha^M, r) = \left(1 - \frac{\beta^M}{\gamma^M}\right)^2 \sigma_v^2 + \left(\frac{\beta^M}{N\gamma^M}\right)^2 N\sigma_\epsilon^2 + \left(\frac{\alpha^M}{N\gamma^M}\right)^2 N\sigma_W^2, \quad (20)$$

Where r stands for the quotient $\sigma_\epsilon^2/\sigma_v^2$. Substituting the values of the equilibrium coefficients, $g(\alpha^M, r)$ simplifies to

$$g(\alpha^M, r) = \frac{\sigma_\epsilon^2\left(4Nr + (\phi + 1)\left(N - \alpha^M(N - 1)\right)^2\right)}{N(N - \alpha^M(N - 1) + 2r)^2} \quad (21)$$

To analyze the difference in price volatility,

$$DV = var(\tilde{v} - \tilde{p}^0) - var(\tilde{v} - \tilde{p}^T), \quad (22)$$

The model decomposes into two terms, DV_1 and DV_2, with

$$DV_1 = \left[\left(\frac{\partial \tilde{p}^0}{\partial \tilde{z}}\right)^2 - \left(\frac{\partial \tilde{p}^T}{\partial \tilde{z}}\right)^2\right]\sigma_z^2 \qquad (23)$$

And

$$DV_2 = g(\alpha^0, r) - g(\alpha^T, r). \qquad (24)$$

The term DV_1, shows that the difference in price volatility stems from the difference in market liquidity, DL. There is also the presence of a second term DV_2 that affects the difference in price volatility by other factors.

If DV_2 vanishes or it is small enough, then:

$$\begin{aligned}
sign(DV) &= sign\left[\left(\frac{\partial \tilde{p}^0}{\partial \tilde{z}}\right)^2 - \left(\frac{\partial \tilde{p}^T}{\partial \tilde{z}}\right)^2\right] \\
&= -sign\left[\left(\frac{\partial \tilde{p}^0}{\partial \tilde{z}}\right)^{-1} - \left(\frac{\partial \tilde{p}^T}{\partial \tilde{z}}\right)^{-1}\right] \\
&= -sign(DL) \qquad (25)
\end{aligned}$$

There is an inverse relationship between price volatility and market depth, this indicates that the mechanism with greater market price volatility provides the lower market depth.

Another set-up in which an inverse relationship between market depth and price volatility emerges in large markets, from the studies:

$$\lim_{n\to\infty} var\left(\tilde{v} - \tilde{p}^0\right) = \lim_{n\to\infty} var(\tilde{v} - \tilde{p}^T) = 0 \qquad (26)$$

Consequently

$$\lim_{N\to\infty}\left[var(\tilde{v}-\tilde{p}^{\cdot O})-var(\tilde{v}-\tilde{p}^T)\right]=0. \qquad (27)$$

The analytical derivation of sufficient conditions on the primitives that guarantee a direct relationship between price volatility and market depth is not easy. For instance, if

$$\frac{\sigma_\varepsilon^2(1+\phi)}{N\sigma_v^2} + \left(1-\phi\,\frac{(N^2-4N+2)}{N^2}\right) > 0 \qquad (28)$$

Hence, exist a unique value of σ_z^2, say $\tilde{\sigma}_z^2$ for which volatility and liquidity are aligned.
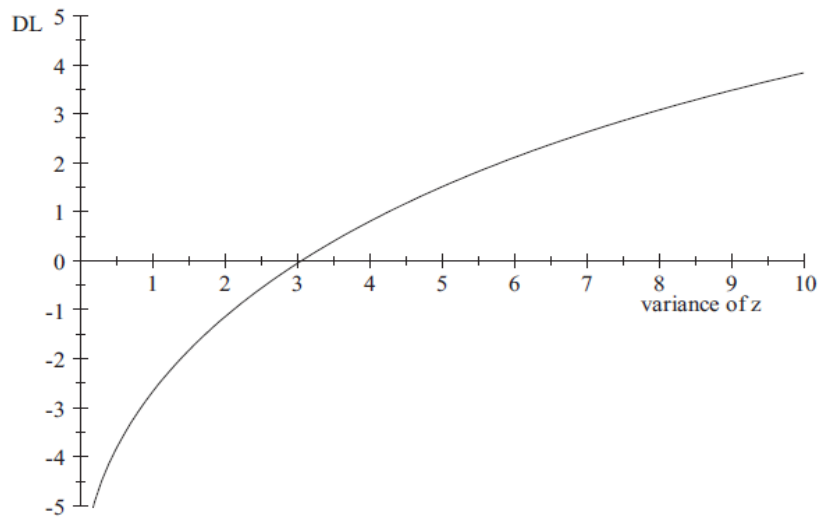
Figure 2
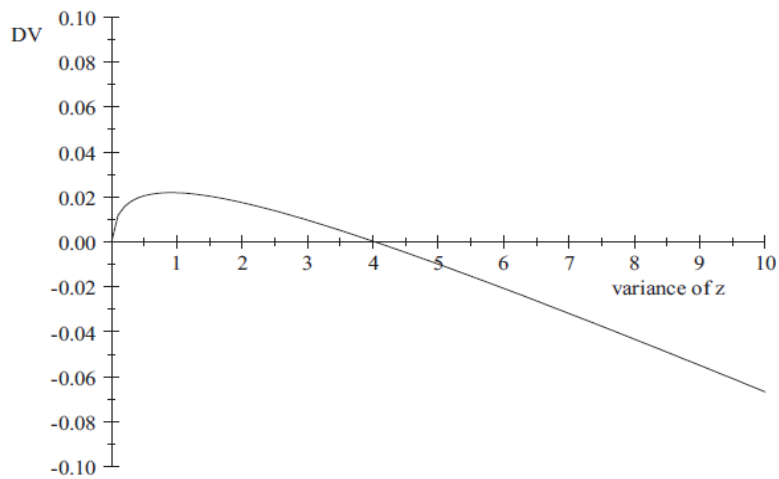
Figure 3

The two figures above expose a particular case in which (27) holds. In figure 2, DL is showed in terms of c for $N=10$, $\phi=2$, $\sigma_\varepsilon^2=10$, $\sigma_v^2=0.5$, and $\rho=1$. The result is $\tilde{\sigma}_z^2=3.052$. Thus, when $\sigma_z^2<3.052$, the transparent market is more liquid, whereas when $\sigma_z^2>3.052$, the opaque is deeper.

Figure 3 represents DV as a function of σ_z^2 for the parameter configuration: N=10, ϕ=2, σ_ε^2=10, σ_v^2= 0.5, and ρ=1. One can observe how for low values of σ_z^2 (σ_z^2<4.030), the price volatility is higher in the opaque market, whereas for σ_z^2>4.030, the opposite holds true. Therefore when $\sigma_z^2 \in$(3.052, 4.030), the opaque market is both more liquid and volatile.

Figure 4

Figure 4A displays the differences in volatility in terms of σ_z^2 for different values on N. The solid curve corresponds to N=10, the dashed one to N=20, and the dotted one to N=30 (as N increments the parameter configuration set in which the transparent market is less volatile for all σ_z^2).

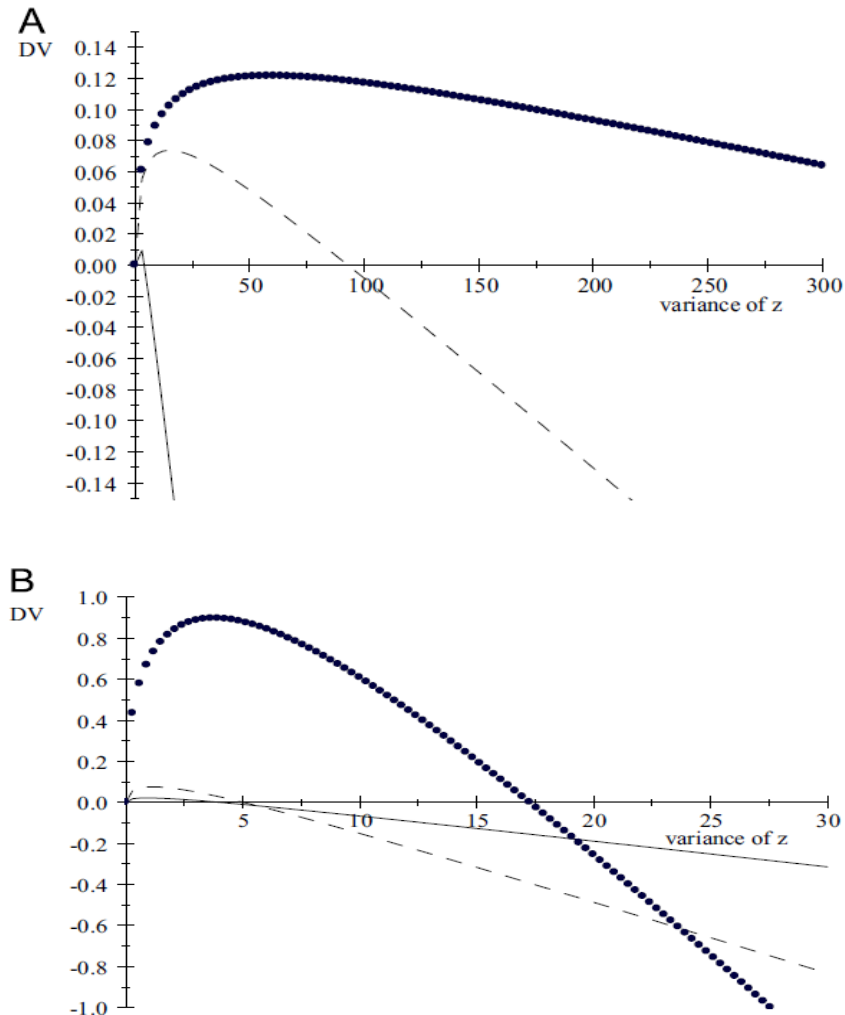In fig. 4B, the analysis plot DV as a function of σ_z^2 for different values of σ_v^2. The solid line corresponds to $\sigma_v^2=0.5$, the dashed one to $\sigma_v^2=1$, and the dotted one to $\sigma_v^2=5$. This figures shows that as σ_v^2 increases, the parameter configuration set in which the transparent market is less volatile is higher. So, under the proper restriction, when σ_v^2 goes to infinity, the transparent market is less volatile for all σ_z^2, as a consequence we can say that there is an inverse relationship between market depth and price volatility.

In large markets, transparency increases liquidity and reduces price volatility, whereas in small markets, the implications of market transparency depend on parameter specification.

The principal conclusion is that a change in transparency, not always decreases the execution costs of liquidity traders. However, this analysis shows that transparency is beneficial for active securities, independently of the knowledge (public or not) traders have of their initial analysis.

Continuing to look at the research of de Frutos and Manzano I think that it is still important to make clear the concept of transparency, focusing more on the time of trading. The analysis "Risk Aversion, transparency and market performance" makes a right distinction for the time, a "pre-trade transparency refers to the wide dissemination of price quotations and orders before the trade, and a post-trade transparency refers to the public and timely transmission of information on past trades, including execution time, volume and price"[13]. The analysis is interesting because it shows that transparency on certain aspects could not influence market competitiveness. A fundamental aspect when we decide to study the trading market is related to forecasting, all the analysis and all the studies are being carried out to see what could happen; traders and market makers have a strong interest in being able to forecast their transactions (good forecasts will lower carrying costs). Transparency simplifies the dealer' task of obtaining

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[13] De Frutos, M.A., Manzano, C., 2002. Risk Aversion, Transparency and Market Performance. Journal of Finance. SEC Market 2000 Study.

their planned order flow, because in this way, market subjects and in particular informed subjects are able to understand if a particular market is profitable or not and able to study profitable margins and quantity of the orders.

If there is an opaque visibility, subjects are uncertain about the bid required to obtain more "favorable execution prices when markets are fragmented". This research explains that liquidity may be bigger when markets are less transparent, given the fact that more noise can create more profit for dealers (more general for all the informed and specialist subjects). However, quotation transparency need not be beneficial either for investors or for dealers. Investor orders are executed at a better price in fragmented markets. "Dealers in fragmented markets face more competition and tighter margins, but they can also enjoy lower inventory carrying costs".

As I wrote before, the studies are focused on a centralized and fragmented market. A particularity of a centralized market is that, having a progressive auction, all dealers raise bid price and ask prices to their reservation levels, hence revealing their reservation prices.

"In centralized markets, the optimal prices will be the second best reservation prices, regardless of the dealers' attitudes towards risk". Nevertheless, the optimal price depends on the risk attitude as reservation price depends upon them. In fragmented markets, dealers don't know the intention of their competitors when they decide quotes. So we can say that fragmented markets are like markets functioning as a first price auction.

The size of the market order is also clear in this analysis, the model determines the size of the public order into the two market structures considering the solution to the trading stage. "In fragmented market, the price effect dominates the risk effect, hence the risk aversion makes the market order size bigger. In central-

ized market, the price effect is absent and there is only a risk effect. So this demonstration tells us that market liquidity is greater in the less pre-trade transparent market: Expected spreads are smaller and volume is higher. The model concludes saying that, ceteris paribus, all market participants strictly prefer to trade in fragmented markets".

From this analysis it is clear that fragmented market gives more price competition. The intuition is that at period one, the dealer has two reasons to offer better prices: risk aversion and the possibility of exploiting the acquired information in subsequent trading.

More practical analysis was made by Kyong, Park and Ok where thanks to the changes in the Korean market they were able to analyze the effect of pre trade transparency. A change in pre-trade transparency has an effect on stock market quality through different aspects. Each trade analyzing the possible true value of the stock decides the optimal strategies in direct response to the change in the quote disclosure and in response to the changes in the strategies of other agents.

Generally the optimal level of transparency (pre-trade transparency) is chosen through a specific policy variable that can be freely set by an exchange or by regulators. The principal question in relation to actuate a specific level of transparency is to understand how this application can improve market quality, however as we have seen before, there is no consensus that with an increase of a pre-trade transparency there is an improvement in market quality. This study is made thanks to a particular event on the Korea Exchange (KRX), an electronic order driven market. The KRX publicly discloses a specified number of the best buying and selling prices and the number of shares desired or offered at those prices.

On March 6, 2000, the number of publicly disclosed prices (and the number of shares at each price) was increased from 3 to 5, and

from 5 to 10 on January 2, 2002. These two discrete changes in the disclosure policy allow to address the effect of pre-trade transparency on market quality. The analysis of the two events is done by controlling volume and price using a panel data design. Using appropriate controls, they find evidence that market quality improved following 2002 event; the evidence appears convincing using the OLS standard errors. They conclude that market quality is an increasing concave function of pre-trade transparency, with significantly decreasing returns to transparency above the level of disclosure established by 2000 event. The model is made with six annulled hypotheses on market stability and informational efficiency of the price. Every hypothesis has the following basic structure: market quality is unchanged after the event compared to before the event. The model uses two methods: a standard event-study method, without controlling other relevant variables; and a panel-data analysis, controlling the endogenous variable volume and price.

The model gives significant results: when it is correcting endogenous variable using a panel-data analysis, market quality improves following both the 2000 and 2002 events, showing that market quality increases in pre-trade transparency; the consequent improvement in market quality following the 2002 event is much more than following the 2000 event, this shows that market quality is a concave function of pre-trade transparency with significantly diminishing returns above the level of disclosure established by the 2000 event.

This study analyzes 50 trading days before and after each of the 2000 and 2002 events.

Group (based on volume)	No. of firms	Market cap. (billion won) Mean	Average volume (1,000 shares) Mean		Average number of trades Mean		Average closing price (won) Mean	
			Before	After	Before	After	Before	After
Panel A: 2000								
All	145	740.0	451.0	419.6	542.9	452.3	13,126.5	12,705.8
Small-firm	35	43.2	13.9	28.2	44.3	72.7	13,850.5	13,781.4
Medium-firm	49	85.8	73.8	95.0	159.3	187.5	11,697.6	11,060.7
Large-firm	61	1,665.4	1,004.9	904.9	1,137.1	882.9	13,859.0	13,410.2
Panel B: 2002								
All	245	540.6	1,599.1	1,458.4	559.7	726.6	12,564.0	14,401.4
Small-firm	81	44.7	17.5	24.7	82.5	102.4	16,969.9	18,859.8
Medium-firm	79	426.0	108.5	180.9	257.5	345.8	13,626.1	14,931.3
Large-firm	85	1,119.7	4,491.6	4,011.8	1,295.4	1,675.3	7,378.4	9,660.2

Table 1 – the table reports descriptive statistics of the sample firms stratified into each of three groups (small, medium, and large firms) listed on the KRX. The groups are formed based on trading volume during the continuous trading session for each of the before-the-event sample periods.
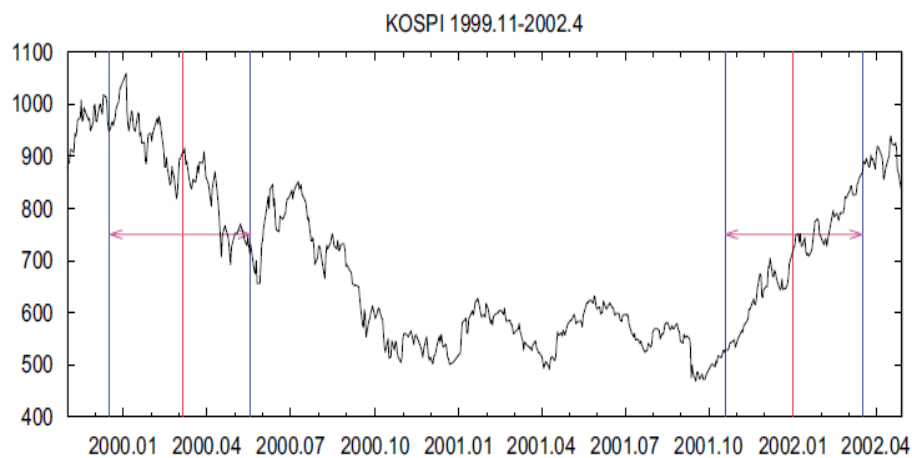
Figure 5 - The Korea Stock Price Index (KOSPI) from November 1999 to April 2002

In Table 1, described statistics of the sample firms are divided into three groups: small, medium, and large firms. The total market value of the 2000 (2002) sample firms is 107 (132) trillion won (approx. 103.9 (128.2) billion US dollar), consisting of 36.6% (65.8%) of the total market value of all firms listed on the KRX at the end of 1999 (2001). The firms' average market values

for the 2000 (2002) sample range from 43.2 (44.7) billion won to 1,665.4 (1,119.7) billion won. The Table shows that, there is a slight decrease in trading volume (for both periods) first and after the event. The prices decrease around the 2000 event, while they increase around the 2002. The market trend confirms what is written in table 1(Fig.5). This analysis indicates that both events improved market quality and it concludes that market microstructure event studies should use panel-data analysis to check for relevant endogenous variables to ensure the efficiency of their results.

Comparing the anonymous and fully transparent regimes it shows that the effect of transparency on liquidity is influenced by two elements: endogenous entry and traders' strategic behavior. The model shows that transparency enhances liquidity, however, when the authors allow for endogenous acquisition it finds that transparency reduces liquidity. The reason for this result is that when uninformed traders observe the insiders' demand, they englobe a signal on the liquidation value of the asset, which is a distort vision (noisy) of the insiders' private information: as a consequence they behave almost as if they were insiders. Since informed agents pay lower adverse selection costs than uninformed ones, they provide liquidity at lower costs. Hence, when uninformed traders have more information about the liquidation value of the asset, liquidity increases. In other words, transparency reduces adverse selection costs for uninformed traders and motivates them to offer liquidity. This result, that is standard in precious literature on the market transparency, is reversed with endogenous entry of informed agents: transparency allows uninformed traders to learn information from other traders' net demands and this reduces their adverse selection costs[14].

When agents have a strategy, they are concerned about price impact of their trade and this reduce the liquidity.

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[14] *Rindi, B., 2002. Informed traders as liquidity providers: anonymity, liquidity and price formation. Review of Finance.*

When agents are competitive, transparency increases liquidity; the adverse selection costs are reduced when there is transparency. On the other hand, when allowing for endogenous information acquisition, the equilibrium number of insiders and liquidity are lower (under the fully transparent regime). "Informed agents, who pay the least adverse selection costs, are the best liquidity suppliers": since transparency reduces the incentive to buy information it reduces market depth and reduces the number of informed traders who want to enter in the market. Transparency is the best ally for informational efficiency and volatility.

1.4 Anonymous traders and Insider trading phenomenon

Anonymously and insider effects are strictly related to our analysis and it is good to make some considerations in relation to these phenomenon.

The principal question is what happens when people with different information decide to trade. How market prices are affected by agents' information affects how the traders can infer information from market prices. The fundamental insight is that prices serve two purposes: they clear markets and they aggregate information. This dual role makes the behavior of prices and markets much more complex than that assumed in the standard asset pricing paradigm.

The reason why these two phenomenon exist in the financial market is because of the tendency of the trader to make the optimal habitat to make profit, in particular these two phenomenon could be very profitable for informed traders. Informed traders acquire and act on information about fundamental instrumental value. They trade when they believe that prices differ from fundamental

values. They buy when they believe that prices are below fundamental values, and they sell when they believe that prices are above fundamental values. Informed traders differ by how they form and act upon their opinions about fundamental values. Value traders estimate fundamental values by collecting and analyzing all available information. News traders are the first to trade on new information. Information-oriented technical traders identify systematic patterns which indicate that price differs from their fundamental values. Arbitrageurs compare fundamental values across instruments. All these informed traders prefer to work on an anonymous market, given the fact that in this way their profits are higher, meanwhile when the information is shared the price moves faster to the fundamental value and their profits are lower.

On the purpose of anonymity, a good analysis was made by Comerton-Forde, Frino and Mollica, where it focused on the impact of limit order anonymity on liquidity in Paris, Tokyo and Korean markets. The paper examines the impact of changes on the anonymity of limit orders on Euronext Paris, TSE and KSE on April 23, 2001, June 30, 2003 and October 25, 1999, respectively. This study shows that the removal of broker identifiers had a significant impact on liquidity, attached to limit order on Euronext Paris and TSE. As a result, the increase in anonymity provokes a decrease in relative bid-ask spreads and effective spreads of orders. This means that the introduction of anonymous limit orders improves market quality. Even in this paper a decrease in the anonymity on the KSE provokes a decline in liquidity. An important implication of these findings is that information pertaining to broker identification provides information to market participants about the nature of the order flow displayed in the order book.

Anonymity is strongly interconnected with the insider phenomenon. Traders engage in insider trading when they base their trades on material information about the value of an instrument that is

not publicly available. Most insider trading involves private information that corporate managers know about the prospect of their companies.

Insider trading also may involve information that traders improperly obtain from other sources. In most countries, insider trading is illegal and punishable by fines or imprisonment. Insider trading laws are very difficult to enforce, however. At the beginning of the phenomenon, only few countries decided to restrict the act, the United States, Canada, and Great Britain were the first to attempt to enforce their insider-trading laws.

Insider trading has many economic effects. In the financial markets, it affects investor confidence, price efficiency, and liquidity. From a macroeconomic aspect, insider trading affects the labor market for senior corporate managers, and the quality of the management decisions that these executives make.

Insider information is not available information about the value of a security. This particular information is information that would cause a change of price if it were widely known. Fighting insider-trading is quite difficult, rarely insiders trade on their information themselves because they know it is illegal, therefore, they give their information to confederates who trade on their behalf. Identifying who is trading on insider information however is often impossible. For the stock exchange in the United States, there's a market surveillance department that monitors its markets for trading irregularities. The surveillance officers look for suspicious events. When they identify unusual trading, they consequently try to determine whether a recent release of public information would explain it. If they cannot find an obvious explanation, they call the listed firm and ask whether they are aware of information that could have caused the price change. When the surveillance officers understand that the firm will soon change significantly in some aspect not yet public, they may suspect insider trading.

In general, large price changes associated with high volumes that occur before releases of significant unexpected news often indicate that insiders or their confederates were trading. In order to analyze the insider trading phenomenon there are a lot of arguments in favor and against restricting insider trading.

People that are against insider trading believe that effective restrictions on insider trading increase investor confidence, lower transaction cost, and solve corporate control problems which arise when insiders can trade on inside information. On the other hand, the main arguments for unrestricted insider trading involve price efficiency, the costs of enforcement, and incentives for entrepreneurial behavior by managers.

The law of insider trading is one way society allocates the property rights to information produced by a firm. In the United States, early common law permitted insiders to trade in a firm's stock without disclosure of inside information. The U.S. trend was followed by other countries gradually, although enforcement levels continue to vary substantially from country to country[15]. When we talk of insider trading phenomenon, there are two different point of view: people that are in favor of a deregulation of insider trading and people that are opposed. Those in favor of regulating insider trading typically reject the fact that efficiency is the controlling criterion or attempts to show that the prohibition is justifiable on good reason. Examining the literature closely it is hard to understand what is better, but the reasons in favor of regulation are probably stronger at the moment.

In large corporations insider trading could be assumed as an alternative compensation for entrepreneurs. The firm and the manager could improve profit and benefits knowing what the manager will do and what his abilities are. In contrast, an entrepreneur's contribution to the firm consists of producing new value, and new

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[15] *Bainbridge, S.M., 1998. Insider trading: An Overview. UCLA School of Law.*

value most of the time is information. The entrepreneur's compensation must have a reasonable relation to the value of his contribution to give him incentives to produce more information[16]. Insider trading can be used from some managers when they are not satisfied of their salary, in this way they can try to make more profit through the market. "Some of those who favor deregulating insider trading deny that the property rights of firms to information produced by their agents include the right to that information. In contrast, those who favor regulation contend that when an agent produces information the property right to that information belongs to the principal" (Bainbridge, 1998). People that argued in favor of insider trading said that if manager are able to trade with insider information they have interest to maintain the stock price stable and also to move the price to the better direction for their profits. These goal are obtained using "manipulative price".

Insider trading is difficult to detect and, moreover, centralized monitoring of insider trading by the SEC and the self-regulatory organizations within the securities industry may be more efficient than private party efforts to detect insider trading[17].

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[16] *Bainbridge, S.M., 1998. Insider trading: An Overview. UCLA School of Law.*
[17] Macey (1991, p.40-41)

2 Sunshine Trading

In recent years, much attention has been focused on the liquidity of financial markets, especially following the critical crash that hit the markets over the last few years.

Some have suggested that liquidity would be enhanced if traders engaged in "sunshine trading". A trader who follows a sunshine trading strategy preannounces to the other traders in the market that he will trade a specific number of shares or contracts several hours (or perhaps longer) before the order is actually submitted.

Despite several studies and traders sharing opinion that sunshine trading could be a real solution for the great number of problems affecting the trading market, principally related to the informativeness, sometimes it could be a strategy not so efficient given the fact that to support a strategy like that, there should be some optimal conditions that in some markets are not realistically possible. Anyway, it could be useful to analyze the characteristic of this way of trading in order to understand if there could be a possible solution or a possible starting point from which to develop a new and efficient market, not only from the traders' point of view but also from the market point of view.

To document knowledge sunshine trading was first undertaken (on a limited and informal basis) by the portfolio insurance firm of Leland, O'Brien and Rubinstein (LOR)[18].

Sunshine trading must be formally distinguished from "prearrangement trading", which is illegal.

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[18] Kidder, Peabody & Co. (1986).

2.1 What is Sunshine Trading?

Sunshine trading refers to traders who announce to the market who they are, what they intend to do, the full extent of their orders, and why they intend to trade. Sunshine trading works well when sunshine traders are well known and are known to be uninformed and honest. In large markets, sunshine trading at best works only for the largest traders, since only those traders will be able to acquire credible reputation.

The strategy of Sunshine trading does not work if traders suspect that the sunshine trader may be well informed or dishonest. If traders could always obtain more liquidity merely by revealing their identities, all traders would do so. Unknown informed traders would pretend to be uninformed traders, and well known informed traders would create new identities to mask their trading. Well-informed traders who try to pass for uninformed traders are wolves in sheep's clothing. Sunshine trading generally does not work well because it is hard to determine whether sunshine traders are indeed uninformed traders and whether they have indeed revealed their entire trading interests[19].

Good answers to such questions generally require thorough investigation on exchange floors or in screen-based trading systems.

Although sunshine trading may solve the asymmetric information problem for some very well-known traders, it introduces another serious problem. By revealing their intended trades, sunshine traders give free trading options to the market. They therefore attract front runners, quote matchers, and, under some circumstances, squeezers.

Sunshine traders may therefore have higher transaction costs than they if controlled their order exposure more carefully.

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[19] Trading Exchanges, Larry Harris 2003.

2.2 Analysis of past studies

Past studies carried out on the concept of sunshine trading are principally related to the analysis analysis made by Admati (1986) and Pfleiderer (1984). All other researchers make their consideration about sunshine trading using these topics as a starting point.

We have to consider the possibility that some liquidity traders preannounce the size of their orders (sunshine trading). When a trader decides to make a preannouncement there are two possible effects: one is that since it identifies certain trades as informationless, preannouncement changes the nature of any informational asymmetries in the market; another aspect is that preannouncement can coordinate the supply and demand of liquidity in the market.

Two important aspects to analyze when we talk about the preannouncement are the coordination of the supply demand of liquidity; in fact, when potential traders are informed about personal decisions and principally the traders who can take the other side of the preannounced orders could prepare themselves and the market to absorb the orders preannounced. This facilitates the match between demand and supply of liquidity in the market[20]. Preannouncement also has another important implication, the identification of informationless, which could lower the price impact of the order.

Identification of informationless trades have some implications, preannouncement has been used by such traders as index fund managers and portfolio insurers, whose trading motives are not based on private information. If used only by such traders, the preannouncement of an order would identify it as uninformative,

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[20] Grossman (1988)

which would typically change its price impact as well as the impact of other orders.

Important studies were made by Admati (1986) this study was focused on three types of traders: risk-averse speculators, which are the ones who absorb the liquidity shocks of other traders; potential sunshine traders, called announcers; and no announcers, that do not preannounce in any case. The model is based on a standard normal exponential rational expectation model and it isolates two effects of preannouncement. One is due to the assumption that preannounced orders come from traders who do not have private information.

This implies that preannouncement leads to a decrease in the total expected trading cost of liquidity traders, even though it leads to an increase in the expected trading cost of liquidity traders who cannot preannounce.

An interesting element of the preannouncement is that the saving in liquidity traders' expected trading costs are enough to compensate speculators for any losses they might suffer due to preannouncement. The model also shows that, if there is no private information and, at the same time, liquidity provides (speculators) incurs in a cost in order to trade in the risk asset, preannouncement can serve as a mechanism for coordinating the entry of speculators into the market.

The implication of this analysis for the preannouncement is that expected trading costs of the announcers are strictly lower when announcement takes place compared to when it does not; the expected trading costs of the no announcers are strictly higher when preannouncement takes place rather than when it does not and preannouncement strictly lowers the ex-ante expected utility of speculators.

With the preannouncement the total expected trading costs of all liquidity traders are lower, and these savings are higher than the welfare losses of the speculators as measured by the difference in

the certainty equivalents of their surplus with and without preannouncement.

On the other hand, the ex-ante expected utility of speculators is increased with preannouncement. Concerning the price behavior the model shows that the identification of liquidity orders means that preannouncement increases the informativeness of the price and reduces the variance of the price change. As a consequence of this aspect we also suppose that preannouncement leads to a decrease in price variability if entry by speculators is costly. The preannouncement strategy is principally used by certain institutional traders who want to trade for reasons other than privately held (payoff relevant information). The concept of liquidity traders and the fact that we have to assume all the announcers as liquidity traders is crucial.[21]

Looking at the entry costs of speculators the model shows how significant different effects are present. For this topic the model shows that preannouncement would tend to reduce the variance of trading costs. This is in addition to the decrease in expected trading costs brought about by preannouncement.

Another interesting analysis of sunshine trading is also made by de Frutos and Manzano (2002) in "Market transparency, market quality and sunshine trading" that we have seen also in the analysis of market transparency.

The studies are focalized on the possibility that traders voluntarily preannounce the size of their orders to the other market participants. Generally noise traders decide whether or not to announce their order sizes and when trading takes place.

The model presents the solution by backward induction and assuming that the number of noise traders who preannounce is

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[21] A lot of reason make to believe that this assumption is reasonable or that, the preannounced order is most likely not to be based on private information.(Gennotte and Leland 1990).

fixed. Formally, supposing that noise demand comes from H liquidity traders, indexed by h=1,…,H. Thus, $\widetilde{z} = \sum_h^H \widetilde{z}$h   where $\widetilde{z}$ denotes the demand for noise trader h.

Let $\widetilde{z}$, h=1,…,H, be i.i.d. with $\widetilde{z} \sim N(0, \sigma_z^2 /H)$.

The model assumes two types of liquidity traders: announcers (noise traders who preannounce the size of their trades) and non-announcers (who do not preannounce the size of their trades).

Let A denote the subset of liquidity traders who are announcers. Formally,

$$A = \{h \in \{1, \dots, H\} \text{ such that } h \text{ is announcer}\}$$

H_A represents the cardinality of this set ($0 \le H_A \le H$) and z_A denotes the realization of the aggregate demand of announcers, i.e., $z_A = \sum_{h \in A} z_h$. Notice that $H_A = 0$ corresponds to a framework similar to the opaque mechanism (see the market transparency section), whereas $H_A = H$ models a setup analogous to the transparent market.

Therefore, for intermediate values of H_A, the model derives the result:

When $0 < H_A < H$. A SLE exists iff $N \ge 3$. If it exists, then:

$$\mu = \mu_0 - \mu_1 z_A = \frac{2\alpha}{\rho \sigma_v^2 (N - (N-1)\alpha)} \bar{v} - \frac{\frac{N-2}{N-1} - \alpha}{N - (N-1)\alpha} z_A,$$

$$\beta = \frac{\alpha}{\rho \sigma_\epsilon^2} \qquad (19)$$

And

$$\gamma = \frac{\alpha}{\rho\sigma_\epsilon^2}\left(1 + \frac{2\sigma_\epsilon^2}{(N-(N-1)\alpha)\sigma_v^2}\right) \qquad (20)$$

Where α is the unique real root belonging to $(0,(N-2)/(N-1))$ of the polynomial of degree three $Q(\alpha)$, with $\varphi=((H-H_A/H)\rho^2\sigma_\varepsilon^2\sigma_z^2$.

We can note the number of announcers have a strong influence on the equilibrium coefficients. Then, to emphasize this fact, the equilibrium coefficients are written as γ and μ_1 as $\gamma(H_A)$ and $\mu_1(H_A)$.

The model is focusing on the first stage of the game and it studies the incentives for noise traders to engage in sunshine trading. It assumes that noise traders take this decision by comparing their conditional expected trading costs.

$C^{NA}(z_h,H_A)$ and $C^A(z_h,H_A)$ represent the expected trading costs of a no announcer and announcer, conditional on their trade size z_h, when there are H_A announcers.

We can say that the noise trader h is willing to preannounce his trade size when

$$C^A(z_h, H_A + 1) < C^{NA}(z_h, H_A) \qquad (21)$$

If the above equation holds for $H_A =0,\ldots,H-1$, and for all z_h, $h=1,\ldots,H$, then an equilibrium exists in which all the noise traders decide to engage in sunshine trading.

Direct computations yield

$$C^{NA}(z_h, H_A) = \frac{1}{N\gamma(H_A)} z_h^2 \qquad (22)$$

And

$$C^{A}(z_h, H_A) = \frac{1 - N\mu_1(H_A)}{N\gamma(H_A)} z_h^2 \qquad (23)$$

From this equilibrium analysis we can observe the results making some considerations:

Firstly, the conditional expected profits of a noise trader are lower if he is announcer, whenever $z_h \neq 0$; when noise traders have a higher liquidity they prefer to use sunshine trading and when a noise trader decides to make some preannouncements it is independent from the order size he wants to trade.

This last concept is really important because we can derive that when a noise trader has already preannounced his order he does not regret his decision also if he observes that other noise traders also display their orders.

Supposing that $z_h \neq 0$ the model notes that:

$C^A(z_h, H_A+1) < CAN(z_h, H_A)$

Iff

$(1-N\mu_1(H_A+1))/(N\gamma(H_A+1)) < 1/(N\gamma(H_A))$.

From this inequality we can see how there are two opposite effects on conditional expected trading costs: it reduces the price responsiveness of traders' demands ($\gamma(H_A+1) < \gamma(H_A)$)[22], and, it facilitates that the order is partly accommodated ($\mu_1(H_A+1) > 0$),

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[22] The intuition of this fact is as follows. Notice that the degree of market transparency increases with the number of announcers. Then, in a market with more announcers, an increase in the price of the risky asset makes agents more
optimistic about its liquidation value, which leads to a smaller reduction in the individual demands, as compared to a

leading to lower conditional expected trading costs. At the end when there is a domination of the second effect the noise trader h will want to become an announcer.

When $C^A(z_h, H_A)$ is decreasing (this is verified when ϕ is high enough), as $C^A(z_h, H_A) < C^{NA}(z_h, H_A)$ for all H_A and $z_h \neq 0$, it holds that

$$
\begin{aligned}
C^A(z_h, H) < C^A(z_h, H-1) < \cdots &< C^A(z_h, 1) < C^A(z_h, 0) \\
&< C^{NA}(z_h, 0) < C^{NA}(z_h, 1) < \cdots \\
&< C^{NA}(z_h, H) \quad for\ all\ z_h \neq 0 \qquad (24)
\end{aligned}
$$

On this condition (21) holds and there is an equilibrium in which all the noise traders whose size order is not null preannounce.

(24) is a sufficient condition for the existence of this sort of equilibrium.

A weaker condition that can also guarantee its existence is given by Max $H_A \in (0,..,H-1)$ $C^A(z_h, H_A+1) < C^{AN}(z_h, 0)$ for all $z_h \neq 0$, h=1,...,H.

From the studies there is the consideration that other types of equilibria can exist. For instance, if a value of H_A exists such that (21) does not hold, then there is an equilibrium in which $\widehat{H}_A$ some noise traders decide to preannounce and the remainder does not, where $\widehat{H}_A$ denotes the lowest H_A such that (21) does not hold.

Market with fewer announcers.

The two examples illustrate the aforementioned types of equilibria.

Example 1. $H=2$, $z_1=10$, $z_2=10$, $N=10$, $\phi=3$, $\sigma_\varepsilon^2=10$, $\sigma_v^2=10$, $\rho=1$, $\sigma_z^2=10$.

Figure 1 Conditional expected trading costs in terms of H_A (with the parameter configuration stated in Example 1)

Fig. 1 shows how the graph of the function $C^{NA}(z_h,H_A)$ (solid curve) is located above the graph of the function $C^A(z_h,H_A+1)$ (dotted curve). This implies that there is an equilibrium in which one noise trader preannounces and the other noise trader does not.

Example 2. H=2, z_1=10, z_2=10, N=4, ϕ=3, σ_ε^2=10, σ_v^2=10, ρ=1, σ_z^2=10
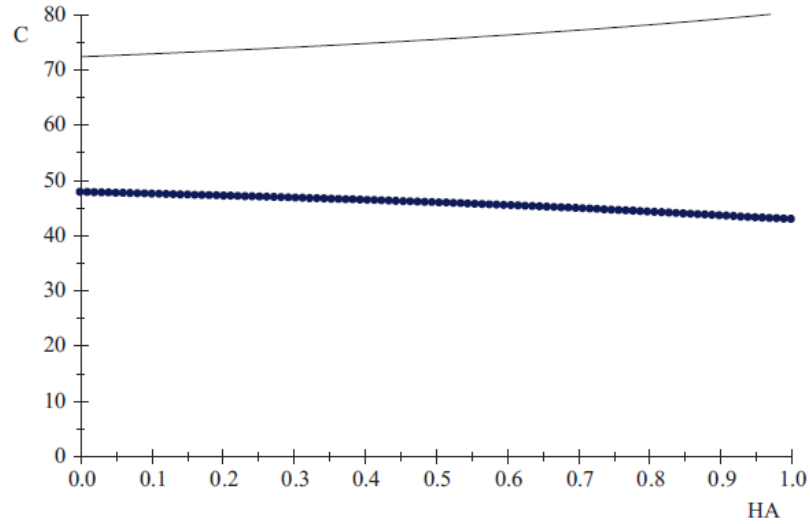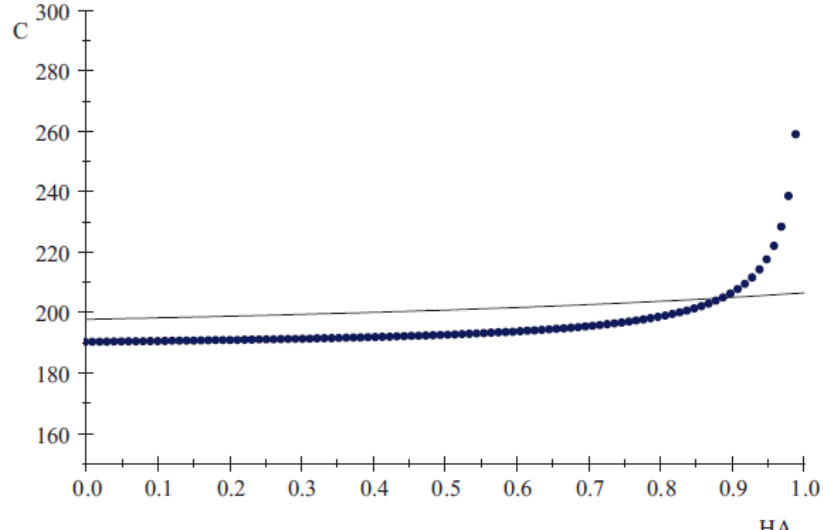

Figure 2 Conditional expected trading costs in terms of H_A (with the parameter configuration stated in Example 2).

Fig. 2 shows how the graph of the function $C^{NA}(z_h, H_A)$ (solid curve) and the graph of the function $C^A(z_h, H_A+1)$ (dotted curve) intersect in a point. This implies that there is an equilibrium in which all the noise traders preannounce.

In large markets (N or H is enough), all the noise traders (whose order sizes are not null) decide to preannounce their order size. As considerations we can say that in large markets the action of a noise trader has a negligible impact on the economy. Principally it is observed that in this case $\alpha(H_A+1)$ is very close to $\alpha(H_A)$, making $\gamma(H_A+1)-\gamma(H_A)$ very small, for this reason the first effect of preannouncement has little relevance. However, the second effect dominates and, consequently, all the noise traders (whose order size is not null) wish to become announcers.

To conclude the journey through the past studies on sunshine trading I think it is necessary to make an analysis of a real study on a real trading market.

In the studies of emerging markets made by Dia and Pouget (2011) some observations are really interesting, principally because they question how liquidity is formed in emerging financial markets and studying liquidity formation of infrequently traded stocks and the role of preopening periods in the formation of liquidity.

Infrequent trading is a widespread feature of the stock market. One important element to understand these aspects are strictly related to the turnover percentage of these markets. Infrequent trading is more preannounced in African stock markets where the turnover in Sub-Saharan countries did not exceed 10% of the capitalization in 1995[23].

In a market like this it is really hard to understand the liquidity formation principally for market designers who would like to promote trading, and for traders whose profits largely depend on execution quality. The two principal aspects of market imperfections are the asymmetric information and the costly market participation and in this particular type of market these problems are present, hence some trading arrangements and market organizations can mitigate the impact of these two factors.

Sunshine trading with his transparent strategies can be a solution for this kind of problems thanks to the fact it can improve the coordination between demand and supply of liquidity. A certain period of preopening market announcing associated with a long-term relationship among market participants can constitute an effective and credible way to implement sunshine trading[24].

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[23] Kenny and Moss (1998).
[24] Dia and Pouget (2010).

As mentioned previously Dia and Pouget use data from the West African Bourse. This stock market, given its peculiarity, represents an ideal scenario to empirically identify sunshine trading. The West African Bourse includes a preopening period; participation in the West African Bourse is likely to be costly for international investors who are the major liquidity providers in African stock markets; only a small number of broker-dealers can submit orders to the market and these orders are not anonymous. The West African Bourse thus offers an ideal venue for the development of long-term relationships necessary for the credibility of sunshine trading and also the West African Bourse includes a preopening period before the daily call market. During this preopening period, tentative prices and volumes are computed but no transaction occurs. This preopening period is transparent: tentative prices and volumes are publicly disseminated among market participants. Such a preopening period thus offers a mechanism through which market participants can communicate to others their willingness to trade.

In this market the practice of sunshine trading seems to give more chance to traders with high liquidity that want to attract liquidity providers. The results on this study indicate that there is a latent liquidity that is not reflected in the order book because of the market participation cost, and that is realized only when traders engage in sunshine trading.

The Data of the analysis includes all the orders submitted to the market from January 3rd, 2000 to December 13th, 2000. This corresponds to 141 trading sessions. For each session, they computed the indicative prices, the market clearing price, and the quantities allocated to each broker-dealer. Among the 40 stocks listed on the Bourse, they focused on the stocks that were included in the index of the Bourse.

For each stock in the model several descriptive statistics are reported for the year 2000 including the average and standard deviation of the volume per trading session, the average number of

orders per trading session and the turnover defined as the total number of shares traded over the number of outstanding shares. As we can simply assume for this kind of market the volume per trading session, and the number of orders submitted to the market are on average quite low.

For this reason the turnover for this market is also low making the market kind of inactive, in fact, all the broker-dealers are not providing liquidity at every trading session. From this consideration it is simple to make the conclusion that this bourse is an oligopoly market, this is a common element for all the markets that have low volume stocks. Interesting data is given from the average transaction cost that is really high with respect to the average of the other markets around the world, they represent from 2.6% to 16.4% of the transaction price for a one hundred-share order with an average equal to 6.8%.

For all the stocks selected for the analysis the trading volume appears highly volatile while the prices are surprisingly stable. These features indicate that the market is punctually able to accommodate huge transactions without major price adjustments.

Starting from these impressions they perform the following regressions. For each stock, they regress the absolute returns from the last trading sessions (a measure of the price volatility) onto the contemporaneous trading volume.

The estimated equation is:

$$\frac{|P_t - P_{t-1}|}{P_{t-1}} = a + b * Q_t + e_t \qquad (25)$$

In the equation t is the time expressed in terms of trading sessions with a non-null trading volume. Pt is the transaction price in CFA francs, and Qt is the trading volume in shares at time t. The result for the coefficient b appears not significantly different from zero

for the stock selected for the analysis and at the same time, the regression R²s are extremely low. The model didn't reject the hypothesis that trading volume has no impact on prices, and in particular that high volumes do not destabilize prices. The results of the analysis carried out by the authors can be seen slightly strangely because, generally one would expect a thin market to generate high execution costs.

If sunshine trading is successful on the Bourse, a significant part of the orders placed early should be eventually executed. Tables 1 and 2 address these issues.

	Time of Placement				
		1st Quartile	2nd Quartile	3rd Quartile	4th Quartile	sum
Order Size	4th Quartile	6%	7%	6%	6%	25%
	3rd Quartile	7%	7%	5%	5%	24%
	2nd Quartile	7%	7%	6%	5%	25%
	1st Quartile	6%	5%	7%	8%	26%
	sum	25%	25%	25%	25%	100%

Table 1 – Distribution of orders according to their size and their time of placement during the preopening period. (Source: see Footnote 30). For each of the stocks selected, orders are classified in sixteen categories according to the placement time quartile and the size quartile they belong to. Table 5 averages these data. The upper-left cell of the table represents the large orders placed early. The first quartile of placement time is on average 9:16 am. The second quartile of placement time is on average 9:39 am. The third quartile of placement time is on average 10:07 am. The first quartile of order size is on average 9 shares. The second quartile is on average 32 shares. The third quartile of order size is on average 92 shares.

Order Size	Time of Placement				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile	average
4th Quartile	25%	24%	35%	58%	36%
3rd Quartile	32%	32%	36%	58%	39%
2nd Quartile	37%	37%	41%	58%	43%
1st Quartile	34%	34%	43%	53%	41%
average	32%	32%	39%	57%	40%

Table 2 – Proportion of orders executed at the call as a function of their size and placement time during the preopening period. (Source: see Footnote 30). For each size and time category, this table reports the proportion of orders (partially) filled at the time of the call averaged across the selected stocks.

These two dimension tables classify the size and the time of placement during the preopening period. Each dimension is divided in four quartiles, creating a 16-cell table. The upper-left cell includes the orders pertaining to the fourth quartile in terms of size, and to the first quartile in terms of placement time. This cell thus includes the large orders that are placed early during the preopening period. Table 1 presents the average proportion of orders of various sizes placed during the four intervals of the preopening period.

Generally sunshine trading is frequent when large quantities are verified, the authors decided to focus the analysis on the 4th and 3rd size quartiles because the most favorable characteristic is verified.

Table 1 can give the possibility to compute the proportion of large orders placed in the first part of the preopening period; the proportions are 50% and 56% for the 4th and 3rd size quartiles respectively. So we can easily assume that during the preopening period the large orders are quite often the majority of the orders.

Table 2 indicates for each order size and each placement time the proportion of orders that have been filled at the time of the call in order to verify that large orders are not made for market manipulation, then it results that 28% of the large orders placed early (4th and 3rd size quartiles, and 1st and 2nd time quartiles) are on average executed concluding that the biggest part of orders are "in the market".

A characteristic of the West African Bourse is that the most intense activity is made before the time of the call, this indicates that when broker-dealers want to exchange large quantities of shares, they place large orders early during the preopening period.

In my personal opinion when we are in a contest like this and we have to assume all these characteristics of a market probably the choice of using sunshine trading is the only real successful option for people that want to make large orders and logically, if we observe a market so restricted with a sunshine trading strategy we can attract potential liquidity providers.

Therefore, when implementing sunshine trading with limit orders agents choose to preannounce prices at which they stand ready to trade. This of course is important to make an analysis to understand the relation between first tentative of trading and the transaction price in order to see if the strategy is optimal or not; then to clarify this issue, the model analyzes the returns with an OLS regression analysis.

Consequently, for each stock the OLS is made by the following equation:

$$\frac{P_t - P_{t-1}}{P_{t-1}} = A^1 + B^1 * \frac{IP_t^1 - P_{t-1}}{P_{t-1}} + E_t^1 \qquad (26)$$

Where IP_t^1 represents the average indicative price during the first part of the preopening period. The results are in Table 3.

	Intercept A[1]	Coefficient B[1]	R^2	Number of Observations
BICC	0	1	1.00	20
BLHC	-0,0011	0.0148	0.00	45
	(0.18)	(0.74)		
CIEC	-0.0019	0.2395	0.12	62
	(0.55)	(0.00)		
PALC	-0.0049	0.7353	0.71	10
	(0.62)	(0.00)		
SGBC	-0.0608	0.3233	0.41	8
	(0.04)	(0.08)		
SHEC	-0.0013	0.5451	0.25	54
	(0.23)	(0.00)		
SNTS	0.0001	0.4446	0.44	69
	(0.91)	(0.00)		
STBC	-0.0012	0.8993	0.41	26
	(0.47)	(0.00)		

Table 3 – Price discovery regressions (Source: see Footnote 30)**.** This table presents the result of OLS regression of the returns from the previous trading session to the call onto the returns from the previous trading session to the first part of the preopening period. The return at date t is computed as the difference between the price at date t and the price at date t-1, divided by the price at date t-1. Only the days with a non-null trading volume are considered. The number of observations are consequently not the same for all the stocks. The data is conditional on the existence of indicative prices in the first part of the preopening period. This further reduces the number of observations. P-values are reported in parenthesis.

Indicative prices taking into account what is explained above is clear that the power of the information computed and announced during the first part of the preopening period are very good data, and for this reason looking at early indicative prices, broker-dealers can have a relatively accurate idea of the price that will prevail on the market. Given this implication and the fact that no transaction occurs during the preopening period, the informational content of indicative prices in terms of fundamental valuation could be questioned.

In the context of sunshine trading, this issue becomes crucial since pre announcers are big participants and may try to manipulate market prices, but, it is also true that information revelation during the preopening period might be beneficial to the traders since it relaxes the participation constraint of the outsider.

To better understand the importance of the information that could have been related it is important to analyze the return between the previous trading session and the next trading session that can be predicted thorough the return between the previous trading session and the preopening period[25].

The model uses OLS regressions to estimate the following equation:

$$\frac{P_t - P_{t-1}}{P_{t-1}} = \alpha^1 + \beta^1 * \frac{IP_t - P_{t-1}}{P_{t-1}} + \epsilon_t^1 \qquad (27)$$

To obtain a measure of the total information that could have been revealed during the preopening period, we also ran these regressions with the call price Pt instead of the mean early indicative price IP_t^1 . The estimated equation was:

$$\frac{P_{t+1} - P_{t-1}}{P_{t-1}} = \alpha + \beta * \frac{P_t - P_{t-1}}{P_{t-1}} + \epsilon_t^1 \qquad (28)$$

The results are in Tables 4 and 5.

[25] Biais, Hillion, and Spatt (1999)

Table 4 – Information revealed by indicative prices

This table presents the result of OLS regression of the returns from the previous trading session to the next trading session onto the returns from the previous trading session to the first part of the preopening period. The return at date t is computed as the difference between the price at date t and the price at date t-1, divided by the price at date t-1. Only the days with a non-null trading volume are considered. The number of observations are consequently not the same for all the stocks. The data is conditional on the existence of indicative prices in the first part of the preopening period. This further reduces the number of observations. P-values are reported in parenthesis

	Intercept *alpha*	Coefficient *beta*	R^2	Number of Observations
BICC	-0.0052	0.9736	0.79	20
	(0.33)	(0.00)		
BLHC	-0.0011	0.8329	0.31	45
	(0.28)	(0.00)		
CIEC	-0.0029	1.2653	0.56	62
	(0.44)	(0.00)		
PALC	-0.0141	0.5556	0.52	10
	(0.17)	(0.01)		
SGBC	0.0297	1.4906	0.83	8
	(0.10)	(0.00)		
SHEC	-0.0026	0.3374	0.09	54
	(0.05)	(0.03)		
SNTS	-0.0008	0.8296	0.42	69
	(0.60)	(0.00)		
STBC	-0.0001	1.1069	0.85	26
	(0.95)	(0.00)		

Table 5 – Information incorporated in transaction prices

This table presents the result of OLS regression of the returns from the previous trading session to the next trading session onto the returns from the previous trading session to the current trading session. The return at the date t is computed as the difference between the price at date t and the price at date t-1, divided by the price at the date t-1. Only the days with a non-null trading volume are considered. The number of observations are consequently no the same for all the stocks. The data is conditional on the existence of indicative prices in the first part of the preopening period. This further reduces the number of observations. P-values are reported in parenthesis.

	Intercept *alpha* [1]	Coefficient *beta* [1]	R^2	Number of Observations
BICC	0.0052	0.9736	0.79	20
	(0.33)	(0.00)		
BLHC	-0.0021	0.0234	0.00	45
	(0.09)	(0.73)		
CIEC	-0.0036	0.1362	0.01	62
	(0.53)	(0.36)		
PALC	-0.0175	0.4496	0.45	10
	(0.13)	(0.03)		
SGBC	-0.0680	0.5485	0.44	8
	(0.10)	(0.07)		
SHEC	-0.0026	-0.0154	0.00	54
	(0.07)	(0.93)		
SNTS	0.0001	0.4871	0.33	69
	(0.97)	(0.00)		
STBC	-0.0012	0.8795	0.27	26
	(0.59)	(0.01)		

Table 4 indicates that, for some stocks, early indicative prices incorporate information. This is supported by the fact that 1 β is statistically significant 5 times out of 8 at the 10% error level (4 times out of 8 at the 5% error level). Using data from Tables 4 and 5, the amount of information revealed in the first part of the preopening period can be measured by the ratio between the R^2 of the regression using the average indicative price during the first part of the preopening period and the R^2 of the regression using the call price. Across the stocks analyzed, 44% of the information is on average revealed during the first part of the preopening period, i.e. long before trading takes place.

However indicative prices during the preopening period do not reflect all the information that is incorporated in the call price.

This can be seen from the fact that 1 β is overall smaller than 1, or from the fact that the R² in Table 4 are in general smaller than the R² in Table 5. This could leave room to insiders' profit. In the context of sunshine trading, the agents cannot afford to profit from insiders' profits without suffering from future denial of liquidity provision. Large broker-dealers who implement sunshine trading are thus less likely to be identified as insiders. This is contrary to what one would expect if the large broker-dealers were colluding to manipulate prices.

Table 6 – Identification of insiders

This table reports the number stocks out of the selected stocks in the model sample for which a broker- dealer has been identified as an insider. To identify insiders, for each stock and each broker-dealer, they regressed the future return at the date t onto the signed position taken by the broker-dealer at date t. A broker-dealer will be considered as an insider if it has a positive coefficient with a p-value smaller than or equal to 10%. The future return at date t is computed as the difference between the price at date t+1 and the price at date t, divided by the price at date t. Only the days with a non-null trading volume are considered

	Number of identifications as insiders
BD1	1
BD2	0
BD3	1
BD4	2
BD5	0
BD6	0
BD7	0
BD8	0
BD9	0
BD10	1
BD11	0
BD12	0
BD13	0
BD14	0
BD15	0
BD16	0

Table 6 reports the number of times each broker-dealer has been identified as an insider across the stocks in the sample. Overall, very few broker-dealers have been identified as insiders. This indicates that the adverse selection risk on the market is fairly low. This may appear surprising in an emerging market but can be explained by the fact that information is revealed during the preopening period. Furthermore, the broker-dealers identified as insiders are not the major broker-dealers of the marketplace.

These major broker-dealers are indeed the ones susceptible to engage in sunshine trading, and are thus the ones who may suffer from future liquidity denials. If they engage in sunshine trading, it seems reasonable to think that they do not attempt to mislead their trading partners. On the other hand, the small broker-dealers that do not receive liquidity shocks because they do not deal much with outside investors can afford to profit from private information if they have some. Altogether, these results suggest that broker-dealers in the West African Bourse did not manipulate prices to their advantage.

2.3 Critical View of the Literature

The studies about sunshine trading described above are in my opinion the most important empirical studies up to the present day, principally the studies of Admati (1986), Hellwig(1980) and Pfleiderer (1984) are the most important because thanks to it all the other researchers have been able to enlarge the concept related to the sunshine trading strategies.

The Admati study is really interesting and of course the capacity of understanding sunshine trading in relation to that study presents some considerations to make.

The document is based on the concept of preannouncement, and, on the fact that only informationless traders are able to preannounce.

In my opinion the preannouncement, to be a good element for a market, should be made by intermediaries such as brokers, who would presumably acquire valuable reputations over time for screening out informed traders. To preserve their reputation, the intermediaries would then ensure that preannouncement is only made by liquidity traders, in fact, if this is not real, the market could be assumed to be full of bluffers or insider traders. It is also interesting to analyze from this document that preannouncement signals an informationless trade which is related to the potential costs of preannouncement for an informed trader.

As we know preannouncement entails a delay in the execution of the order, this delay in order of making profit can be more costly for informed traders than to liquidity traders. There could be the possibility that, if the information is likely to be short-lived, an informed trader may not want to delay his trade.

In my opinion preannouncement has to consider also the fact that, being in the market place where profit is all about work, preannouncement cannot be a good strategy for the traders who have really profitable information, they also have to consider the possibility of reduction of their trading profits[26].

Generally, informational effects of preannouncement tends to increase the informativeness of the equilibrium price. This might reduce some of the risk-sharing benefits of trading between liquidity traders and speculators, and therefore reduce the potential benefits of preannouncement.

To better understand, we can suppose for example that announcers have endowment shocks in their holdings of non-trade assets,

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[26] Consider that if all informed traders are dissuaded from preannouncing and if information is costly, then in equilibrium the preannouncement will no trigger information acquisition, and so informed traders will want to preannounce.

whose payoffs are correlated with the payoff of the risk asset. If there is a huge sharing of information about the asset's payoff it is revealed at the rime of trade because of preannouncement, the risky asset becomes a less effective hedge for the announcers. We can say that preannouncement significantly increases the average level of entry, and also creates a correlation between the entry level and the size of the preannounced order.

I think that an analysis like this doesn't allow the ability to choose whether or not to engage in preannouncement. However, if the practice of preannouncement is established, it is relatively easier for announcers to be able to choose whether to preannounce a particular order or not. The model gives a kind of useful result if we look in the prospective of expected payoffs and trading cost, in fact, the results can be used to analyze in a theoretical way, when the announcers are interested in minimizing their expected trading costs.

The model is also interesting because it shows that if not all speculators enter the market without preannouncement, then the only possible equilibrium of the model in which announcers choose whether to preannounce is one in which all realization of the announcers' demand are preannounced. If the entry cost is so low that all speculators enter without preannouncement, then there is another equilibrium in which no preannouncement ever takes place.

In this model the researcher take the allocation of information as given, preannouncement is likely to have implications for the incentives to collect private information, which would affect the information allocation and the resulting market equilibrium. From the result of the studies we can say that, when preannouncement works, it gives a more informative price. As a consequence of this, of course the possibility to pay for excessive costly information will be reduced.

I think it is also important to take into consideration that less information acquisition generally gives a higher level of uncertainty associated with the risky asset, because if this is true that there is no need for information because the trades could be efficient in this way, but I think that in this way also the principal mechanism of the trading markets, the sharing of information, do not work and the whole system could be damaged. Anyway, these aspects, which would, in turn raise the risk bearing costs borne by both announcers and no announcers.

I'd also like to consider another aspect, looking at the model presentation there could be some problems in relation to the concept expressed, the front running effect could be a very interesting aspect to analyze in relation to the model.

Front running refers to a situation in which a trader, knowing that an order is about to be placed, trades in the same direction before the order is executed. The front-runner plans to unwind his position after the original order is executed and hopes to profit through price of the original order.

The preannouncement strategy is very risky from this point of view, it exposes announcer to high possibility of front running activities that might work to their disadvantage.

From these studies there are some considerations that can suggest that front running will not hurt the announcers in an equilibrium context.

I think that on a kind of analysis like that, the good way for a preannouncement to change the influence on the market is thanks to the entry decision of the speculators, that can play an important role in the game of infomativeness and liquidity of a market. The figure of the speculators in this model is crucial, they provide liquidity to the market, but as we know the figure of speculator is strictly related to the possibility of making profit in a specific market, therefore, providing liquidity only at a cost because they expect a compensation for the risks assumed.

In this model of the financial market, they assumed that there is a continuum of speculators. Since the actions of each speculator have no measurable effect on the price, each behaves competitively. Generally the risk-bearing and adverse-selection costs continue to exist when speculators are imperfectly competitive and preannouncement will have the same types of effects on these costs as it did in our analysis.

We can observe from this study that, when there are positive entry costs and imperfect competition, the expected trading cost of a liquidity trader is decreasing in the number of speculators not only because a larger number of speculators improves the risk-bearing capacity of the market, but also because a larger number of speculators increases the degree of competition.

Since preannouncement lowers the risk of entry for speculators, it tends to increase the average size of the market and therefore the average degree competition.

We can also see that preannouncement introduces a positive correlation between the size of preannounced order and the degree of competition. This correlation will lower trading costs on large orders and increase them on smaller orders; the net effect will be a reduction in expected trading costs. Because of these effects on the degree of competition, preannouncement may reduce expected trading costs by even more in a model with imperfect competition.

Concerning the De Frutos and Manzano model there is a kind of consequence of what we have analyzed in the previous chapter and also in the SLE concept discussed above where the concepts of market transparency are dealt with.

Focalizing on the sunshine trading strategies the model they decide to assume that the decision to reveal the orders (prior to trading) is done voluntarily by the noise traders.

From the studies is derived that noise traders decides to adopt a sunshine trading strategies independent of his order size, generally it is given to the fact that their strategies are not based on particular knowledge or some strategies.

However, could be different situation where for example the noise traders with higher liquidity needs are more interested in sunshine trading, for particular necessity or for example for reason external to the specific markets(the noise meaning itself means something that most of the time have no sense).

Interesting result is also that when the market are very large, noise traders opt most of the time for sunshine trading, maybe because when the number are very huge everyone knows that their order also if they are relatively big can't modify the structure of the market at all.

To conclude the analysis I decide to make an analysis more practical in order to better understand the logic and the phases related to a trading market where is active a sunshine trading optical for the traders that works in.

The paper of Maguey Dia and Sebastian Pouget named "Sunshine Trading in an African Market" studies sunshine trading phenomenon in this precise financial markets. Of course, given the fact that this market is particular for its structure and number of operation, we cannot assume the result as real for every market, but given these particular characteristic the authors was able to analyze the sunshine trading phenomenon.

The model uses data from the West African Bourse, it shows that part of the large orders are placed early during the preopening period and are not cancelled; than it see that for some stocks, tentative prices reveal information long before trading actually oc-

curs and at the end that large volumes are transacted without significant price movements[27]. Market participants appear to implement sunshine trading strategies in order to enhance market liquidity[28].

This paper shows some implications with global portfolio management. The model shows that the West African Bourse has a very high liquidity respect to what is indicated by the average state of the order book.

In line of what we have observed in the previous studies considered we can say how sunshine trading is always a seen good from traders with high liquidity and with the goal to attract liquidity providers.

From the analysis we can see that in this particular market there is a latent liquidity that is not reflected in the order book because of the cost of market participation, and that appears only when traders engage in sunshine trading.

Other consideration are related to the fact that preopening period may play an important informational role and enhance welfare, principally this aspect is verified when we look at market with specific structures like the West African bourse, where the number of stocks and the number of operation are not so high.

To conclude market organizers may thus have an interest in providing traders with pre-trade communication platforms such as preopening periods as a way mean to disseminate information that most of the time are the reason why operation are not made(the phenomenon of insider trading) regarding both liquidity needs and asset valuation[29].

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[28] Consistently with Admati and Pfleiderer (1991) and with Dia and Pouget (2010).

[29] [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18] [Figure 1, 2] from Admati and Pfleiderer (1991) "Sunshine trading and market Equilibrium"; [19, 20, 21, 22, 23, 24] [Figure 3, 4] from de Frutos and Manzano "Market transparency, market quality, and sunshine trading; [25, 26, 27, 28] [Table 1, 2, 3,

3 Estimation of Equity Market Impact

As we have seen in all the examples shown in the previous chapter, sunshine trading is considered as a very important element by all the researchers for the future trading world, but, is it really profitable? When we try to put the theoretical analysis to the reality are all the concepts and the results real?

With my studies I will try to enlarge this concept not only concentrating my studies on sunshine trading but, I will try to look at trading markets as if I was an investor trying to understand with the information that I have, what could be the best strategy to use, taking into account sunshine trading as well as other possible strategies, and compare all these results to work out if it is really profitable.

My analysis aims to show a linear model that can represent the impacts that may occur on a market and, starting from this element, studying the possible market strategies in relation to the sensitivity of the impacts themselves. In that way I can see, having different results, in which market or stock trend I can approach a particular trading strategy.

The chapter is organized as follows. The description of the model is in section 3.1. In section 3.2, there is an explanation of the data. In section 3.3, variable analysis; 3.4 The volume observations; 3.5 the trajectory cost model; 3.6 Permanent and Temporary impact developments; 3.7 choice of functional form; In section 3.8 there are representations of the model in a series of examples and in section 3.9 the residual analysis.

4, 5, 6] from Dias and Pouget (2010) "Sunshine trading in an African Stock Market".

3.1 Description

I would like to start my analysis focalizing my study on the transaction movements' impact on a particular market and what elements provoke changes.

When we look at the markets we know that investment performance are strictly related to the market movements.

When we look at a particular trend we can assume that impacts are divided into two principal categories:

- Direct: derived from market operation, they are explicitly stated.
- Indirect: they are not explicitly stated. These impacts are the hardest to understand and, principally for large traders, this is an important component.

Many past work has been devoted to understand and quantify market impact costs. Breen, Hodrick, and Korajczyk (2002) studied the net market movement over five-minutes and half-hour time periods against the net buy-sell imbalance during the same period, using a linear impact model; similar work was done by Kissell and Glantz (2003); Dufour and Engle (2000) to investigate the key role of waiting between successive trades.

Lilo, Farmer and Mantegna (2003) find some evidence for a power-law scaling in the impact cost function, and they found a lot of dependence between market capitalization and daily volume. Bouchaud, Gefen, Pottersand and Wyart (2004) also studied the several correlation between volume and price data.

My personal goal is to make an analysis of indirect impact by the most commons stocks of S&P 500, and try to explain these impacts through few explanatory variables in a way that can give me estimations of these impacts and control of the data.

The model concept starts from the idea of dividing markets into permanent and temporary impact (Almgren and Chriss (2000)); the permanent component is combined with information, meanwhile, temporary component rising from the liquidity demands derived by movements in a short time.

My personal idea of analysis is based on the management and evaluation of impacts, based on past observations that affects the markets. In this way, I able to understand how a stock can influence the market. This is an optimal start point to develop the analysis that a market operator can do, both as regards the strategy that want to use, both as regards the reliability and transparency of a market.

3.2 Data

The dataset on which the analysis is based is composed by the last two years movement of the most common stock in the S&P 500, from January 2014 to December 2015.

The data is downloaded from Google-finance and is a variation measurement of one minute's time. In Google Finance, intra-day data is available in several frequencies. The construction of the sample is based on the selection of stocks that have a higher volume level, in this way I am able to analyze more precisely how the volumes will be determined in the assessment of impacts. Through the selection of measures of movement of significant volume our sample goes to a reduced number of 50 stocks analyzed[30].

In this way I am able to observe in a detailed way the sensibility of a market and the indirect element that can influence itself.

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[30]The dataset is taken by the following link:Example:
http://www.google.com/finance/getprices?i=60&p=10d&f=d,o,h,l,c,v&df=cpct&q=IBM (example bout IBM dataset).

A market operation generally is split in two or more transactions and obviously the impact of a particular operation could not be immediate, then, taking into account this point I focalize my observation selecting part of the time series where the volume is significant and I observed variation over time for this determined period, that, on average, is longer than a typical trading trajectory. Hence, I tried to observe when market movements are consistent, how the signal and the operations influence the system.

The model selection, as I said before, is based on the volume trade operation and, for this reason for every stock selected I took into consideration the period with high significant volume that is directly linked with a major market activity for these particular periods selected.

Volume is a measure for the intensity and pressure which are the basis of a trend.

The greater the volume, the more reliable the long-term trend in place will be. The analysis of the volumes thus, provides a number of important confirmation signals or uncertainty of the trend. The volume represents a set of the transactions carried out on a tilt in a given unit of time. In other words, they show the interest that investors are placing in a stock or in a market.

Studying the volumes provides a greater or lesser dynamism which can help in predicting how they develop the business on the market and provides important information on the interest of a particular movement of the operators.

From the analysis of the relationship between prices and the volume it is generally possible to understand the degree of intensity characterizes the supply and demand pressures in the market. The volume trend represents a confirmation of the validity of the movement in place, when the phases of expansion and contraction follow the same direction of prices.

3.3 Variable Analysis

As I said above my purpose is to portray the market through few numbers of input variables. For our selected data we started with measuring market impacts.

Let's assume P(t) is the price of the asset assumed in a particular period selected, we choose the following inputs:

- P_0 : market price before the period selected
- P_{post}: market price after the period selected
- $\bar{P}$: average realized price during this period

We selected a period where the volume is significant and through an evaluation of a determined time we analyze these three inputs.

The pre-impact price P_0 is the price before the impact of the significant volume period analyzed (it could be assumed as an approximation, since some information may leak before any record enters the system).

The P_{post} should take the "permanent" effect of the period examined.

To be a good input estimator P_{post} should be taken long enough after the period selected is closed.

In Dufour, A. and R.F. Engle (2000) I found that one-half hour after the period examined is adequate to the analysis, then, I defined a time period as:

$$t_{post} = t_n + \frac{1}{2} hour \qquad (1)$$

Starting from these points, the impact variables are:

$$I = \frac{P_{post} - P_0}{P_0} \qquad (2)$$

$$J = \frac{\bar{P} - P_0}{P_0} \qquad (3)$$

Where I is the permanent impact and J the Realized impact.

Of the two impacts J is the most interesting, it describes the real movement in terms of market structure on the period analyzed. My personal goal is the determination in a more linear possible way of the elaboration of a realized and permanent impact.

The result of these two observations could be positive or negative, it depends on the volatility factor, and, on price movement given from a higher number of buyers or sellers on the market.

	Mean	Min	Q1	Median	Q3	Max
Permanent impact (I%)	0,01	-3,95	-0,17	0,01	0,19	2,66
Realized impact (J%)	0,03	-3,57	-0,11	0,02	0,17	2,33

Table 1- Summary statistics of my observation: mean and quartile levels for each of several descriptive variables. The variables are very nearly distributed about zero.

3.3 Volume observations

The level of market activity is known to vary substantially in different periods of trading day, this element influences all market processes.

To make a better analysis, I decided to divide day's volume from t = 0 to t = 1, with t =0 for market opening and t = 1 for market closing.

Taking into account these elements about volume, I want to describe the impacts I and J in terms of the following input quantities:

$$X = \frac{1}{n} \sum_{i=1}^{n} x_i \tag{4}$$

$$T = t_n - t_0 \tag{5}$$

$$T_{post} = t_{post} - t_0 \tag{6}$$

Where X is the average volume for a particular relevant period, T is the duration of the observed period and T_{post} is the impact duration of the observed period.

X can be assumed as the volume average of the period selected; as well as I described before volume is a very interesting element to analyze impacts and, under certain aspects, X can be assumed as a very similar data of aspects, X can be assumed as a very similar data of a normalized significant order for a period selected.

T and T_{post} are two crucial data, given the fact that the time, principally for temporary impact is important.

Other important auxiliaries are taken into account in my model, so not only X, J, I but also:

V = Average daily volume in shares

σ = daily volatility

V represents a ten day moving average; for my model analyzes volatility in terms of changes of time which is fundamental to catch permanent and temporary impact.

These values are useful mainly to "normalize" the moving variables through stocks with largely varying properties. On the continuous of the model I will prefer to use the variable X/V that seems a more reasonable variable with respect to X itself.

In this model, the selection of volume periods, as a part of the average market value, represents a crucial point for the analysis. On the other hand, I use volatility to define the impacts, hence, for a given participation for the daily volume there should be a determined level of participation in the "normal" flow of the stocks.

My empirical results display that the most important scale factor for the impact is volatility.

3.4 Trajectory Cost Model

As I mentioned before, the model follows the decomposition of the price impact into two components.

In addition, to make the model simpler, I assumed that the volume trade is constant during the time selected, and, I omit cross impact, because data-information doesn't contain any detail about the conditioning effect between stock prices of different stock.

Given all these elements the market impact can be assumed as two components:

- Permanent: crucial element component of the trading market, in my model I assumed this value independent on T.
- Temporary: more sophisticated component that is the result of possible price concession needed to attract counterparties in a short time interval. The time for temporary impact is fundamental, it is highly sensitive to this factor.

Interesting studies about these concepts have been developed also by Madhavan (2000).

The realized impact for a market can be assumed as:

$$Realized = Permanent + Temporary + Noise$$

The temporary impact is not directly observable, and, for this reason I elaborate the model below.

We start with an observable volume movement X; when the volume is high, the more intense and precise the market is, the higher the volume and clearer the trend and the impacts will be.

To represent the model better I introduced a trade rate in volume X/T, taking T as the fraction of time selected (it can be assumed as a percentage of the total day trading).

3.5 Permanent and Temporary impact

3.5.1 Permanent impact

The model assumes that P(t) follows an arithmetic Brownian motion, following a drift dependent on v = X/T

$$dP = P_0 g(v) dt + P_0 \sigma dB_t \tag{7}$$

Where B_t is a standard Brownian motion, g(v) is a permanent impact function assuming g(0) = 0 and t is the volume time observed and it represents a fraction average of an average day's volume.

I introduce the time in the expression, taking v = X/T for $0 \leq t \leq T$ and I obtained the permanent impact:

$$I = Tg\left(\frac{X}{T}\right) + \sigma\sqrt{T_{post}}\,\xi \tag{8}$$

Where ξ is a standard Gaussian variate ($\xi \sim N(0;1)$) and g(v) is a linear function.

3.5.2 Temporary impact

We can imagine that the composition for impacts in a market is structured as follows:

$$\tilde{P}(t) = P(t) + P_0 h\left(\frac{X}{T}\right) \tag{9}$$

Where $h\left(\frac{X}{T}\right)$ is a temporary impact function.

The equation above is a continuous-time approximation to a discrete process.

For having a better perspective of temporary impact, it is better to imagine the division of time in one hour or even better in a one-half hour, this optical can give us an accurate description.

Taking into account the time factor observed before I assumed the temporary impact as:

$$J - \frac{I}{2} = h\left(\frac{X}{T}\right) + \sigma\left(\sqrt{\frac{T}{13}\left(4 - 3\frac{T}{T_{post}}\right)}\,\omega - \frac{T_{post} - T}{2\sqrt{T_{post}}}\xi\right) \tag{10}$$

Where $\omega \sim N(0,1)$ and $\xi \sim N(0,1)$ are independent.

The previous observations of permanent impact caused by past movements can be represented by $\frac{I}{2}$.

The error term components, on the other side, considers the drift of the Brownian motion on [0, T] for his middle part.

The data fitting proceedings is quite linear: we compute the impact observations I, J from the data analyzed and then, regress those values against the volume size and time to pull out directly the function g(v) and h(v).

3.6 Choice of Functional Form

To have a better understanding and structure the model we also have to choose what should be the form of g(v) and h(v), permanent and temporary impact functions.

At this point we have to postulate that the functions are power laws, making the hypothesis:

$$g(v) = \gamma |v|^{\alpha} \qquad\qquad (11)$$

And

$$h(v) = \eta |v|^{\beta} \qquad\qquad (12)$$

Where the parameter γ and η and the coefficient should be determined through linear regression data and making some hypothesis.

The choice of the exponents is extremely difficult, also because with our data it is particularly challenging to enlarge some observations.

We are far from neutral in the choice of the exponents.

The permanent impact function should be assumed free from arbitrage, given my previous assumption; for this reason I prefer the linear model $\alpha = 1$. There are strong arguments supporting this choice in Huberman and Stanzl (2004).

Moreover, to make the permanent price impact independent of time observation the linear function is the only adaptable one.

For the temporary impact the function should be concave, on this purpose there are ample empirical evidence that indicates how the function should be concave, then $0 \leq \beta \leq 1$.

Loeb (1983) gives strong evidence for this, and, in the same way Lillo, farmer and Montegna (2003). Barra (1997) suggest in particular theoretic arguments that $\beta = \frac{1}{2}$ is particularly conceivable, giving a square-root impact function.

Assuming this exponent, as it is largely explained by their authors, a mere linear regression is sufficient to define the coefficients. For this regression I utilized heteroskedastic weighing with the error magnitude in (8, 10).

All these analysis have been made not only to find the coefficients of these regressions, but I have also taken into account the collection of error residuals ξ and ω, that must be considered the normality as they presume (results are showed below).

With the model as we have explained above, I assumed a "hypothetical" asset without considering that all the properties may change during the time. For example, I can imagine that if I want an execution of a given number of shares, it would incur a higher impact cost if I am trading on a day with unusually low volume or with unusually high volatility.

I, therefore, should assume in the model that the natural variable of trading impact is not the movement volume per se, but the movement in relation to the background flow for a particular stock in the time period when observations will occur.

Then the impact function should be X/VT rather than X/T; where v is the average number of operations per day.

On the other hand, observations should not be assumed as raw observations of percentage movements, but they should be assumed as a fraction of the "normal" daily movement of the price, for this reason I also give great importance to daily volatility σ.

Taking into account these observations I changed the previous expressions into:

$$I = \sigma\, Tg\left(\frac{X}{VT}\right) + noise \qquad (14)$$

$$J - \frac{I}{2} = \sigma\, h\left(\frac{X}{VT}\right) + noise \qquad (15)$$

The error expression depending on volatility is represented by the noise g(v) and h(v) can be explained as dimensionless functions of a dimensionless variable.

After this modification, I will also be taking into consideration the fact that many variables change across stock, also in very different ways. This is because, movements and impacts depend on many other factors such as outstanding, bid-ask spread or market capitalization.

From this perspective, I think that temporary impact function cannot have substantial influences, but, on the other hand there are some modifications to do from a permanent perspective.

The "liquidity factor" for example is extremely important and it should be inserted in the function g(v), this element is more individual and it depends on particular stocks.

Let's assume l as liquidity factor, we can assume it as:

$$l = \left(\frac{\Theta}{V}\right)^{\delta} \qquad (16)$$

Where Θ is the total number of shares outstanding, and the parameter δ is simply an exponential factor.

This observation is a ratio that describes the inverse turnover[31].

Accordingly, we can write the model as:

$$\frac{I}{\sigma} = \gamma\, T\, \left(\frac{X}{VT}\right)^{\alpha} \left(\frac{\Theta}{V}\right)^{\delta} + noise \qquad (17)$$

$$\frac{1}{\sigma}\left(J - \frac{I}{2}\right) = \eta\, \left(\frac{X}{VT}\right)^{\beta} + noise \qquad (18)$$

The only element to find out is the exponent δ that I assumed equal to ¼ in an approximate way, taking into consideration the studies of Huberman and Stanzl (2004) and from Breen, Hodrick, and Korajczyk (2002) where the topic is critically discussed.

Hence:

- the impact of J shows that there is an increment with Θ, the total number of shares outstanding.
- Permanent impact is linear
- Temporary impact as described in past studies has a concavity function.

---

[31] This observation is widely observed on Breen, Hodrick, and Korajczyk (2002).

After deciding the exponent values, I defined the values of γ and η with linear regression of the model above, using heteroscedasticity error estimates given in (1, 2), I found:

$$\gamma = 0.320 \pm 0.042 \quad (t = 7.67)$$

$$\eta = 0.143 \pm 0.0061 \quad (t = 21)$$

The t-statistics are computed assuming that the Gaussian model in 1, 2 is verified.

The error estimates are the value divided by the t-statistics.

The R^2 values for these analysis are generally less than 1%, this indicates that only a small part of the volume of the dependent variables I and J is explained by the model in terms of the independent variables.

The γ and η coefficients are assumed as "homogeneous coefficient of market impact": as they are imagined in my mind can be applied to every asset in the entire data set.

To summarize all my results, the final equations are as follows:

$$I = \gamma \, \sigma \, \frac{X}{V} \left(\frac{\Theta}{V}\right)^{1/4} + noise \qquad (19)$$

$$J = \frac{I}{2} + \eta \, \sigma \left(\frac{X}{VT}\right)^{3/5} + noise \qquad (20)$$

They give us the expectation of the market impact for every stock market selected.

It is easily understood how volatility moves my observations in a deterministic way. I chose to structure my observations in an eas-

ier and more linear way, but more detailed models could be constructed to capture more precise elements of a market (maybe, it could more internal data be helpful, unfortunately I am not able to have today).

I should expect that probably coefficients, exponents, and maybe the forms of the model can be continually changed in order to reflect more detailed and recent data.

3.7 Examples

In table 2 I use my model in order to see how to demonstrate the results.

I selected two different stocks of two different markets in order to see clearly the difference of the model results.

As we know, Google is one of the most important companies in the USA, and its structure is an example to follow for all the companies that do the same business. Its revenues are for 90% generated from advertising, and its image of solidity gives great power to the company.

On the other hand, General Motors is a very different company in respect to Google, it is an American multinational corporation that designs, manufactures, markets and distributes vehicles. The two companies do business in a completely different way, and, for this reason I selected these two companies for a deeper analysis of my model.

	GOOGL			GM		
Average daily volume - V	7,584M			40,329M		
Daily volatility(%) – σ	2,78%			2,42%		
Norm. volume size - X/V	0,1			0,1		
Shares outstanding - Θ	688,32M			1,640M		
Inverse turnover - Θ/V	91			41		
Norm. permanent - I/σ	0,097			0,082		
Permanent price impact - I	27			20		
Duration (days) – T	0,1	0,2	0,5	0,1	0,2	0,5
Norm. temporary - W/σ	0,144	0,093	0,054	0,145	0,054	0,012
Temporary impact cost - W	40	26	15	35	13	3
Realized cost – J	53	39	28	45	23	13

Table 2 - The table shows permanent and temporary impact costs, for a value of 10% day average volume, for two very different stocks. The value W is the temporary impact cost, and it depends on time. I write W= J – I/2.

In these numerical examples I considered volume analyzed of the average daily volume of 10%, then we can assume that volume percentage taken into consideration is equal to a fraction of the trading made by one hypothetical customer, that for example in a trading day session buys 10% of the total daily average volume.

From this analysis we can see how in Google's case the turnover is 1/91 meanwhile for General Motors is 1/41 of its total shares each day. This means that GM has a greater level of mobility in respect to GOOGL, this is given to the fact that Google has a greater number of shares outstanding compared to General Motors.

From my model it's evident that, on an equal normalized volume size of 0,1 for the two stocks, we have a permanent impact for GOOGL of 27 and 20 for GM. This indicates that the movement selected shows us how a movement is equal to 0,1 compared to the total volume of a single day has a more significant effect on GOOGL than GM.

The permanent impact function is linear, and, as I said before the permanent cost numbers are independent of the time scale of execution.

On the other hand, temporary impact as is explained above is strictly related to the time component, for this reason I split the time in three different sections in order see how, with different time horizons of operations, the impacts change; obviously, the greater the time window, the lower the temporary impact[32].

From the analysis of the two companies, it is clear that temporary impact is greater for GOOGL compared to GM, even considering a volume/trade size of 0,1. Interesting results are noticeable when we look at the greater values of T, the difference between the two stocks is more evident.

More extended points of view are given by figure 1 and 2 where some selected stocks of my sample are shown from the S&P 500 companies.

From this prospective it is easily visible which company has a greater permanent impact consequence. From our analysis, great importance is given by the daily volatility and, also in these figures we can see how these impacts are influenced by this data.

From this approach we can also understand better which hypothetical strategies to adopt and, in the following chapter my studies are focused on that.

One particular characteristic that stands out from these figures is how, in this way, also for stocks in the same sector there could be completely different observations.

For the temporary impact, we can look at three different periods of time (T), this element can be really important in an optical of trading where there could be the difficulty in choosing a specific trading strategy.

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[32] These could be useful data to understand trading strategies.

Understanding how impact can persist during the time is a crucial element for the selection of stocks for particular trading strategies.
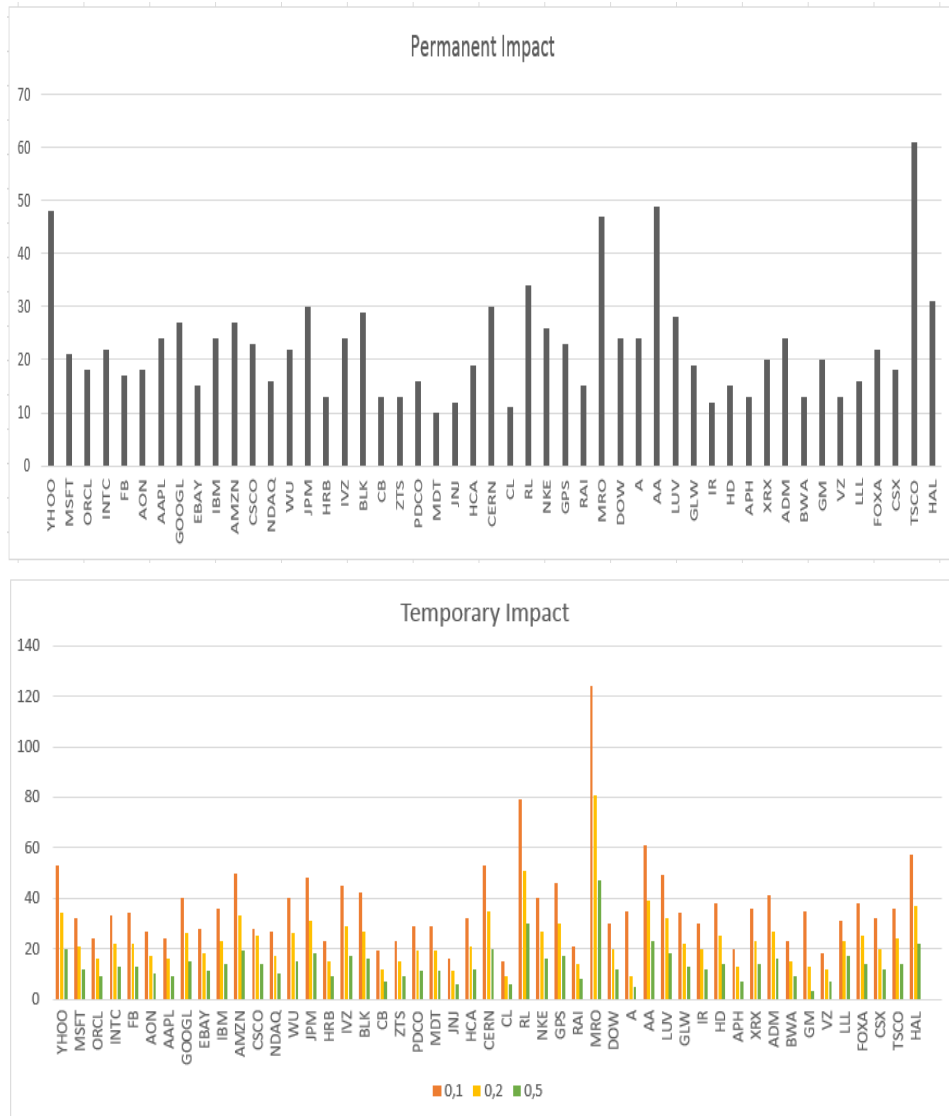

Figure 1, 2 - Representation of a sample of selected stocks from S&P 500 used for our model description. Figure 1 represents the Permanent impact and figure 2 Temporary impact.

From the data we can easily see how MRO has a greater impact compared to the other one, this can be explained by a very significant daily volatility (above 5%) and an inverse turnover relatively low compared to the average of the selected stocks.

MRO has a great impact, it is principally related to the uncertainty related to the oil market of the last years, and on this optical

the model describes in a correct way the abnormality of the market.

On the other hand we can see how JNJ has a really low impact result for permanent and temporary impacts, this is also explained thanks to a very low daily volatility (1,14%) but also to a more stable liquidity index that shows a lower level of mobility.

Johnson and Johnson probably has a lower impact in respect to MRO also because the location of the market is undoubtedly more predictable in respect to the oil market.

In the next chapter I will enlarge these results that are showing up from my model in more practical terms taking into consideration the possible different scenarios and the possible different trading strategies adoptable.

3.8 Residual Analysis

The results are not only the values discovered from my analysis.

As it is written above we have used error formulation for the residuals, ξ and ω. The means are close to zero and the variance is reasonably close to 1, the only exception is the fat-tailed[33]
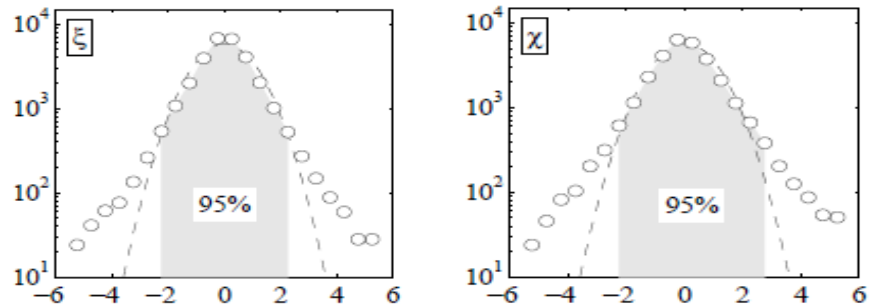
Figure 3, 4 -logarithmic histograms of residual errors ξ and χ, for the period sample selected and for permanent and temporary impact respectively. The dotted line demonstrates the value that would be presumed in a standard Gaussian distribution of zero mean, and variance equal to 1. The distribution is fat-tailed, but, the standard Gaussian is a rational fit to the central part.

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[33] Rydberg (2000), shows how is normal for return distributions on medium-short time intervals the presence of fat-tailed distribution.

4 Sunshine Trading: impact and comparison with other strategies

Starting with the achievements of the previous chapter, where we studied the impacts in terms of liquidity linked to the temporary and permanent impact, now I want to focus more in the possible points of view that a market participant may have when it approach with specific situations, in this way we will be able to have a broader perspective and be able to have clearer ideas not only on sunshine trading, but also for the markets in general.

My goal is to propose a linear and easy demonstration about strategic position of a trader respect to a market, and at the same time evident comparison between different trading strategies.

I think that for a trader that want to evaluate a specific market and, in which way approach to it, it is more important what the perceptions of a market are.

Generally, the market structure is more influenced about "voices", "impressions" and temporary and possible permanent effect rather than the effectiveness reaching and evaluation of the real value. On a market that works in this way, then, permanent and temporary studies can assume a great value as they are described by Almgren and Chriss (2001).

I enlarged this concept trying to construct a linear model where, thanks to the permanent and temporary impacts analyzed in the previous chapter, we can understand more clearly the optimal strategies to use when we are trying to approach a specific market, and so, understanding in comparison with other trading strategies if sunshine trading could be a better strategy respect to the others.

Finally, to have a better understanding of the model, I showed different graphs representing the impact results for different hypothetical strategy under some assumptions.

4.1 Market scenarios

We have to understand better the world in which we are operating and the trading strategies related to the market structure where we want to operate. We could find an optimal strategy using sunshine trading in a particular market and, at the same time we could find that sunshine trading is the worst strategy to adopt.

Generally financial markets are typically defined by having transparent pricing, basic regulation on trading costs and fees, and market forces determining the price of securities that trade.

Financial investors, especially thanks to the technological progress, have access to a large number of financial markets and exchange represents a vast array of financial products. Some of these markets have always been open to private investors; others remained the exclusive domain of major international banks and financial professionals.

Financial markets can be found in every nation in the world. Some are very small, with only few participants, while others, for example NYSE and the forex markets, trade trillions of dollars daily; sunshine trading can be actuated in every market, but sunshine trading is not equal in every market.

To make a good decision in order to adopt the right strategies we have to make a deep analysis starting from the observation of the market, then, understanding how companies, markets and the traders that operate in a specific market work, how they compete and how they respond to the changes. Understanding market structure provides a starting point for judging industry and market

news, policy changes and legislation and how it shapes the personal investing decision. Also understanding the general behavior of other operators is crucial better decisions on which strategies to adopt.

Starting to look at the market structure there are several basic defending characteristics for a correct analysis:

the commodity or item that is sold and the level of differentiation between them; the number of companies in the market; the case or difficulty of entering the market share of the biggest firms; the relationship between producers or sellers; the most important point for our analysis, the number of buyers/sellers and how they work with or against sellers/buyers to influence price and quantity.

We also have to understand how a specific market obtains the structure that we are going to approach, in fact, the more convolute a system is, the less efficient it is likely to be.

It is also necessary to understand if we are in a centralized market or in a market based on wholesale and retail order flow that is more complex in respect to the first one.

In a market, if orders are being taken away from common market mechanism, using orders like internalization, preferencing and internal order crossing practice, it will make it harder for buyer and sellers to find each other in an efficient way.

To make a better scenario analysis it is also useful to take a better look at the market structure and see if we are in a market near to one of the four specific basic types.

If we are in a perfectly competitive market, we know that the forces of supply and demand determine the amount of goods and services produced as well as market prices set by the companies in the market.

In a situation of perfect competition we should know better that buyers and sellers are referred to as price takers rather than price

influencers, than on first impact could seem wrong using a sunshine trading strategy, however it depends on the specific case. Anyway, this kind of market is really hard to discover, and this structure is generally a reference point from which economists compare the other market structure; this is true because, when competition is perfect in retail and wholesale order flow markets, low commission compensates poor execution so that inter-price do not ultimately depend on the best execution standards.

Generally, if we are in a market where dealers and brokers have consistent power, they will exploit that power and try to reach excess profit as much as they can. How much excess profit they can obtain depends on how far or near to a competitive market the market is.

Unlike perfect competition, the monopolistic competition does not assume lowest possible cost production. Companies in monopolistic competition sell very similar products with small differences they use as the basis of their marketing and advertising. An interesting point is that, in monopolistic markets the subjects are price maximizers, so, when the profits are attractive, traders are more motivated to enter the market, so maybe a sunshine trading strategy could be a very good choice to expect a good reaction from the other side of the market.

From a monopolistic side it is easy to take this into consideration. In a monopoly there is just one supplier, the price competition is then absent, the supplier is the price-maker, setting a price that maximizes profits. Generally in a monopoly the rules are all defined and we operate in a bounded world, so I think that using sunshine trading or not is the same, in any case there will be no consequences.

The last structure to analyze is the oligopoly market. Oligopoly is a market structure where the subjects collude, or work together to limit a competition and dominate a market. The crucial characteristic is that, since market structure discourages true competition

the producers are able to set prices, but the market is price sensitive. The dynamic relationship among and between sellers and buyers change pricing, profits and production levels. Traders require to know how firms react to those relationships and changes and forecast their reaction. In this case, taking a position is more subjective, so sunshine trading strategy is not so easy to recommend. It is also important to take a look at the operator in a specific market, and try to understand through the signal which type of traders are in, and are operating in a specific market.

We can meet a large variety of different traders with different strategies and, hence, this influences a market in its characteristic.

Order anticipators are very usual to find in a market; they are speculators who try to profit by trading before other traders trade. Order anticipators include front-runners, sentiment-oriented technical traders and squeezers.

Front runners[34] collect information about trades that other traders have to decide to arrange. This kind of trade has different implications, this depends on who he/she is front-running (informed or uninformed trader), hence, he can play the market less or more efficiently.

However, the long-running effect of front-running informed traders are still negative (they make the price less informative). Front-runners decrease the profit that informed traders make. As a consequence, fewer informed traders will trade profitably.

Front-runners generally make markets less liquid, also because they do not provide service to the traders they front-run.

Similar to front-runners are the sentiment-oriented technical traders that try to predict the trades that uninformed traders will decide to make. They try to predict trading decisions that other traders have not yet made. Sentiment-oriented technical traders are like front-runners because they try to trade before other traders;

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[34] See Cap. 2.3 Critical view of the literature.

they therefore accelerate the impact that other traders will have on price. Their trading tends to make price less informative and they decrease liquidity.

To conclude the analysis of order anticipators we have the squeezers, they try to monopolize one side of a market so that anyone who wants to liquidate a position on the other side must negotiate with them[35]. Squeezers are order anticipators because they trade before other traders have the chance to trade. Sunshine traders have to be really careful about the bluffers, if they decide to trade in a market where there is a high presence of these traders, they could have great loss. Bluffers are profit-motivated traders who try to fool other traders into trading unwisely[36].

Sunshine traders, as we know, try to make the market really transparent, and bluffers are practically traders who actuate the opposite strategies, their aim is to affect the information that traders use to make their trading decisions, so, it is possible that these traders can be replaced by sunshine traders. The most famous bluffers are rumormongers, they disseminate false information, or, they disseminate true information, in a manner that they believe traders will misinterpret. However, if a trader is able to understand what the bluffer is trying to do (looking at the fundamental value) it will be easy to make a profit out of the bluffer.

As we have discussed in the previous chapter[37], insider trading is really important in order to understand a market.

Sunshine trading and insider trading seem really far from each other but, many times, the choice between these two strategies could be made by the same trader; even if these are two opposite strategies, generally the trader who wants to actuate sunshine trading also hypothesizes the possibility to use information in a different way, as well as insider trading.

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[35] Actually this strategy is illegal in a lot of market, f.e. it is illegal in U.S.
[36] Trading Exchanges, Larry Harris 2003.
[37] Anonymous traders and Insider trading phenomenon (Cap. 1.4)

Anyway, as we discussed, many times insider trading is not available and it remains just a way to make a better analysis (if it were legal, insider trading may be the most profitable choice).

4.2 Sunshine trading impacts

The choice of sunshine trading is a strategy that involves changes from the point of view of the impacts. I decided to perform the analysis of these effects starting from different studies by Admati (1986) and Pfelieder (1984), but especially from Hellwig's (1985) we can go into an analysis that studies what effects sunshine trading has on the market. Taking into account the models explained in Chapters 1 and 2 we can develop a model very similar to that of Hellwig (1980).

Assuming one riskless asset and one risky asset; a hypothetical trading takes place in period 1 and consumption in period 2; the risky asset pays off a random quantity $\tilde{R}$ in period 2.

In this scenario there is a continuous speculation $x \in [0,1]$ that, if a trader decides to enter into the market, can trade in the risky asset. In general, speculators engage the orders from the liquidity traders and can therefore be assumed as market makers who create liquidity. Speculators look at the signal $\widetilde{Y_x} = \tilde{R} + \widetilde{\epsilon_x}$ before the trading takes place, where $\widetilde{\epsilon_x}$'s are independent from traders.

As demonstrated in chapter 2, we can assume two different types of trading: announcers and non-announcers. Announcers generally have a quantity of demand equal to speculators for the risky asset, it is denoted by $\tilde{C}$ and with a variance c. If preannouncement operates correctly, and the traders before the trading show the value of $\tilde{C}$ to the market, and they are required to trade precisely this number of shares in the declared trading period. When I assume that pre-announcers disclose their intentions, they for the market are assumed as liquidity traders. Contrary, the non-

announcers demands are never known before the trading takes place. I assumed that the total demand of non-announcers is denoted by $\widetilde{D}$, and its variance is d.

For simplicity of my analysis, I made the following assumption about preferences and distributions:

- The random variables $\tilde{R}$, $\widetilde{\epsilon_s}$, $\widetilde{D}$ and $\tilde{C}$ have zero means are normally distributed and mutually independent.
- The utility function for speculators is assumed as exponential with risk aversion coefficient equal to 1.
- Speculators, using their private information, maximize their expected utility ex ante.

Bearing in mind what is enlarged in Grossman and Miller (1988) we can assume a fixed cost that speculators must preserve to be present in the market for the risky asset. I also assume that entry costs are reinforced before the signals of $\tilde{R}$ is observed; the quantity of the market is thus determined endogenously by the entry decision of speculators.

4.3 Effects of Preannouncement

I scanned the effects of preannouncement based on the logic of this strategy where the traders disclose a certain order as coming from liquidity traders. Then, I assumed that the entry cost for speculators is zero, in this way all the speculators have an informative private signal. From Hellwig's (1980) analysis, that elaborates a rational expectation model with an infinite number of traders (same observation was made by Pfleiderer(1984) and Admati(1985)) when preannouncement is not detected into the market, the expected rational equilibrium is:

$$\tilde{P} = \gamma_R \tilde{R} + \gamma_S \tilde{S} + \gamma_D \widetilde{D}$$

Where

$$\gamma_R = \frac{x(s+d)+1}{(x^2+x)(s+d)+1}$$

And

$$\gamma_S = \gamma_D = \frac{x(x(s+d)+1)}{(x^2+x)(s+d)+1}$$

When preannouncement is not discovered into the market, the total liquidity demand unpredicted is $\tilde{S} + \tilde{D}$. This explains why all of the coefficients are functions of s and d only through s + d. Anyway, if the total demand of non-announcers is assumed as $\tilde{D}$, their expected trading cost, indicated by C_D, is:

$$C_D = E\left(\tilde{D}(\tilde{P} - \tilde{R})\right) = E\left(\tilde{D}(\gamma_R \tilde{R} + \gamma_S \tilde{S} + \gamma_D \tilde{D} - \tilde{R})\right) = \gamma_D \tilde{D}$$

The last equality exploits the fact that $\tilde{D}$, S, and $\tilde{R}$ are independent. The expected trading cost when announcers don't preannounce their demands is $C_S = \gamma_s s$.

Hence, if we assume that pre-announcement is identified, and given the fact that the total liquidity demand is $\tilde{S} + \tilde{D}$ and the expected value of $\tilde{D}$ is equal to zero, the expected utility of the liquidity demand when preannouncement happen is $\tilde{S}$. If pre-announcement takes place, then, the unknown part is equal to $\tilde{D}$ (with variance d). This is less than $s + d$ the variance when pre-announcement doesn't occur.

Now I did the same analysis but, this time with the hypothesis that preannouncement is disclosed into the market. From the studies of Admati (1985),Hellwig(1980) and Pfleiderer (1984) it follows that the equilibrium price with preannouncement is:

$$\tilde{P}^* = \gamma_R^* \tilde{R}^* + \gamma_S^* \tilde{S}^* + \gamma_D^* \tilde{D}^*$$

Where

$$\gamma_R^* = \frac{xd + 1}{(x^2 + x)d + 1}$$

$$\gamma_S^* = \frac{x(xd + 1)}{(x^2 + x)d + 1}$$

And

$$\gamma_D^* = \frac{x^2 n}{(x^2 + x)d + 1}$$

The value $\gamma_S^* \tilde{S}$ does not influence the informativeness of the price and it is assumed as a constant that speculators are aware of. The expected trading costs of the announcers are $C_S^* = \gamma_S^* s$.

Anyway, for preannounces there are different implications:

1. The implication of this analysis for the preannouncement is that expected trading costs of the announcers are significantly lower when announcement occurs with respect to when it does not.

2. Expected trading costs of the no-announcers are considerably higher when preannouncement occurs rather than when it does not.

3. The ex-ante expected utility of speculators plummets with preannouncement. The equilibrium price with preannouncement ($\tilde{P}^*$) is more informative about $\tilde{R}$ than is the equilibrium price without preannouncement ($\tilde{P}$)

4. The variance of $(\tilde{R} - \tilde{P}*)$ is remarkably lower than the variance of $(\tilde{R} - \tilde{P})$

5. For some parameters, the variance of $\tilde{P}*$ exceeds the variance of $\tilde{P}$, and for other parameters the opposite is true[38].

The first two points are about the expected trading costs of liquidity traders. It is useless to decompose liquidity trade costs into two components: risk bearing costs and adverse selection costs[39].

Preannouncement has the consequence of reducing the risk-bearing costs for announcers as well as non-announcers, this is because it provides more information to speculators and therefore reduces the riskiness of the risky asset. On the other hand, it also reduces the adverse-selection costs for the announcers[40].

The third point figures out that pre-announcement makes speculators ex-ante worse-off. If there is little noise in the price there is little uncertainty about the pay-off of the risky assets, and speculators are able to pull out less consumer surplus from liquidity traders.

It should be noted that third part is sensitive to the assumption that all the speculators have the same precision of private information. This happens because preannouncement reduces the informational advantage that the better informed speculators have over speculators with poor private information, and this benefits the poorly informed speculators. The conclusions about these three points seem robust also taking into consideration past studies, especially with Grossman and Stiglitz (1980).

When the informative part is sufficiently small but positive, the uninformed are better with preannouncement and can offset the informed for their loss in welfare due to preannouncement.

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[38] Proof and explanations are in the appendix.
[39] Amply discussed in Glosten and Milgrom (1985); Kyle (1985); Subrahmanyan (1991).
[40] The effect of preannouncement in trading \cost are discussed into the model of Roell (2000) and the result are very similar to my observation.

The last three points affect the consequence of preannouncement on the variability of price changes and on the variability of the price itself. Intuitively, preannouncement leads to a more informative price (and, as consequence, less variable price changes). This is intuitively obvious, since traders have strictly better information about $\tilde{R}$ through the price when preannouncement takes place. Preannouncement has an ambiguous effect on the variance of the price itself. Recall that $\tilde{P} = \gamma_R \tilde{R} + \gamma_S \tilde{S} + \gamma_D \tilde{D}$; thus, using the independence of $\tilde{R}, \tilde{S}, and \tilde{D}$, $Var(\tilde{P}) = \gamma_R^2 + \gamma_S^2; + \gamma_D^2$.

4.4 Financial Market evaluation

To focalize our analysis on the traders' strategy we can build a model which represents the passage in a financial market.

The problem we are interested in is how a trader can optimize his approach to a market with a given order. I assumed that a trader would buy X_0 units of a security over a fixed time period [0,T].

Suppose the trader completes the order in N+1 trades at time $t_0, t_1, \dots, t_N$ where $t_0 = 0$ and $t_N = T$.

Then I have X_{t_N} as operation at time t_N.

Hence, the strategy could be assumed as:

$$\sum_{n=0}^{N} X_{t_N} = X_0$$

We can imagine moving the parameter depending on the strategy adopted and, as a consequence, we can have different evaluations where we move parameters like:

$\{0 \le t_0, t_1, \dots t_{N-1}\}$ set of time

and trade of size $\{X_{t_0}, X_{t_1}, \dots X_{t_N} : X_{t_n} \ge 0; \forall n \text{ and } (1)\}$

Let Θ_D denote the set of strategies:

$$\Theta_D = \left\{ \{X_{t_0}, X_{t_1}, \dots X_{t_N}\} : 0 \leq t_0, t_1, \dots t_{N-1} \leq T; X_{t_n} \right.$$

$$\left. \geq 0 \ \forall n; \sum_{n=0}^{N} X_{t_N} = X_0 \right\}$$

I can assume the price of the operation as $\bar{P}_n$ for the trade X_{t_n}. The trader selects his strategy over a given trading horizon T to reduce the expected total cost of his purchase:

$$\min_{X \epsilon \Theta_D} E_0 \left[\sum_{n=0}^{N} \bar{P}_n X_n \right]$$

It is good also for a trader taking into consideration not only these elements but also the past operations in relation to the market.

As we have seen previously, to make a specific analysis I want to focalize on the Limit order book market (that is one of the most frequent market operations).

A limit order is an order to trade a given number of shares of a security at a determined price. In a market managed by a limit order book (LOB), traders are able to post their supply demand in the form of limit orders to an electronic trading system.

If $q_A(P)$ is the density of limit orders to sell at price P, and $q_B(P)$ be the density of limit orders to purchase at price P. The number of sell orders in a short price interval [P, P+dP] is $q_A(P)dP$.

You generally have:

$$q_A(P) \begin{cases} + & P \geq A \\ 0 & P < 0 \end{cases} \qquad\qquad q_B(P) \begin{cases} 0 & P \geq B \\ + & P < B \end{cases}$$

Where $A \geq B$ are the best ask and bid prices, separately

$$V = (A + B)/2 \qquad\qquad s = A - B$$

V is the mid-quote price and s is the bid-ask spread.

A limit order at time t is defined by the function:

$$q(P; F_t; Z_t; t)$$

F_t describes the fundamental value of the security and Z_t is the set of state variables that could affect the LOB as, for example past trades.

F_t (fundamental value) could be assumed as Brownian motion given the fact that, when there are any traders, the mid-quote price could change thanks to news about the fundamental values.

Anyway, $V_t = F_t$ in absence of any traders. We can imagine, for simplicity, that the only set of relevant state variables is Z_t (the history of past trades).

I assumed that the shift in the mid quote price is linear in the total trade and, it is equal to:

$$V_{0^+} = F_0 + \lambda X_0$$

With $0 < \lambda < 1$

λX_0 Corresponds to the permanent impact of trade X_0.

The impact on asking price can be assumed as $A_t = F_0 + \frac{s}{2} + \lambda X_0$, taking into account how the permanent impact can influence the movement of the markets.

To give continuity to the analysis carried out previously and for effecting the analysis in a more simplified way I preferred to take the X_0 value as previously assumed in chapter 3. Now assume $X_0 = X/V$ and, I decided to take the same value normalized previously equal to 0.1.

4.4.1 Temporary impacts

This problem has led several authors to modify the conventional settings. As I said before Almgren and Chriss (1999, 2000) and Huberman and Stanzl (2005) discussed what concerns the temporary impact and in the previous chapter we have analyzed the concept in a deep way.

We can say that, the temporary price impact gives additional flexibility in dealing with the continuous-time limit of the problem. The temporary price impact reflects an important aspect of the market, namely the difference between short-term and long term supply/demand.

In addition to the effect of preannouncement impact, then it is useful to introduce a way to evaluate the effect of temporary impact on markets.

Starting from the last equation we can add also another element

$$V_{0^+} = F_0 + \lambda \left(\frac{X}{V} \right) + \gamma \left(\frac{X}{V} \right)$$

Where V_{0^+} is the mid-quote price, $\lambda \left(\frac{X}{V} \right)$ represents the permanent impact and $\gamma \left(\frac{X}{V} \right)$ the temporary impact.

4.5 Sunshine trading: permanent and temporary impacts

After we have analyzed a practical and linear way in order to estimate the permanent and temporary impact we can concentrate our analysis on sunshine trading.

Firstly, taking all the results on the chapter 3, and, normalizing all the results, we can elaborate some assumption in relation to the model:

$$V_t = F_t + \lambda \left(\frac{X}{V}\right) + \gamma \left(\frac{X}{V}\right)$$

And

$$A_t = V_t + \frac{S}{2} + \lambda \left(\frac{X}{V}\right) + \gamma \left(\frac{X}{V}\right)$$

From a graphical way we can easily analyze how the stock market can be influenced, assuming as fundamental value a value that for the history of the stock can be assumed as true.

However, as mentioned in chapter 3, we have a normalized volume size for (X/V) that I, for simplicity, presumed as always equal, but this element clearly depends on particular characteristics of the markets.

The Following figure 1 and 2 represents the permanent, temporary and total impact of the selected stocks in chapter 3 before the introduction of trading strategies.
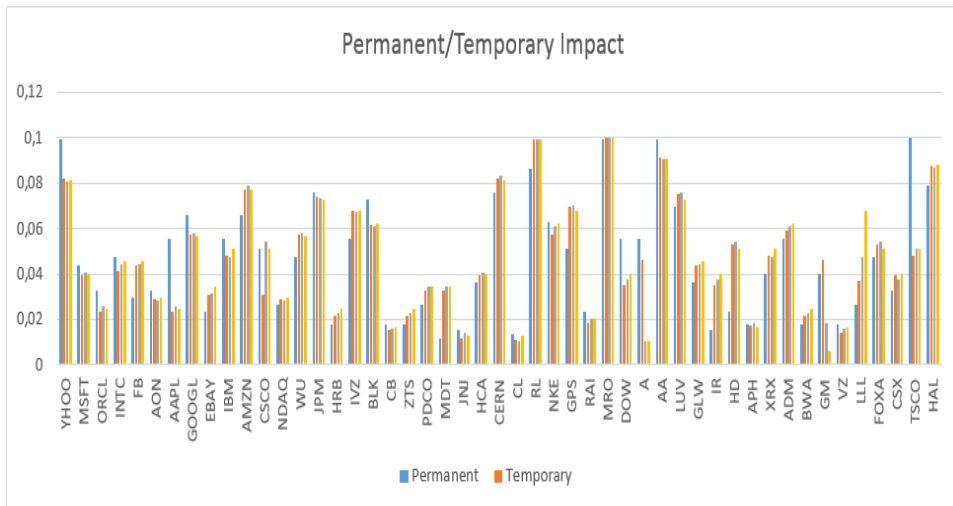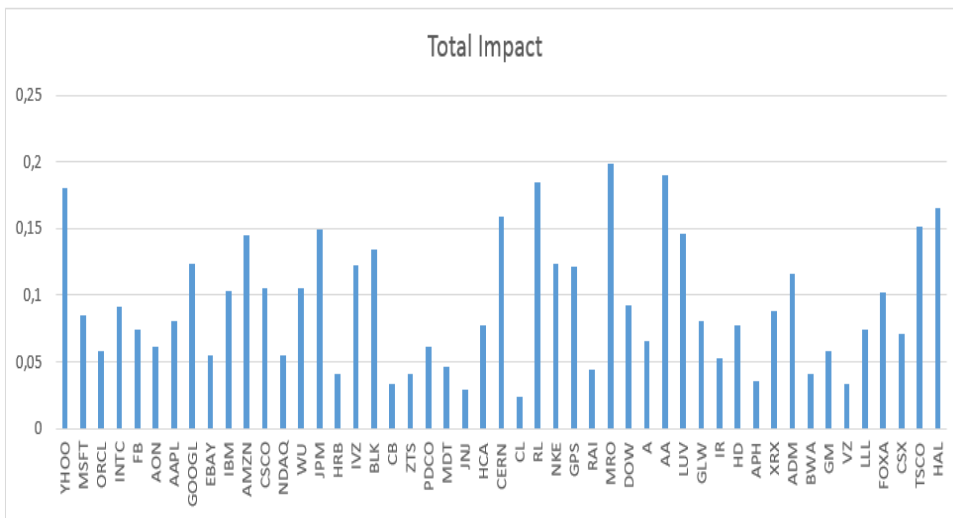
Figure 1

Figure 2

4.5.1 Moving impact

From my previous observation enlarged and confirmed in a con-sistent way from past studies, we can easily assume that, when we adopt a particular strategy, as a consequence the parameter for temporary and permanent impact could change.

So we can assume that:

$$V_t = F_t + \pi \left(\lambda \left(\frac{X}{V} \right) \right) + \Theta \left(\gamma \left(\frac{X}{V} \right) \right)$$

It is hard to choose how these parameters can be moved in order to make a better assumption on how sunshine trading can change the impacts.

My observation, amply discussed previously, makes me assume that sunshine traders are uninformed traders, this kind of strategy cannot be considered by a trader who is well informed on what is the fundamental value, hence, for this reason I should assume that their trades should therefore result in a smaller permanent price change. This can be presumed as a smaller value for $\left(\lambda \left(\frac{X}{V} \right) \right)$.

We can reanalyze the impact assuming a lower permanent price impact and, at the same time an increase in temporary impact.

Taking into account these assumptions verified above and con-sidering studies of Admati(1991), Gennotte and Leland(1990), Roell(1990), Ross(1989), Almgren and Chriss(2000) and Huber-man and Stanzl(2005) I assumed, in an approximate way, a re-duction for permanent impact which is manifested assuming $\pi = 0.75$ and an increase in temporary impact that occurs with $\Theta = 1.25$.
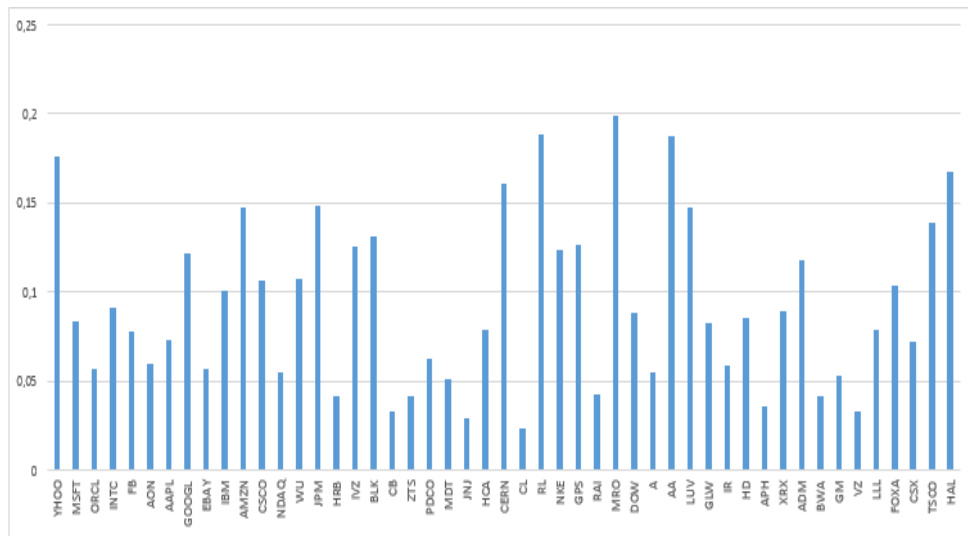
The figure 3 and 4 shows the impact results.

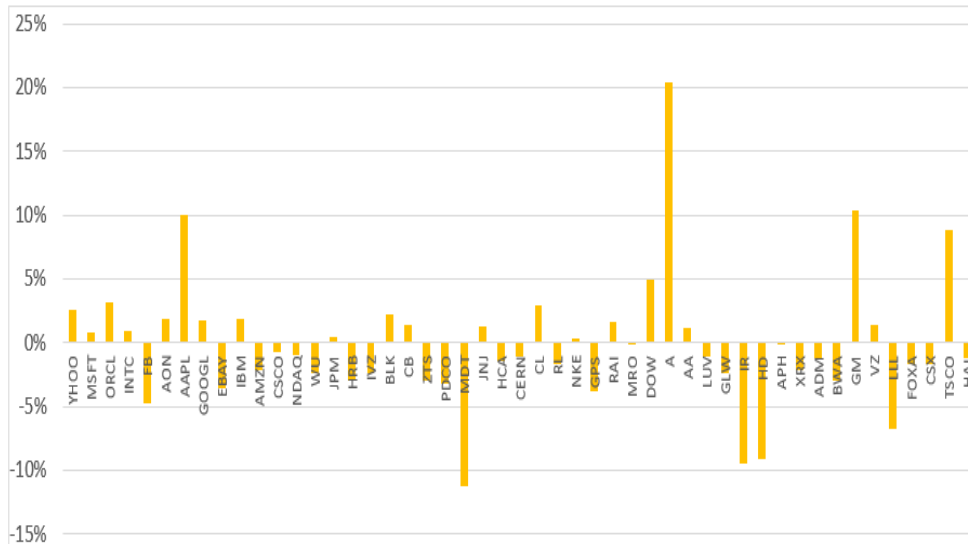**Figure 3 –** Total impact with sunshine Trading

Figure 4 – Percentage changing of sunshine trading strategy from figure 1.

Figures 3 and 4 show that the observed impact changing from the starting point of figures (Figure 1, 2) to a sunshine trading strategy. From the traders point of view, an action that has a significant impact in relation to market activities provokes higher costs, when a trader is in the buy-side of a market (we use the buy side to give a continuum to our analysis above, but, the same consideration can be done for the sell-side), he/she will prefer this strategy if the percentage changes on impacts are reduced from the starting point.

In the sample that we used we can see how, when the trader is on the buy-side, that it could be interesting to use sunshine trading for the stocks: APPL, A, GM, TSCO. These have the most significant market change in order to reduce the impacts.

On the other hand, this strategy will be inconvenient if the trader wants to buy stocks like MIJT, IR, HD, LLL.

However, concerning the effect of sunshine trading on market transparency, it is also interesting to note that the impacts are strictly related to this concept, in fact the smaller the impacts the closer the market price to the fundamental value.

Obviously, the reduction of impacts is closely related to several factors. In fact, from this point of view the results don't give us a clear vision as a real general lowering of impacts is not testable due to sunshine trading; this strongly confirm the study linked to uniformed traders, so we usually say that the sunshine trading formula does not reflect a real form of improved market transparency, as those who possess information and intend to exploit them surely will not adopt this strategy.

4.5.2 Extension: Other kind of strategies

The model analyzed before, based on temporary and permanent impact, gives us the ability not only to understand that sunshine trading has certain effects on the market, but, with the same observations we can analyze different market scenarios, and, figure out which strategy to use and, why not, to study the impact of our intentions even before we enter a market.

I decided to create two different scenarios that are very close to two different trading strategies already discussed above, in order to see two different movements of impacts.

Looking at what we have seen from the sunshine trading observations we can manage the two parameters in order to observe

how the impact market changes, for example if we look at a strategy similar to insider trading, in accordance to what I said in chapter 2 and with the confirmation of past studies of Huddart and Hughes and Levine(2001); Finnerty (1994); Theissen(2003) and Williams(2004) we can conclude that insider trading strategy has a great incidence on permanent impact and on the other hand, assuming that insider traders are informed traders, the temporary effect is relatively low.

Keeping in consideration this observation, when we move our parameters and give great weight to the permanent impact respect to temporary impact, we are moving through a more informed trading strategy, similar to an insider trading operation.

On the other hand we should also imagine a possible scenario where, our strategy has a great impact on temporary effects in respect to the permanent. Whit this perspective it could be very interesting to assume a strategy similar to the bluffing strategy.

This kind of strategy is interesting, from a bluffer's point of view, I have seen that they are profit motivated traders, they have as their goal the capacity to move the temporary impact to make profit through the noise that voluntarily they create.

However, bluffing is very risky, if it doesn't work, the trader will lose a lot of money. Taking into consideration these observations and in accordance with the studies of Chen, Reveens, Pennok (2009) and Shakroborty and Yilmaz (2007) we can manage the temporary and permanent impact with great incidence on temporary impact in order to assume a strategy consequence similar to a bluffer strategy and generally related to a noisy trader.

From these observations I assumed two different scenarios: one, very similar to a possible scenario of an insider trader, giving more weight to the permanent impact (π=1.5 and Θ=0.5), and, the other one very similar to an hypothetical bluffer trader (π=0.5 and Θ=1.5); figure 5, 6, 7,8 shows the impact results.
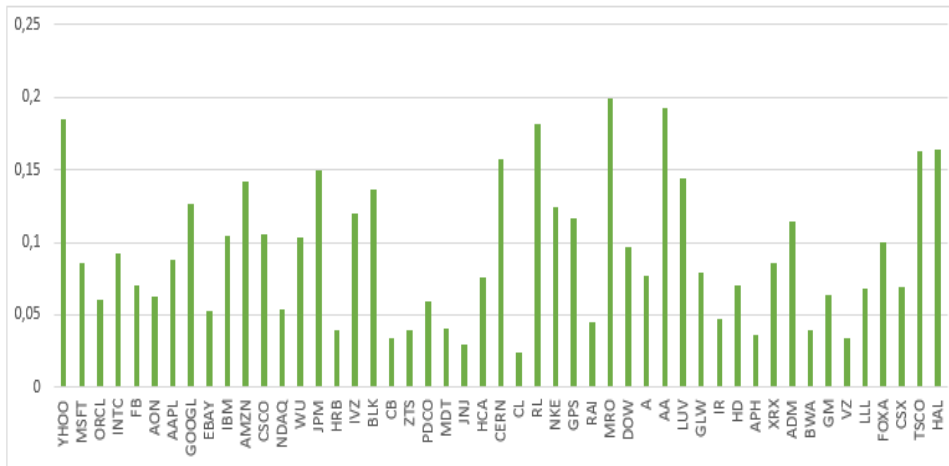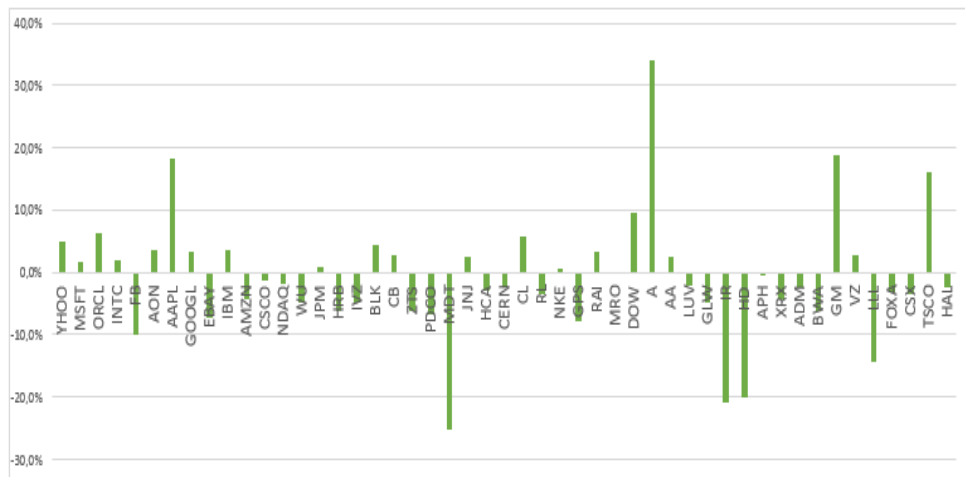
Figure 5: Total impacts when π=1.5 and Θ=0.5.

Figure 6: observed impact changing of figure 5 from the starting point of Figure 1.

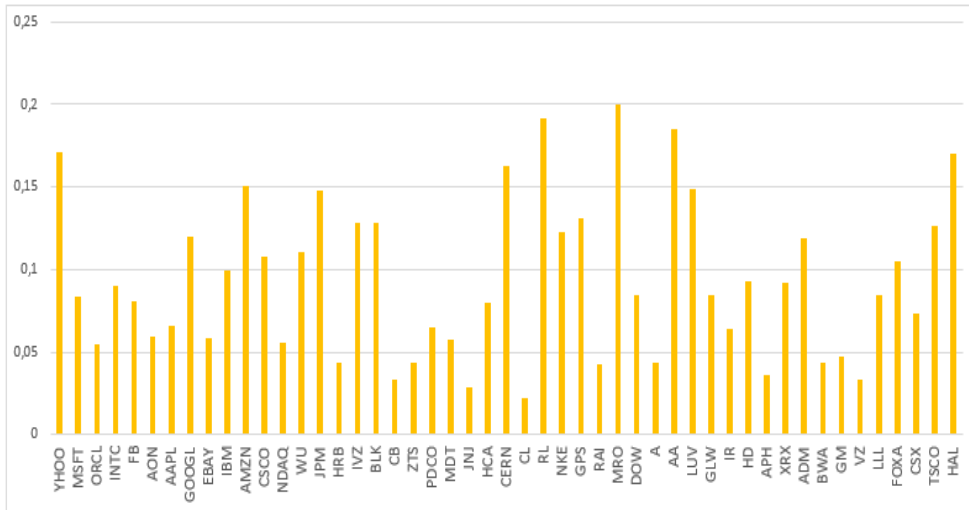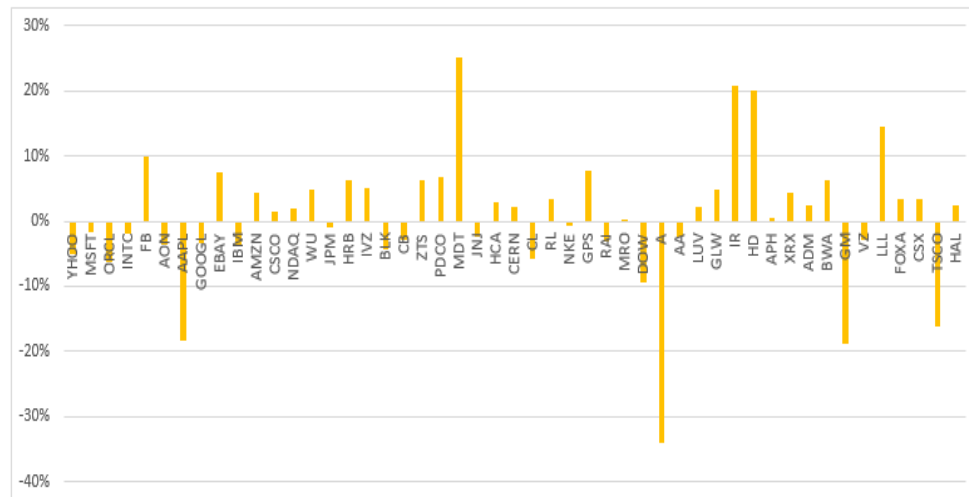**Figure 7:** Total impacts when π=0.5 and Θ=1.5.

Figure 8: observed impact changing of figure 7 from the starting point of Figure 1.

A strategy like the ones that we analyzed here, very similar to a possible insider trader strategy, can give us the name of stock that is more useful respect to the other. From the figure 5 – 6 we can see how, a "hypothetical" insider trader can choose the stocks that have a percentage change near to 0%, given the fact that his intention is to create less noise possible in relation to the market, he/she knows the fundamental value and, he/she will not invest in stocks too risky.

Contrary, for figure 7 – 8, that observes a strategy closer to the bluffers, it will be a different kind of analysis, I will start assuming the subject as an uninformed trader and as consequence we would to select the stocks that create the biggest changing on impacts, in order to create a great noise.

Hence, for this reason it can be profitable choose to bluff in stocks like APPL, MDT, A, IR, HD, GM, all stocks that from our analysis provoke great impact changing.

With this analysis, starting from a dataset of the most common stock in S&P 500, observed from variation measurement of one minutes' time, I tried to determine how a specific drift and a specific operation can bring effects that affect future trends. I tried to make an analysis that reflects in the most pragmatic way the reality of the stock world, putting myself in the shoes of an investor on the verge of a specific market operation, and then, considering all the data processed in this paper, I tried to come to a conclusion in relation to which action, industry and market is more suitable to its level of risk, its strategic style, and its ability to contribute to the transparency of the market itself.

Finally, for the purpose of managing the market, this method of analysis can be a great instrument for making decisions; the figure of impacts divided between permanent and temporary are fundamental to the analysis of a trader, whether he/she is considered an informed trader or he/she is not. The market, as a subject can be considered informed, is always subject to hypothetical changes that might be incomprehensible. From that, an optical type of temporary and permanent impacts may be the right way to try to predict how the market can change.

Conclusions

My analysis aimed to show a linear model that could represent the impacts that may occur on a market and, starting from this element, studying the possible market strategies in relation to the sensitivity of the impacts themselves. In that way I have seen, getting different results, in which market or stock trend I can approach a particular trading strategy.

I started by selecting a dataset of the last two years movement of the S&P 500 stocks, from January 2014 to December 2015, in order to analyze in a detailed way the sensibility of markets. My personal purpose was to portray the market through few numbers of input variables. I based my analysis principally on the study of volume, in fact, the level of market activity is known to vary substantially in different periods of the trading day and this influences all market processes.

I assumed that the market impact can be considered as temporary and permanent. To represent these two components I postulated that the function for these two impacts are power laws, and I found the parameter through linear regression data and making several hypothesis.

My goal was to resume the temporary and permanent impact in only one value that could capture all the elements that move the impact itself.

I selected two different stocks (GOOGL and GM) of two different markets in order to see clearly the difference of the model results. Through the parameters that I chose, we can see how the level of mobility of each day can influence the evaluation of a stock, and also how permanent and temporary impacts are strictly related to all the values that are used from a trader when he/she analyzes the market.

Studying closely the results for all the stocks selected we have the chance to understand which hypothetical strategy to adopt.

One particular characteristic that stands out from these figures is how, in this way, also for stocks in the same sector there could be completely different observations.

For the temporary impact, we can look at three different periods of time, this element is really important in an optical of trading where there could be the difficulty in choosing a specific trading strategy. This gives an evaluation of how an impact can persist over time being a crucial element for the selection of stocks for particular trading strategies.

Starting with the analysis made up to this point (largely explained in chapter 3), I focused more on the possible points of view that a market participant may have when they are faced with specific situations, in this way we are able to have a broader perspective and we are also able to have clearer ideas not only on sunshine trading, but also for the markets in general.

My analysis concluded with the affirmation that a sunshine trader is an uninformed trader, this kind of strategy cannot be considered by a trader who is well informed about the fundamental value, for this reason I found out how their traders should therefore result in a smaller permanent price change and, at the same time an increase in temporary impact. The result of these strategies were significant; from the traders' point of view, an action that had a significant impact in relation to market activities provoked higher costs, meanwhile, when a trader was in the buy-side of a market, he/she preferred this strategy if the percentage changes on impacts are reduced from the starting point.

In the sample that we have used in chapter 4 we have seen how, when the trader is on the buy-side, it could be interesting to use sunshine trading for the stocks that had the most significant market change in order to reduce the impacts.

However, concerning the effect of sunshine trading on market transparency, it was also interesting to note that the impacts were strictly related to this concept, in fact the smaller the impacts the closer the market price to the fundamental value.

Obviously, the reduction of impacts was closely related to several factors. In fact, from this point of view the results didn't give us a clear vision as a real general lowering of impacts was not testable due to sunshine trading. This strongly confirmed the study linked to uniformed traders, so we have said that the sunshine trading formula did not reflect a real form of improved market transparency, as those who possess information and intend to exploit them surely will not adopt this strategy.

To conclude I carried out the same analysis of sunshine trading on two more kinds of strategies. The model analyzed, based on temporary and permanent impact, gave us the ability not only to understand that sunshine trading has certain effects on the market, but, with the same observations we can analyze different market scenarios, and, figure out which strategy to use and why, to study the impact of our intentions even before we enter a market.

In conclusion, I can say that the analysis of stock trends are very useful to understand the strategy to adopt when a trader wants to evaluate a market.

From my calculations, we can conclude that sunshine trading seems to be a strategy that, apparently, could be interpreted as a strategy that encourages transparency in the markets. However, from my analysis, sunshine trading being a strategy used by uninformed traders, doesn't bring good information, but on the contrary, it creates a higher deviation from the fundamental value, and this happens especially when there are big orders from sunshine traders.

On the other hand, from a merely technical point of view, a pre-announcement gives you a more relaxed approach, but this can

only occur when regulations are implemented based on the pursuit of transparency from all the operators of a market.

Appendix

For the first point we have

$$C_S + C_S = \frac{xs(x(s + d) + x^2 d + 1)}{((x^2 + x)d + 1)((x^2 + x)(s + d) + 1)} < 0.$$

For the second point we have

$$C_D - C_D{}^* = \frac{x^3 sd}{((x^2 + x)d + 1)((x^2 + x)(s + d) + 1)} > 0.$$

To prove the third point, we use the following Lemma, which is explained in Admati and Pfleiderer (1987).

First we define Δ to be the total cost savings of the liquidity traders (announcers and nonannouncers) due to preannouncement. From the first two points we have:

$$\Delta = (C_S + C_D) - (C_S{}^* + C_D{}^*)$$

$$= \frac{xs(x(s + d) + 1)}{((x^2 + x)d + 1)((x^2 + x)s + d) + 1)} > 0$$

Thus, the total expected trading costs of liquidity traders are lower with preannouncement.

Now let

$$\Theta \equiv \frac{(x^2 + x)(s + d) + 1}{x^2(s + d)^2 + x^2(s + d) + 2x(s + d) + 1}$$

And

$$\Theta^* \equiv \frac{(x^2 + x)d + 1}{x^2(sd + d^2) + (x^2 + 2x)d + 1}$$

The expected utility of a speculators without preannouncement is $-(\Theta)^{1/2} \exp(-w)$, and without preannouncement it is $-(\Theta^*)^{1/2} \exp(-w)$.

Let ϑ be the amount of money would be willing to pay to prohibit preannouncement. In other words, ϑ solves

$$-(\Theta)^{1/2} \exp(-w + \vartheta) = -(\Theta^*)^{1/2} \exp(-w),$$

Or

$$\vartheta = \frac{1}{2} \log\left(\frac{\Theta^*}{\Theta}\right).$$

We want to show that $\frac{1}{2}\log\left(\frac{\Theta^*}{\Theta}\right) < \Delta$ or, in words, that the maximum amount speculators would pay to prohibit preannouncement is lower than the savings in trading costs of the liquidity traders due to preannouncement.

First note that sicne $\Theta^* > \Theta$,

$$\frac{1}{2}\log\left(\frac{\Theta^*}{\Theta}\right) < \log\left(\frac{\Theta^*}{\Theta}\right) < \frac{\Theta^*}{\Theta} - 1$$

It is straightforward to show that

$$\frac{\Theta^*}{\Theta} - 1$$

$$= \frac{xs(x(s+d)+1)}{((x^2+x)s+d)+1)(x^2sd + x^2d^2 + x^2d + 2xd + 1)}.$$

Consider now the ratio $(\frac{\Theta^*}{\Theta} - 1)$ to Δ. This is given by

$$\frac{1}{\Delta}\left(\frac{\Theta^*}{\Theta} - 1\right) = \frac{x^2d + xd + 1}{x^2sd + x^2d^2 + x^2d + 2xd + 1} < 1.$$

It follows that $\Delta > \frac{1}{2}\log(\frac{\Theta^*}{\Theta})$. The other points are straightforward and therefore omitted.

References

Admati, A. R., 1987, "Viable Allocations of Information in Financial Markets", Journal of economics Theory, 43, 76-115.

Admati, A.R., Pfleiderer, 1988, "A Theory of Intraday Patterns: Volume and Price Variability". Review of Financial Studies, 1, 3-40.

Admati, A.R., Pfleiderer, 1986. A monopolistic market for information. Journal of Economic Theory. 400-438.

Almgren, F.R., 2001. Optimal Execution with Nonlineat Impact Functions and trading-Enhanced Risk. Journal of risk 3, 5-39.

Ambrose, B.W., Cai, K.N., Helwege, J., 2011. Fallen Angels and Price Pressure. JEL Classification: G10, G12.

Bainbridge, S.M., 1998. Insider trading: An Overview. UCLA School of Law.

Bessembinder, H., Carrion, A., Tuttle, L., Venkataraman, K., 2015. Liquidity Resiliency and Market Quality Around Predictable Trades: Theory and Evidence.

Bessembinder, H., Maxwell, W., Venkataraman, K., 2006. Market transparency, liquidity externalities, and institutional trading cost in corporate bonds. Journal of Financial Economics, 82, 251-288.

Biasis, B., Hillion, P., Spatt, C., 1999. Price discovery and learning during the preopening period in the Paris Bourse, Journal of Political Economy 107, 1218-1248.

Bloomfield, R., O'Hara, M., Saar, G., 2011. Hidden liquidity: some new light on dark trading. Johnson School Research Paper.

Bloomfield, Robert, and Maureen O'Hara, 1999 Market Transparency: who wins and who loses? Review of Financial Studies 12, 5-35.

Boehmer, E., Saar, G., Yu, L., 2005. Lifting the veil: an analysis of pre-trade transparency at NYSE. Journal of Finance 60, 783-815.

Brauch, S., 2004, Who Benefits from an Open Limit-Order Book? Forthcoming in Journal of Business.

Brandi, F.M., Russell, J.R., 2006. Full-information transaction costs. Working paper, Graduate School of Business, University of Chicago.

Breem, Hoodrick, and Korajezyk. 2007. Predicting Equity Liquidity – Columbia Business School.

Calcagno, and Lovo, S., 2001. Market Efficiency and Price Formation when Dealers are Asymmetrically Informed. Working Paper, HEC School of Management.

Carlin, Bruce Ian, Miguel Sosa Lobo, and S. Viswanathan, 2007. Episodic Liquidity crises: cooperative and predatory trading. Forthcoming in Journal of Finance.,

Chan, Louis K., and Josef Lakonishok, 1993, Institutional trades and intraday stock price behavior, Journal of Financial Economics, 33, 173-199.

Chang, C., Yu, X., 2004. Informational efficiency and liquidity premium at the determinants of capital structure. Working paper, Indiana University.

Comerton-Forde, C., Frino, A., Mollica, V., 2005. The impact of limit order anonymity on liquidity: evidence from Paris, Tokyo and Korea. Journal of Economics and Business 57, 528-540.

Damodaran, A., Liu, C.H., 1993. Insider Trading as a Signal of Private Information. Review of Financial Studies, 6, 79-119.

Dia, M., Pouget, S., 2011. Sunshine trading in an African stock Market. Managerial Finance 37, 257-274.

Dufour, A. and R.F. Engle (2000). Time and the price impact of a trade. J. Finance 55(6), 2467-2498.

De Frutos, M.A., Manzano, C., 2002. Risk Aversion, Transparency and Market Performance. Journal of Finance, 57, 959-984.

Easley, D., Kiefer, N.M., O'Hara, M., Paperman, J.B., 1991. Liquidity, information and infrequently traded stocks. The Journal of Finance, Vol. 51. No. 4. pp. 1405-1436.

Eom, K.S., Ok, J.H., 2007. Pre-trade transparency and market quality. Journal of Financial Markets 10, 319-341.

Finnerty, J.E., 1976. Insiders and Market Efficiency. Journal of Finance, 31, 1141-1148.

Foucault, T., Moinas, S., Theissen, E., 2007. Does anonymity matter in electronic limit order markets? Review of Financial Studies 20, 1707-1747.

Garcia, D., Urosevic, B., 2013. Noise and aggregation of information in large markets. Journal of Financial Markets. P. forthcoming.

Gemmill, G., 1996. Transparency and liquidity: a study of block transactions in the London Stock Exchange under different publication rules. Journal of Finance 51, 1765-1790.

Glosten, L. R., and P.R. Milgrom, 1985, "Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders", Journal of Financial Economics, 14, 71-100.

Goldstein, M. A., E. S. Hotchkiss, and E.R. Sirri, 2007. Transparency and liquidity: A controlled experiment on corporate bonds. Review of Financial Studies, 20, 235-273.

Gomes, C., Waelbroeck, H., 2013. Is Marcket Impact a Measure of the Information Value of Trades? Market Response to Liquidity vs. Informed Trades. Portware LLC.

Green, R., Hollifield, B., Schurhoff, N., 2004. Financial intermediation and the costs of trading in an opaque market. Working paper, Carnegie Mellon University.

Hasbrouck, J., 1991. Measuring the information content of stock trades. The Journal of Finance, 46, 179-207.

Hellwig, M.F., 1980. On the aggregation of information in competitive markets. Journal of Economic Theory, 22, 477-498.

Hendershott, T., Jones, C.M., 2005. Island goes dark: Transparency, fragmentation, and regulation. Review of Financial Studies, 18, 743-793.

Huberman, Gur, and Werner Stanzl, 2004, Arbitrage-free price update and price-impact functions, Econometrica, 72, No 4, 1247–1275

Huddart, S., Hughes, J.S., Levine, C., 2001. Public disclosure and dissimulation of insider trades. Econometrica 69, 665-681.

Huddart, S., Hughes, J.S., Williams, M., 2004. Pre-Announcement of Insiders' Trades. JEL Classification D81 J33 M12.

Jhon, Kose, Ranga Narayanan, 1997. Market Manipulation and the Role of Insider Trading Regulations. Journal of Business, 70, 217-247.

Kissell, R. and M. Glantz. 2003. Optimal Trading Strategies. Amacon

Kyle, A.S., 1985. Continuous auctions and insider trading. Econometrica 53, 1315-1335.

Larry Harris, 2002. Trading and Exchanges: Market Microstructure for Practitioners. Oxford University Press.

Linnainmaa, J., Saar, G., 2012. Lack of anonymity and the inference from order flow. Review of Financial Studies 25, 1414-1456.

Lillo, F., J. D. Farmer, and R.N. Mantegna. 2003. Master curve for price impact function. Nature 421, 129-130.

Loeb, T. F., 1983. Trading Cost: The critical Link between investment information and results. Financial analysts Journal. 39(3), 39-44.

Lyons, R.K., 1996. Optimal transparency in a dealer market with an application to foreign exchange. Journal of Financial Intermediation 5, 225-254.

M. Angeles de Frutos, Carolina Manzano, 2014. Market transparency, market quality, and sunshine trading. Journal of Financial Markets 17, 174-198.

Madhavan, A., Porter, D., 2005. Should securities markets be transparent? Journal of Financial Markets 8, 266-288.

Morris, S., Shin, H.S., 2003. Global games: theory and applications. In: Dewatripont, M., Hansen, L., Turnovsky, S. (Eds.), Advances in Economics and Econometrics. Cambridge University Press, pp. 56-114.

Obizhaeva, A., 2007. Information vs. liquidity: Evidence from portfolio transition trades, Working paper.

Pagano, M., Roell, A., 1996. Transparency and liquidity: A comparison of auction and dealer markets with informed trading. Journal of Finance, 51, 579-612.

Pfleiderer, P., 1984, "The volume of Trade and the Variability of Prices: A Framework for analysis in noisy rational Expectation Equilibria", working paper, Graduate School of Business, Stanford University.

Rindi, B., 2002. Informed traders as liquidity providers: anonymity, liquidity and price formation. Review of Finance 12, 487-532.

Rindi, B., 2002. Transparency, Liquidity and Price Formation. Working paper, Bocconi University.

Roell, A., 1990, "Dual Capacity Trading", Journal of Financial Intermediation, 1, 105-124.

Seyhun, H.N., 1986. Insiders' Profits, Costs of Trading, and Market Efficiency. Journal of Financial Economics 16, 189-212. North-Holland.

Simaan, Y., Weaver, D., Whitcomb, D., 2003. Market Maker Quotation Behavior and Pre-Trade Transparency. Working Paper, Baruch College.

Skjeltorp, J.A., Sojli, E., Tham Wing Wah, 2012. Sunshine trading: Flashes of trading intent at the NASDAQ. Tinbergen Institute Discussion Paper, No. 12-141/IV/DSF47

Subrahmanyam, A., 1991, "Risk Aversion, Market Liquidity, and Price Efficiency", Review of Financial Studies, 4, 417-441..

Theissen, E., 2003. Trader anonymity, price formation and liquidity, European Finance Review, 7, 1-26.

Verrecchia, R.E., 1982. Information acquisition in a noisy rational expectations economy. Econometrica, 50(6), 1415-1430.

Waisburd, A., 2003. Anonymity and Liquidity: Evidence from the Paris Bourse. Mimeo, Texas Christian University.

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