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THE BROKERAGE OF ASYMMETRIC INFORMATION

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Abstract

In this paper we oversee the logic of information sets, firstly handling information and markets in perfect environments and, secondly, dealing with information and markets in imperfect environments, in the context of bounded rationality. Further on, asymmetric information is addressed together with the role of opportunistic behaviour through hidden action, hidden information, the free-rider problem and signaling, expanding on financial accounting and asymmetric information. At last, asymmetric markets are expanded on, reviewing the buyers' and sellers' markets so as to handle the performance of intermediaries who stand ready to provide with immediacy and liquidity to buyers and sellers of financial assets. There are two contributions that this paper brings forward: firstly, an intuitive treatment of information sets in the context of mathematical Set Theory so as to make tractable some issues still neglected. Secondly, we claim and develop that a careful assessment of information sets makes headway towards an approach that regards market makers and other intermediaries as brokers of asymmetric information.

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I am taking a somewhat different tack today; it will be an expression of discontents and expectations. As I shall try to argue, the uncertainty about economics are rooted in our need for a better understanding of the economics of uncertainty; our lack of economic knowledge is, in good part, our difficulty in modelling the ignorance of the economic agent.

(Kenneth Arrow, from his Presidential Address, American Economy Association, December 29, 1973, New York.)

01.- INTRODUCTION

As from the 1970's, both Financial Economics and Corporate Finance underwent deep changes by addressing new issues, designing more realistic models, improving quantitative techniques and getting sound feedback from other fields like Law and Economics, Financial Accounting and Non-Linear Multivariate Mathematics.

These innovative paths of research took cognizance of the pervading and essential role information performs in financial markets all around the world. But this acknowledgment also meant a turning point for Financial Economics and Corporate Finance, because empirical and theoretical work had previously been felt at variance with conventional models used by economists. As Arrow put it in his presidential address: " the so-called capital markets are in many structural aspects very different from our model markets."

At the onset of this period, a new profile of economic agent was made operational by academics and researchers, so as to make clear in Finance what the old paradigm of the economic agent could not explain for certain. In a way, it was a contesting approach that provided not only with realism but explanatory power, as well.

Before the 1970's, the concept of economic agent took for granted two distinctive patterns of behaviour:

a) perfect rationality,
b) effortless mathematical optimization.

In contrast, Financial Economics began to use a pattern of behaviour which predicates the main features of the economic agent on the grounds of:

a) bounded rationality,
b) opportunistic behaviour.

These new underlying assumptions proved to be consequential, and a wide array of promising approaches followed (some leading references are given between brackets) :

- Transaction Costs Approach (Demsetz, 1968; Williamson, 1985)
- Incomplete Contracts and Markets (Aghion-Bolton, 1987; Hart, 1995; Magill-Quinzii, 1998)

- Agency Theory (Ross, 1973; Jensen-Meckling, 1976; Barnea-Haugen-Senbet, 1985)
- Market Microstructure (Garman, 1976; Copeland-Galai, 1983; Ho-Stoll, 1986; Grossman-Miller, 1988; Spulber, 1996; Shultz, 2000)
- Corporate Governance (Grossman, 1982; Williamson, 1996; Shleifer-Vishny, 1997)
- Asymmetric Markets (Scitosky, 1990)
- Inefficient Markets (Roll,1988; Schiller, 1989; Shleifer, 1999)
- Non-linear Dynamics and Chaos (Brock et al., 1991; Day, 1993; Hubbard-Hubbard, 1999)
- Institutional Approach (Williamson, 1985; North, 1991)
- Theory of the Firm (Tirole, 1988; Milgrom-Roberts, 1993; Demsetz, 1997; Spulber, 1999)
- Economics of Disequilibrium (Kaldor, 1985)

A useful review of this development can be found in Mayer (1992), while sources given above provide with extensive references.

What we want to do in this paper can be summarized this way:

Section 02 sets forth the logic of information sets. Perfect information and markets are surveyed in the next section. In contrast, section 04 deals with imperfect information and markets in the context of bounded rationality.

Further on, in section 05, asymmetric information is handled together with the role of opportunistic behaviour through hidden action, hidden information, the free-rider problem and signalling; we close the section with a discussion about financial accounting and asymmetric information.

Section 06 is devoted to asymmetric markets, which pervade financial systems all around the world. Here, we review the buyers' and sellers' markets so as to handle the performance of intermediaries who stand ready to provide with immediacy and liquidity to buyers and sellers of financial assets.

There are two contributions that this paper brings forward: firstly, an intuitive treatment of information sets in the context of mathematical Set Theory so as to make tractable some issues still neglected. Secondly, in section 07, we claim and develop that a careful assessment of information sets makes headway towards an approach that regards market makers and other intermediaries as brokers of asymmetric information.

02.- INFORMATION SETS

Any economic agent, whenever trades directly with another party, or by means of an economic agent who acts on his behalf as an intermediary, makes up his mind either on the grounds of his own information up to that moment, or that which is supplied by his counterpart or intermediary. Trading here points to a wide range of likely events or processes which involve buying or selling, intermediating, contracting, keeping long or short future positions in the commodities, financial or labor markets. Narrowing down the examples to financial markets, trading commits economic agents to many choices: from buying or selling financial assets to loaning or borrowing in the credit market; from merging two companies to signing a partnership contract in a venture capital; from enacting a plain vanilla swap to underwriting an Initial Public Offer for equity or debt.

From now on, the symbol **W(t ; k)** will stand for the ***INFORMATION SET*** of the agent number "k". We usually envision such a set has having in store any current or past information the agent can get access to, up to the moment "t". Therefore, decision-making turns out to be contingent upon information sets.

Although this is the customary format of what we understand as an information set, some qualifications should be borne in mind, for the sake not only of semantics but rigour, as well.

a) We said that the agent stores only attainable information to him. That means that he reaches his decision, in most cases, with only a fraction of the whole information which he could get access to in an ideal world where he enjoyed the greatest possible information set.

b) Although information sets can be regarded as databanks for any agent, they also convey the idea of toolkits for decision making. In fact, they include mathematical models and heuristic procedures, points of view and beliefs, market trends, biases, error analysis and learning processes, past experiences and professional qualifications, just to give some examples of its distinctive components.

c) The problem with this usual format is the vagueness it conveys. Because we are concerned in Financial Economics with the information that is relevant for the agent to make decisions, the information set should be freed from any piece of information that has nothing to do with his purposes. For example, when an agent deals with Treasury Bonds it doesn't seem sensible to keep in his information set an unrelated passion for gardening or painting; even less his own home affairs linked with neither his investments nor his trading behaviour (Apreda, 2000a and 2000b).

d) It is usually assumed that information sets fulfil a nesting property: prior information sets are contained in the current one. In other words: past information is also stored. **W(t ; k)** includes, for instance, the information set that existed two periods before, **W(t-2 ; k).** It goes without saying that most of the old information sets might have been as incomplete as the current one, handling only a fraction of the available information at each date.

e) Information sets are widely used in game theory, although with a distinctive approach consistent with that field of study and research (a very good survey in Rasmusen, 1998). The purview of this paper is laid on a rather different mindset with regard to information sets.

In most exchanges, as from the XIX century, trading requires at least three parties: the buyer, the seller and the intermediary. On the other hand, counterparts bind themselves by commitments which can be as simple as a implicit contract (for instance, any consumer purchasing in a supermarket) or as complex as a contract between a corporation and the oncoming Chief Executive Officer (which may stem from a search in the labour market for high qualified executives, also with consequences in the market for corporate control).

Therefore, as we approach real world transactions, either transient or permanent ones, the counterparts' information sets not only store information about the things to be traded, but the ways

trade itself is to be performed, inclusive of agents' needs and expectations attached to the whole process.

03.- PERFECT INFORMATION SETS

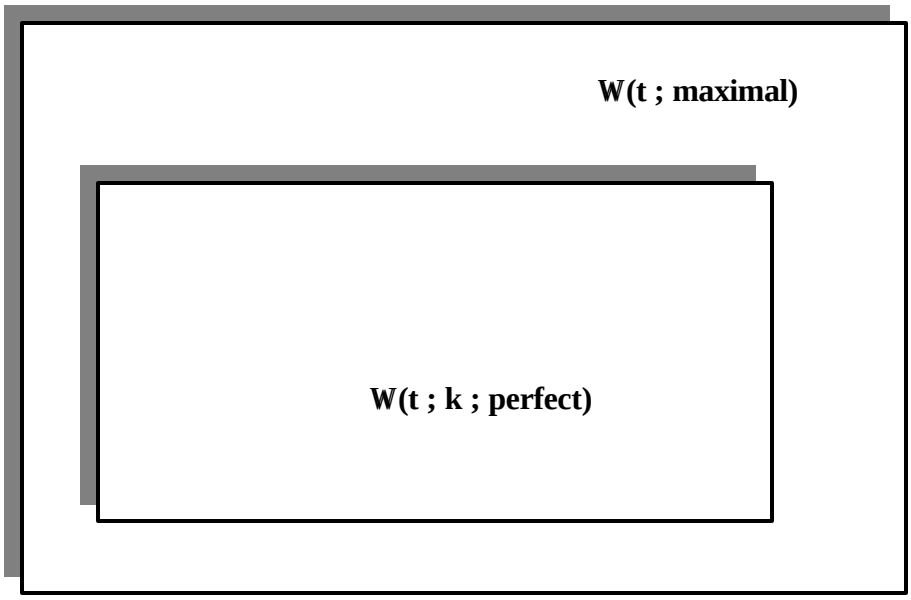
The first attempt to cope with information sets in Economic Analysis was rather restrictive, setting forth an ideal decision-making environment of perfect information, conveying two main features (Arrow, 1986):

- Economic agents are rational, in the sense they maximize an objective function subject to constraints, and they have complete fully ordered preferences defined over the domain of the consequences of their feasible actions.

- Any economic agent is able to get access to any information available in the market, with neither cost nor any delay. The market is frictionless.

This point of view brings about two consequences that deserve further qualification.

Picture 1 : The Perfect and the Maximal Information Sets



a) **On the available information**

Any agent accesses to all available information, in a frictionless market. Then, trading costs, taxes, credit risk, bankruptcy, agency problems and information asymmetries are ruled out. Even worse, this

is a world without intermediaries and a place where each agent has boundless rationality. The sort of information set that stems from those assumptions would meet the Public Information Set (Fama,1970). In fact, neoclassical analysis kept the whole issue of information sets as a given notion, oblivious of any costly and non shared information that could remain in the outside world of the model.

In real markets, however, a lot of information lies outside this ideal perfect information set. In picture 1 we try to convey this fact. The Universal Set (as mathematical Set Theory requires) is the maximal set of information available to all economic agents, at date "t". It certainly includes the ideal perfect information set, beyond which we can find for instance transaction costs, taxes, market microstructure issues, and private information that is held back because of opportunistic behaviour.

b) **On the representative information set**

In this world, we find only one information set, the perfect information set, which is shared at no cost by all economic agents and is included in the space of information actually available to all economic agents, as we can see in picture 2. Hence, we can drop the "k" that identifies a single agent,

Picture 2 : Perfect Information Sets

$$\mathbf{W(t\,;\,k) = W(t\,;\,perfect)} \qquad \text{(for every agent k: 1,2, ... , m)}$$

because

$$W(t\,;1) = W(t\,;2) = \ldots\ldots\ldots = W(t\,;k) = \ldots\ldots\ldots = W(t\,;m)$$

Therefore, all economic agents owns jointly the same information set, which tells them all about the economic variables they have to cope with. This does not rule uncertainty out, as long as all agents remain identically uncertain.

Although the perfect information modelling was predicated on such stringent assumptions, it certainly gave Economic Analysis not only a deeper understanding of many real world situations but an impressive formal advantage, as well. Some remarkable outcomes in Financial Economics were modelled within this framework. For instance, the Modigliani – Miller theorem, the Capital Assets Pricing Model (CAPM), the Black – Scholes pricing formula, the Efficient Markets Hypothesis, the Arbitrage Pricing Theory (APT). For an updated development of these issues, Ross (1998) seems particularly useful. The CAPM, APT and the Efficient Markets Hypothesis are extremely well surveyed in Elton – Gruber (1995).

However, as Professor Colin Mayer (1992) claimed: " In a first stage, Financial Economics was grounded on perfect information and complete market models, which allowed for simplification, leading to the discovery of the main determinants in financial decisions and the developing of strong analytical devices. In a second stage, which started in the 1970's, the perfect and symmetric information assumption was increasingly regarded as untenable, bringing about models in agency relationships, microstructure and transaction costs theory. "

At the presidential address to the American Finance Association (1987), Richard Roll made the following remark about the state of the Financial Economics development: " The immaturity of our science is illustrated by the conspicuous lack of predictive content about some of its most intensely interesting phenomena, particularly changes in asset prices. General stock price movements are notoriously unpredictable and financial economists have even developed a coherent theory (the theory of efficient markets) to explain why they should be unpredictable."

03.01.- PERFECT MARKETS

Markets of homogeneous products, which run with a great number of buyers and sellers endowed with perfect information sets, and no transaction costs whatsoever, are said to be ***PERFECT MARKETS***. When perfect markets also include divisibility and mobility of factors, free exit and entry to the market, they are usually meant perfect competitive.

The most accomplished model including perfect information sets has been the model of perfect competition, early set up by Adam Smith (1777) and expanded along two hundreds years to give, firstly, a consequential formal treatment with Walras at the end of the XIX century and, secondly, the far-reaching framework of the neoclassical approach, ending up with the general equilibrium model by Arrow and Debreu (1954). On this account, Coase's reappraisal of Adam Smith is still nurturing (Coase,1977). The well-known Walrasian framework assumes a frictionless economy with an exogenous price setting, supply and demand are equal at a single price, and transaction costs amounts to zero. Therefore, and among other things, an economic agent is able to observe equilibrium prices with no search costs.

Remark:

A particularly interesting survey of perfect competition historically contemplated can be found in G. Stigler (1957), who commented that " a perfect market is one in which the traders have full knowledge of all offer and bid prices ", adding that " a perfect market may also exist under monopoly ". Attempting to set apart perfect from competitive notions, Stigler pointed that " if we were free to redefine competition (...) a persuasive case could be made that it should be restricted to meaning the absence of monopoly power in the market ".

The neoclassical model is, in accordance with Arrow (1974), set up on two assumptions:

a) The individual economic agent behaves governed by a criterion of optimization under constraints that are partly peculiar to the agent (production functions), and partly terms of trade with the economic system as a whole.

b) The market, by which the aggregate of individual decisions is acknowledged, and the terms of trade adjusted with the decisions of the individuals are naturally constant in the aggregate, i.e., supply equals demand.

Consumers are well-informed and can shop around for the best price at no cost. Hence, there is a single market price that is determined by the interaction of all sellers and buyers, but it is beyond the control of any one of them. In fact, it is a world without frictions, in which there is no place for intermediaries.

At this point, it seems worth reminding what Kaldor (1985) remarked about the unsurmountable weaknesses in the Walrasian mindset. Accounting for auction markets, he set a role for dealers and market makers:

" First, they (auction markets) are not "market clearing" in the sense of equating demand and supply on the strict criterion that the maximum amount sellers desire to sell at the ruling price is equal to the maximun amount buyers desire to buy. There is a change in inventories from period to period, held by insiders in the market, that is quite un-walrasian - it means that demand was either in excess of, or short of, supply - the market has not "cleared", and the transactions, even in the shortest of periods, such as a day or even an hour, did not take place at a uniform price but at prices that varied sometimes minute by minute."

A similar point of view was spelled out by financial economists Sanford Grossman y Merton Miller (1988), on behalf of market makers:

"Much economic theory, in the Walrasian tradition, still proceeds as if prices were set in a gigantic town meeting in which all potential buyers and sellers participate directly. Researchers (...) have expanded the cast to include market makers in the sense of intermediaries who can fill gaps arising form imperfect synchronization between the arrivals of the buyers and the sellers."

04.- IMPERFECT INFORMATION SETS

When we come down to distinctive and observable markets, therefore, imperfect information is not only the rule but a fact of life. This amounts to the following environment:

The economic agent “k” gets access to an information set which is rather a subset of the maximal information set at date “t“, as we can follow from picture 3. We need to qualify this information set, so as to tell it apart from the perfect information set:

$$\mathbf{W(t\ ;\ perfect)\ \ \acute{I}\ \ W(t\ ;\ k\ ;\ imperfect)\ \ \acute{I}\ \ W(t\ ;\ maximal)}$$

As from now and for ease of notation, any imperfect information set will be denoted

$$\mathbf{W(t\ ;\ k\ )}$$

whenever this will be clear from the context. Otherwise, we will resort to add qualifications by means of vectorial notation, as when we wrote above **W(t ; k ; imperfect)**.

Imperfect information sets show some remarkable properties:

(a) Different agents have different information sets.

(b) Each agent can improve his own information set, by means of better or new information at the moment “t“. A foremost source of information comes out of regulations on disclosure of information. Besides, there has grown an information industry in financial markets, trading on data assembly and securities analysis, fostered by the financial press, government agencies, business schools, executives training programmes, academic or institutional research centres. For instance, by buying such information to an expert or intermediary, the agent “k” could enhance his efficiency at valuation and forecasting. But this is contingent upon the agent’s decision to budget for new and better information, or to preclude himself from doing it.

(c) As time passes by, we keep on improving our information set, the new one not only contains the older, but it is also contained in the limit set. That is to say:

$$\mathbf{W(t\ ;\ k\ ;\ imperfect)\ \ \acute{I}\ \ W(t\ ;\ k\ ;\ imperfect\ with\ improvements)\ \ \acute{I}\ \ W(\ t\ ;\ maximal\ )}$$

(d) The imperfect information set enjoys the property of accountability: the agent can give account of its contents, although he may not be willing to disclose most of them.

(e) Actual trading is triggered off by changes on information.

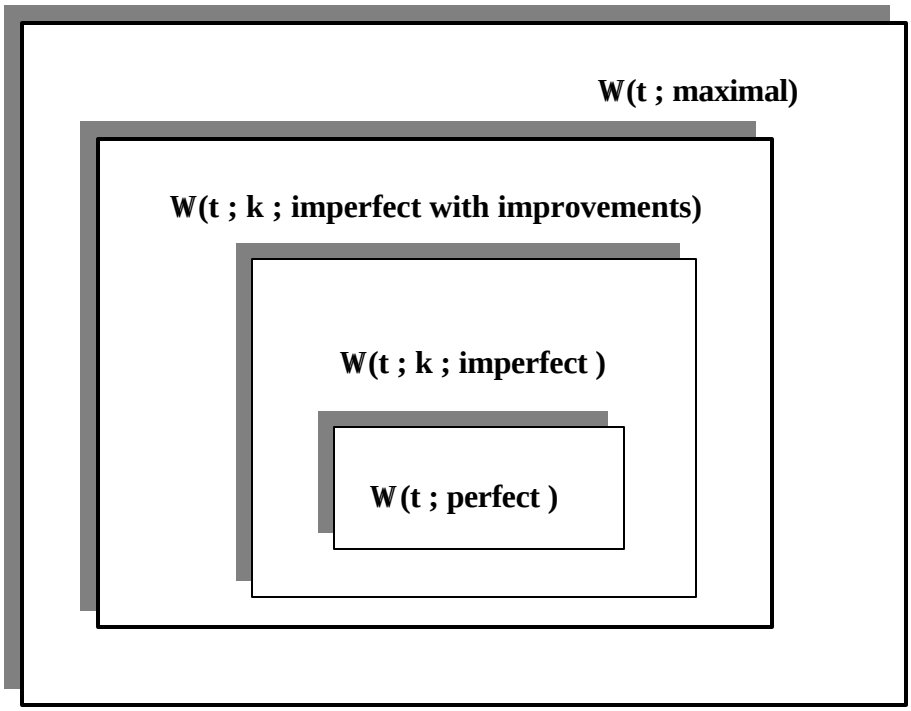
If we watch picture 3, the instrumental information set for the agent is not the maximal one, which stands out as a maximal information set, but only one depicted within the latter

$$\mathbf{W(t\ ;\ k\ ;\ imperfect)}$$

We can imagine the perfect information as included in **W(t; k; imperfect)**, because all economic agents share it. Improvements of the agent information at moment “t“ could come from the outside,

mainly by acquisition of private or professional information at his own cost, although sometimes he may pursue this process taking advantage of inside information, even at the risk of breaking the law.

Picture 3 : Imperfect Information Sets



A good example in Finance on the importance of imperfect information can be found in the market of debt or equity private placements. Whereas public issuers tend to be well-known to investors, private placements issuers are presumably information-problematic companies. On the other hand, bank-dependent borrowers are, most of the time, companies for which little public information is available and they display a wide array of information problems. On this account, Carey et al (1993) deal at length with this topic.

Markets that run at variance with the assumptions of the perfect market paradigm are called ***IMPERFECT MARKETS.*** We are interested in those imperfect financial markets whose economic agents only attain imperfect information sets. It is because of imperfect information, division of labour and specialization that these markets call for intermediaries and institutional environments (Spulber, 1999). Whereas in the perfectly competitive market model firms simply react to prices, in incomplete markets firms exert power at setting prices, mainly through the following features in their current activities or environment: product differentiation; transaction costs; barriers to entry or exit the market;

consumers switching costs; transportation, distribution and storage costs; research and developments investments; reputation; market microstructure and agency problems.

After giving thought to the importance of information in Finance, two questions arise:

- Why is imperfect information so worthwhile in Financial Economics? Firstly, because it nurtures the economic agent with knowledge and proficiency at trading. Secondly, it amounts to unbalanced risk sharing by counterparts in any trade. Whether one party gets rid off some risk or not, it depends on the extent to which the other party is willing to bear such a risk or to undergo it because of his own lack of information. Lastly, imperfect information is the dominant feature in real markets, by and large.

- Why is the economic agent unable to make use of the maximal information set? Because of bounded rationality.

04.01.- BOUNDED RATIONALITY

In order to get access to information sets, either time or efforts seem unavoidable. Therefore, manifold costs arise when we try to find out, gather, collect, process, evaluate, store, trade and apply information. Furthermore, deliberation about an economic decision is also a costly activity in which the decision maker tries to achieve a balance between the benefits of better decisions and the cost of additional allocation of effort to the decision making process. (This issue is extensively developed in Conslisk, 1996).

As Kreps (1990) sensibly put it: " A boundedly rational economic actor attempts to maximize some relevant measure of personal well being but finds out that is costly to do so and, unable to anticipate all contingencies and aware of this inability provides ex~ante for the almost inevitable time ex~post when an unforeseen contingency will arise."

It was Herbert Simon (1947) the first to install this subject as academically relevant, giving rise to the Bounded Rationality Approach. As models of bounded rationality are grounded on the idea of scarcity, they deal with human cognition as a scarce resource.

05.- ASYMMETRIC INFORMATION

While trading securities among them, economic actors and their intermediaries jointly engage in a twofold process:

a) the actual trade of primary or derivative securities

b) a virtual exchange of subsets of their information sets.

It is this twofold process which leads to the issue of asymmetric information. In fact, let us suppose that agents "k" and "s" are about to trade. In order to do so, they share information, but only to a certain extent. That is to say:

$$W(t\,;k) \neq W(t\,;s)$$

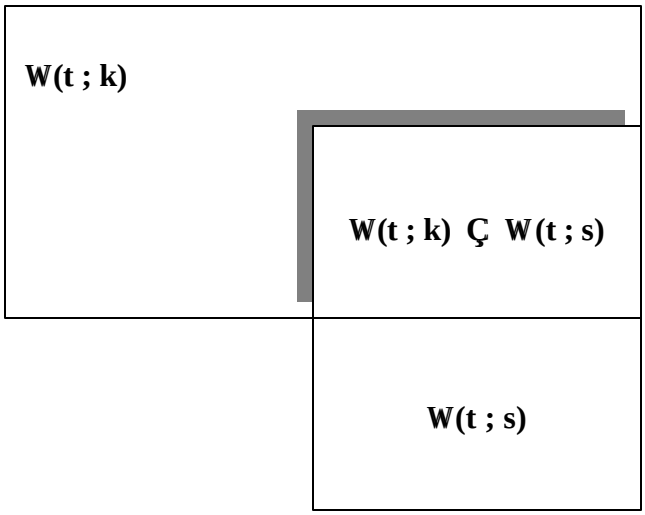
Although this feature should not prevent counterparts from rounding off their transaction, a new development arises. One of the parties may take advantage of not-shared information on behalf of his own interest to the extent of getting much more from his counterpart than it would have been the case if that private information had been shared.

ASYMMETRIC INFORMATION refers to the advantage one party can enjoy by having different information than his counterpart, so as to improve either the trade or the relationship for his own benefit.

Picture 4 conveys the main idea. Both agents share some information for sure, as we can see in the subset $W(t\,;k) \cap W(t\,;s)$, but they also have information that remains hidden or non-accessible to each counterpart. In this case, we can point at two subsets which are private information regions: agent "k" keeps all the not shared information for himself, and the same can be predicated on the agent "s" behaviour. They are explicitly deployed in picture 5.

Why would the economic agent take profit of non-shared or private information, bringing about conflict of interests? The answer lies on opportunistic behaviour.

Picture 4 : Two parties trade on the intersection of two information sets



05.01.- OPPORTUNISTIC BEHAVIOUR

It is a tenet of Economic Analysis that agents behave so as to fulfill their self-interest (Adam Smith, 1777). But when we think that agents perform their goals in a world of future commitments and uncertainty, the concurrence of self-interest and the likelihood of breaking promises to deliver goods, services, efforts or payments in the future, both lead to opportunistic behaviour. If one party knows something that the other does not, that party may willingly distort, misrepresents or not disclose that information on his own benefit, what amounts to self-interest with guile.

In picture 5, we can be certain that, if any opportunistic behaviour is to take place, it will come out of the "private domains" within those information sets that each actor keeps under wraps:

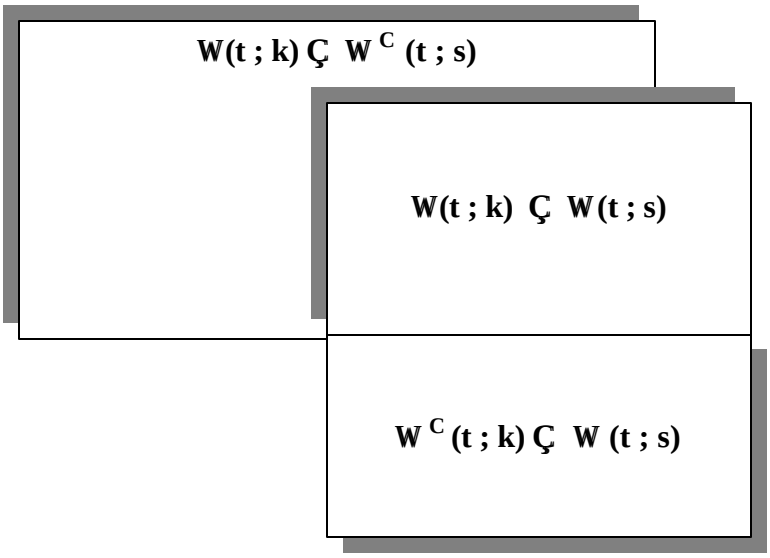
a) for the econonic agent "k", it is the subset **W(t ; k) Ç W ^{C} (t ; s)**, which reads as " the points in the set **W(t ; k)** not shared by the set **W(t ; s)** ".

b) for the econonic agent "s", it is the subset **W ^{C} (t ; k) Ç W(t ; s)**, which reads as " the points in the set **W(t ; s)** not shared by the set **W(t ; k)** ".

Remark:

It can be argued that one party may even perform opportunistically in the intersection of both information sets. Although this event is a likely one, for instance when one party behaves in a stupid way, bounded rationality would rule out this outcome most of the time.

Picture 5: Asymmetric Information and Opportunistic Behaviour



We must bear in mind, however, that some of these single and private subsets, may convey information not relevant for the trade. But it is what remains of those subsets that nurtures different kinds of knowledge pertaining any trade, as represented in picture 6.

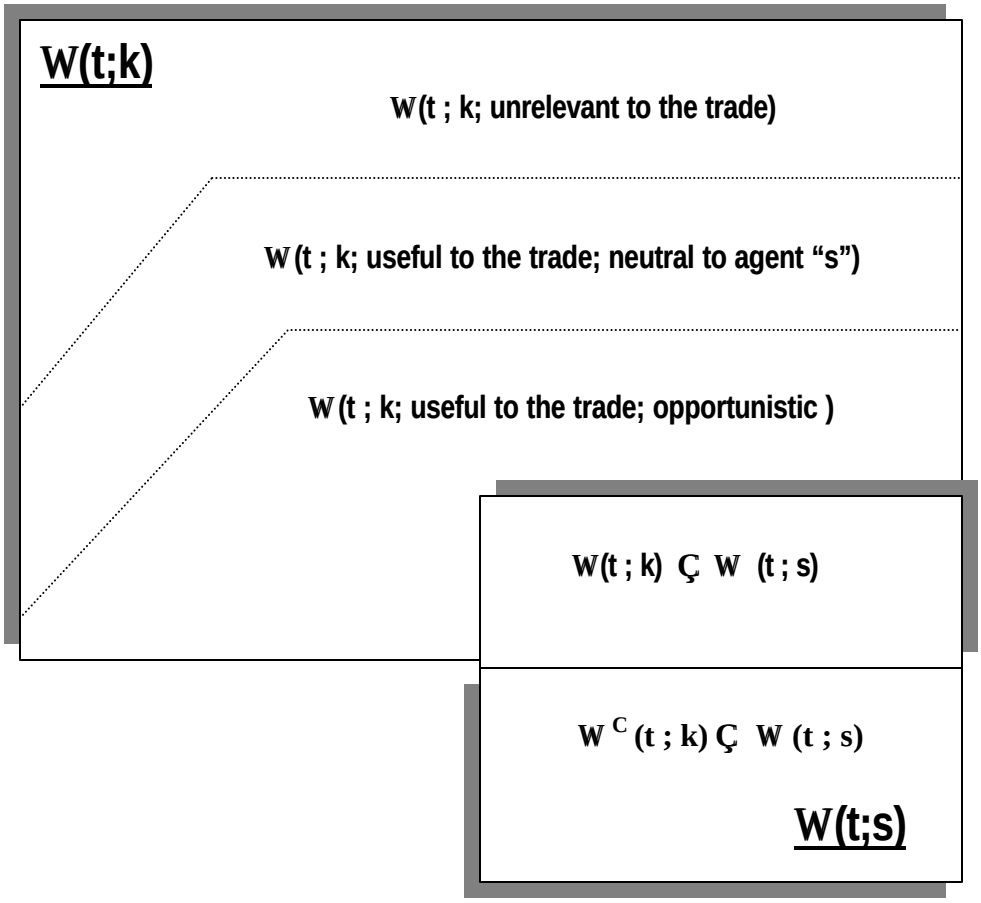
Not every piece of information included in the information set of the agent "k" is actually needed for a particular transaction. Hence, we can isolate at date " t " pieces of information not relevant for the trade:

W(t ; k; unrelevant to the trade)

Next, useful information for the party but not harmful towards the counterparts interest (know-how, expertise, professional qualifications, customers and advisers networks, reputation) is found in the subset

W(t ; k; useful to the trade; neutral to agent "s")

Picture 6 : Unrelevant, useful and opportunistic subsets in an information set



Finally, useful information for the party, but the sort of which conveys impairment or damage of the counterpart's interest is included in

W(t ; k; useful to the trade; opportunistic)

When the economic agent realizes that he could get more from a trade or relationship by not fulfilling his commitments, by means of calculated effort to mislead, shirk, hide, deceive, misrepresent, confuse, we say that he follows an ***OPPORTUNISTIC BEHAVIOUR***. (Williamson, 1996)

There are four types of opportunistic behaviour which have deserved a distinctive concern from academics and practitioners dealing with financial markets: hidden action, hidden information, free-rider problems and signalling. By giving a brief summary of each of them, we would like to stress the fact that they are powerful patterns of behaviour aimed to impairing or even lessening the quality of information sets, preventing reliable information from spreading over parties, markets and prices.

a) HIDDEN ACTIONS

At the root of ***HIDDEN ACTIONS*** lies the problem of the extent to which actions (efforts, behaviour, decision making, performance or tasks to be accomplished) can be observed, verified or monitored. Therefore, there may be an inducement for one party to keep a likely profitable personal agenda, leaving for the counterpart to foot the bill. On the other hand, to cope with hidden action seems of the up-most importance to handle verifiable or measurable variables of performance, that is to say, variables that which can be checked by an independent arbitrator.

Remark:

In the context of an agency relationship this sort of asymmetric information paves the way to Moral Hazard problems (Prescott,1999), involving the risk that the agent will pursue his own self-interest regardless of the relationship.

b) HIDDEN INFORMATION

At the root of ***HIDDEN INFORMATION*** lies the problem of the extent to which relevant characteristics can be known or screened beforehand by counterparts in any trade. They can be personal or non-personal. By personal characteristics we mean, for instance, biographical features, professional qualifications, past experience track, personal skills, and credibility from each party at trade. By non-personal we point at characteristics found in goods or services rather than in human beings: quality, maintenance, contents, sanitary conditions, compliance with set standards, packaging, after-sales service, consistency between what is promised and it is delivered. Hidden information also means information on some relevant state of nature which can influence the outcome ot the relationship between counterparts in any trade or lasting contract. Faced with a set of feasible contracts, non-neutral to risk people will select different contracts; this means self-selection or, from the company's point of view, adverse selection.

Remark:

In the context of an agency relationship this sort of asymmetric information leads to Adverse Selection problems (Wilson, 1980), involving the risk that the agent will not be able to honour the relationship because of its incompetence.

c) FREE - RIDING PROBLEMS

This problem arises whenever some people do not spend resources on collecting information but can take advantage of others agents who had invested in such information; that is to say, they get a ***FREE - RIDE*** on somebody else's effort. For example, investors who buy or sell only after knowing what well-known dealers or investors are doing eventually. If some investors acquire information that tells them which securities are undervalued (overvalued) and they buy (sell) these securities, other investors who have not paid for this information may be able to buy (sell) right along with the well-informed investors, who don't reap all the profits they could have done otherwise (Grossman and Hart, 1980).

d) SIGNALLING

Opportunistic behaviour advises the economic agent to hold back private information whenever he can obtain greater utility by keeping it secret. But sometimes, opportunistic behaviour may encourage the economic agent to let the other part know a bit of hidden information, whenever by doing so he will be able to improve his welfare or get better terms in the transaction. A ***SIGNAL*** is some activity or decision that upholds the agent has a certain ability or characteristic. For instance, education acts as an important signal for human resources departments in corporations and banks, conveying the message "this person is able of learning, being trained, and brings with him a distinctive professional qualification". A good introduction to signaling is Riley (1999).

05.02.- FINANCIAL ACCOUNTING AND ASYMMETRIC INFORMATION

Usually, Financial Accounting provides stakeholders with reliable information, whereas Management Accounting performs a similar role but for managerial use. Both techniques seek to improve their end-users information sets.

It is for Financial Accounting to lessen asymmetric information problems. Such a goal is attempted by enhancing the quality of information and calling for external auditors. However, Financial Accounting must cope with a manifold set of problems that have given room to both great concern and debate, namely:

- Globalization: which uncovers different standards in the production of reliable information and regulatory frameworks. In particular, lack of Good Practice rules in most of capital markets and their domestic companies. (Mishkin, 1999)

- Creative Accounting: also known as window-dressing, allows a particular event to be reported in a way which conveys disadvantages for end-users of financial accounting reports, and distorts information sets. Three pervading examples are provided by the market for corporate control, when preventing (or fostering) takeovers, by drafting statements to avoid bond covenants infringements and, lastly, by dealing with off-the-balance sheet activities. (Rees-Sutcliffe, 1992)

- Disclosure: this is for certain a delicate issue which conveys not only the regulation of inside information but the fuzzy boundaries between legal or illegal inside information. Theft of inside

information is a striking example of illegal insider information. Whereas a producer of information can share or sell it to others, information theft involves information acquisition and trading activities that are economically damaging to parties, to the extent of outright wealth expropriation. (Jensen, 1992)

- Corporate Governance Issues: mainly through public and private placements, on the own hand, and the different ownership structures all around the world. This makes a hard task for information sets to become comparable. (References with sound comparative analysis are La Porta et al., 1999; and Demirag et al. 1998)

- Internet Information Asymmetries and Costs: corporations sometimes have incentives to boast or lie about the securities they issue, and the investor cannot test the quality of the information that the issuer provides, neither easily nor accurately. This comes as a serious problem for small issuers or start-up companies. Internet might increase adverse selection problems in capital markets, could weaken regulatory environments and disclosure requirements, foster fraud and lower prices transparency. (Black focus on this issue at length, 1998).

- Financial Secrecy means non-disclosure of financial information and it can be regarded as another product traded in the market of financial services. This market gathers a wide range of activities from legal ones as banking secrecy and capital flight, till illegal ones as tax evasion, money laundering from drug trafficking, weapons dealing, political bribery, smuggling and gambling. (Walter, 1992)

In a nutshell, these broad issues bring about more imperfection to information sets. Still worse, they nurture widespread opportunistic behaviour.

06.- ASYMMETRIC MARKETS

Imperfect markets that run with asymmetric information are said to be ***ASYMMETRIC MARKETS.*** For the purposes of this working paper, it seems sensible to take three environments that pervade financial markets: the buyers' markets, the sellers' markets, and markets with intermediaries.

06.01.- BUYERS' MARKETS

In general, a consumer has an overwhelming disadvantage in information when facing retailers, intermediaries or producers on the other side of the market, who become more knowledgeable about what they sell, distribute or produce than their current or prospective buyers. This feature highlights an asymmetry which benefits the sellers, who perform as price-makers, against the buyers who remain as price-takers.

But competition among price makers precludes that they could reap all the profits. As Scitovsky (1990) argued in a well-known paper, monopolistic competition spread through many consumer-retailer-producer relationships, and they have to compete not only on price, but on conveniences offered to buyers. That is to say, sellers engage themselves in ***NON-PRICE COMPETITION***. Among those conveniences, we can isolate some examples: advertisement and displays to provide with free

information; convenient location and surroundings; credit and deliveries benefits; guaranties either on merchandise to be sold or on services to be provided; politeness and accuracy in staff; easy refunding policies. A truly remarkable example of immediacy is given by the way supermarkets manage their own inventories along brands, sizes, colours, shapes, volume, package, delivery, quantities, and catering of different tastes or needs.

To make up for the essential information asymmetry between generalist agents (consumers) and specialist agents (producers or retailers) non-price competition builds up the so-called ***BUYERS' MARKETS*** through conveniences and sharing of information at customers disposal. In this way, consumers buy not only a good, but a portfolio of ancillary services, even if they have to pay a premium embedded in the final price. Some regulations take a part in this process of redressing informational disadvantages to the side of consumers. In some countries, even bills have been passed on truth-in-lending and truth-in-selling, contents disclosure, dates of last consumption. Last of all, advertising conveys information, and the more competitive advertising becomes, the more accurately the information is delivered.

Remark:

This approach seems at variance from the usual one, which states a buyers' market as the place where goods are sold cheaply because there is little demand. A sellers' market is usually predicated on large demand, which allow sellers to ask high prices. We have to bear in mind this semantic difference throughout this paper.

06.02.- SELLERS' MARKETS

SELLERS' MARKETS are the counterparts of buyers' markets, and they take place whenever the buyers become price-makers because of both superior knowledge and many sellers stand ready to offer their products or services. By the way, this is the usual setting in the labour market. Also we found this sort of environment with the small and medium size suppliers to big companies or governments, within the framework of monopsony varieties. Buyers resort to non-price competition so as to provide their suppliers with conveniences. Some current examples are: fringe benefits and incentives; working conditions and background improvements; corporate venture capital addressed to suppliers; credit enhancement; sharing of information.

06.03.- INTERMEDIARIES

Although the impressive rise of intermediaries in real markets took place the XIX century, their main traits as we know them nowadays have grown for the last fifty years, following the Second World War. With Professor North's own words (1991): "As from mid XX century, specialization requires increasing percentages of the resources of the society to be engaged in transactions, so that the transaction sector rises to be a large percentage of the Gross National Product. This is so because specialization in trade, finance, banking, insurance, as well the simple coordination of economic activity, involve an increasing proportion of the labor force."

An ***INTERMEDIARY*** is an economic agent that purchases from suppliers for resale to buyers or give assistance to buyers and sellers so as they can meet and transact, eventually. It performs as an agent of multiple principals. Among his many specialized tasks we can highlight the following ones:

- To look for suppliers
- To search and foster the buyers' side
- To establish buy and sell prices (price-setting firms)
- Contracting with suppliers and buyers
- Inventory management
- To supply with immediacy and liquidity
- Production and trading of information

Intermediaries have a distinctive advantage: they can deal at the same time with a sellers' market and a buyers' market, as they were qualified in 06.01 and 06.02. As such, they resort to conveniences and non-price competition (different rates to different customers, ancillary services, professional guidance).

The field of Financial Economics concerned with intermediaries and their associated institutions like the exchanges is called ***MARKET MICROSTRUCTURE.*** It is surprising that the intermediaries' role has been so neglected for decades. For instance, the financial system could hardly be explained without intermediaries, as Bentson and Smith (1976) showed in a classic paper. Whereas the neoclassical economic analysis didn't give any room to microstructure, this has become a promising subject for researchers, academic and practitioners for the last thirty years. A landmark in the field was Demsetz's paper on intermediation (Demsetz, 1968) and a provocative approach to intermediaries within a microstructure approach is Spulber (1999).

Large intermediaries usually nurture both buyers' and sellers' markets because of superior information, management of their own inventories, and price-making skills. Although we believe this subject is worthy of expansion on other markets for goods and services, we are going to narrow down our interest in capital markets intermediaries only (Blake, 2000).

It is worth to give an overview of some functions intermediaries perform: price setting, immediacy, liquidity provision and arbitraging.

a) An intermediary sets the price at which he is willing to buy from producers, sellers or other intermediaries (bid-price), and the price at which he is willing to sell to buyers or other intermediaries (ask-price).

b) Intermediaries hold inventories on hand and stand ready to sell (immediacy provision). But also they hold cash balances on hand and stand ready to buy (liquidity provision). As intermediaries face both supply and demand shocks, uncertainty precludes an easy market clearing. Excess inventories entail costs of carriage, while stock outs mean sales earnings foregone.

c) Intermediaries arbitrage between sellers and buyers, because they match bid-ask prices with valuation models that provide with fundamental values. The bid-ask spread signals the extent of

the responsiveness of prices to supply and demand changes. Therefore, mispricing and imbalances are sought after by intermediaries in all earnestness.

It is by the concurrence of price setting, inventories management and arbitrage (inclusive of transaction costs and market microstructure) that intermediaries attempt to clear the market by running their businesses on daily operations (Tobin, 1999). A non-linear dynamics approach to price setting with intermediaries, microstructure and transaction costs, can be found in Apreda (1999).

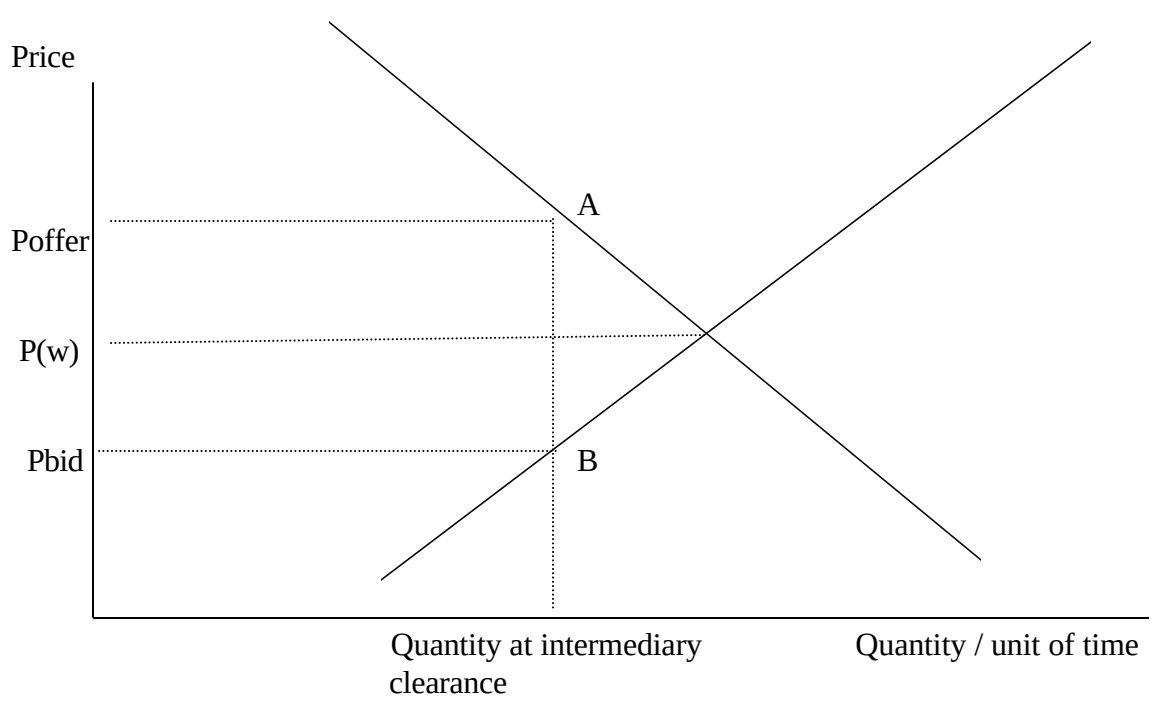
Remarks:

i) Once issued, a security remains in the market unless three disrupting events took place: the security's term to maturity is reached, perhaps it is repurchased before maturity or, sometimes, an embedded option is exercised by holders who convert the security into cash or another security. This means that the supply of security is fixed or almost sticky in short periods: actually, whenever a financial asset leaves a portofolio it is for entering another one.

ii) When we regard the supply of securities as fixed, in short periods, we mean that the inventory of financial assets doesn't change, unless new issues, repurchases or contingencies which trigger off an increase or decrease of the inventory. In this case, the analysis is carried out from a stock point of view.

iii) But in financial markets with intermediaries, we shift our interest to purchasing or selling transactions ready to be rounded off. It is to measure these flows that we use a relative scale, computing the flow as the number of trades per unit of time, as it is shown in picture 7.

Picture 7 : Intermediary price setting in the context of a flow market



iv) In this market, equilibrium for intermediaries would be reached whenever the flow of selling order matches the flow of buying orders. That is to say, it depends of the spread management. Incidentally, the equilibrium or walrasian price, P(w), becomes unattainable, because in that case there are no intermediaries at all. The consistency of this approach to markets requires that buying and selling orders could be settled with immediacy. But this is, precisely, the role of intermediaries perform when by dealing with their own inventories (Spulber, 1996b).

07.- INTERMEDIARIES AS BROKERS OF ASYMMETRIC INFORMATION

It is imperfect information that enhances the role of intermediaries. In fact, they not only produce information but also perform manifold related tasks:

a) they actively trade in information,
b) they bring about opportunities for making buyers and sellers reveal some of their private information,
c) they supply their own private information as a convenience addressed to buyers' and sellers' markets at the same time.

Whenever an intermediary fulfils these professional functions, he carries out the role of a ***BROKER OF ASYMMETRIC INFORMATION.*** To qualify this statement it seems helpful to proceed with a set of environments that keep the brokerage into perspective.

In picture 8 three information sets are shown. Two of them

$$W(t;k) \quad , \quad W(t;s)$$

belong to different economic agents who trade with a dealer whose information set is

$$W(t;l)$$

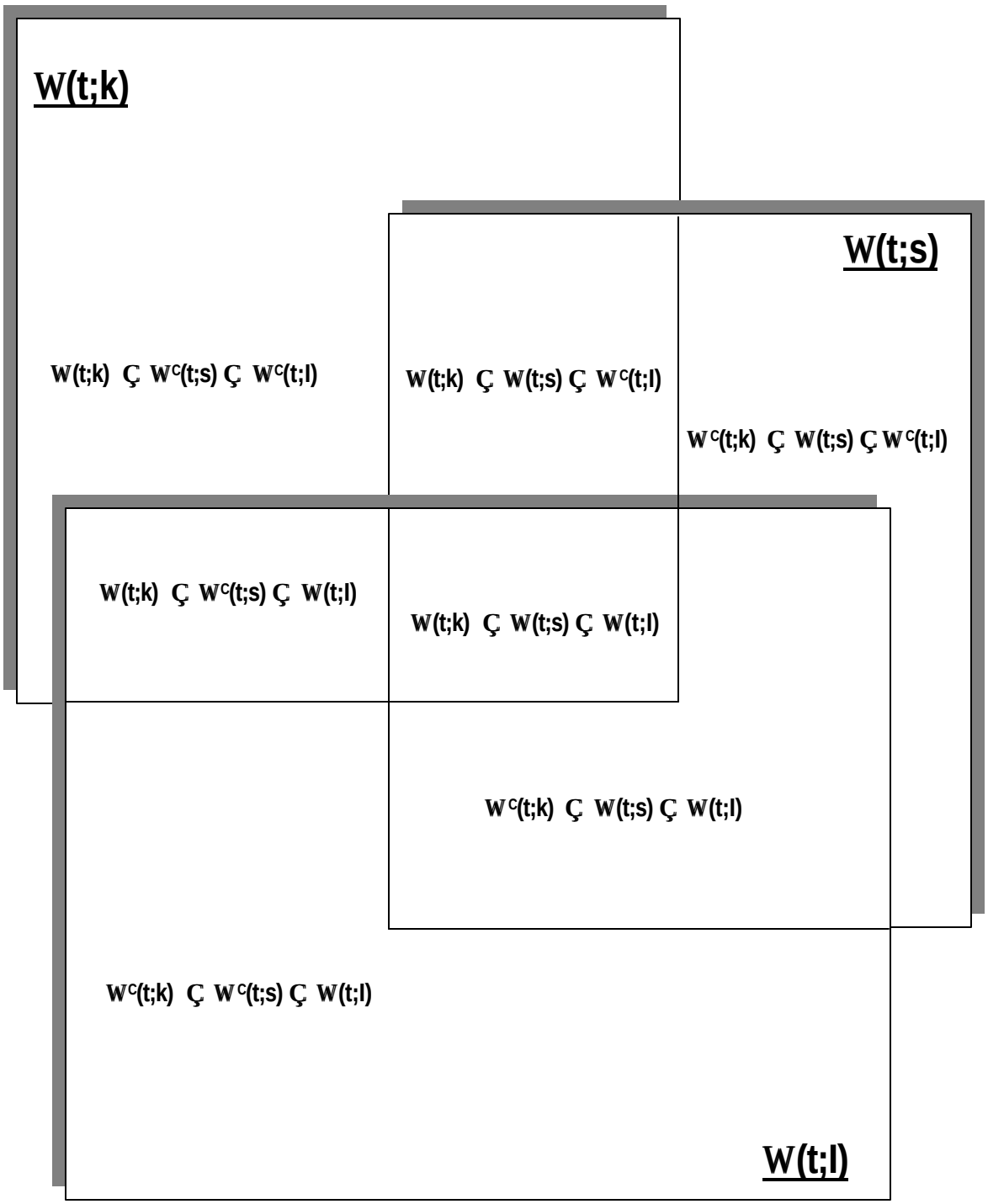
The agents can be other dealers, brokers, institutional investors, banks, corporations or governments. If we want to narrow down the set of likely agents, there is room to include informed or rational traders performing in one side, and liquidity traders in the other side, as they were depicted by Grossman-Miller(1988).

Environment 1: <u>Pooling Information Sets</u>

When agents "k" and "s" trade with the dealer, both of them may wish to buy (or sell) him a financial asset. Perhaps they are willing to take different positions, one of them going long, and the other short. Anyway, for the trade to be effective, all participants carry on their purposes on the grounds of a pooling of information sets

$$W(t;k) \text{ Ç } W(t;s) \text{ Ç } W(t;l)$$

Picture 8 : Dealers as brokers of Asymmetric Information



When a single economic actor "t" trades with an intermediary they pool their information sets, to the extent of sharing information so as to round-off the exchange. That is to say:

$$W(t;k) \text{ Ç } W(t;l)$$

As we can understand from picture 8, pooling doesn't mean losing all the private information endowment.

Environment 2: Private knowledge on the side of both agents

Next, let us now suppose that both agents share some sort of information not accessible to the intermediary. This could be the case when institutional investors are conversant about restrictions to their portfolios set up by regulators, or inside information (perhaps they have knowledge of an impending change in the rules). Another example can be drawn from two traders who believe they have a good rationale to buy or sell certain financial asset, disregarding fundamental values (that is to say, they would be non-informed traders, as in some current models). Furthermore, let imagine that both traders (perhaps chartists) actually might overcome the dealer and bring him into a loss. Where is such information to be located? Clearly, it is embedded in the subset:

$$W(t;k) \text{ Ç } W(t;s) \text{ Ç } W^{c}(t;l)$$

Environment 3: Private knowledge on the side of the dealer

By the same token, let us rephrase the former environment so as to make the dealer as the owner of some private information that allows him to overwhelm those economic agents that come to him asking to sell securities because of liquidity or portfolio rebalancing targets. Being knowledgeable, the dealer will be able to buy assets paying less than otherwise (that is to say, sellers would be liquidity-traders, as in some current models). The distinctive information subset that grants the dealer with such an advantage is

$$W^{c}(t;k) \text{ Ç } W^{c}(t;s) \text{ Ç } W(t;l)$$

Environment 4: Exclusive private information

This is the usual environment where the most current adverse selection problems arise. Let us assume that

$$W(t;k)$$

is the information set of a corporation which moves towards a bond or stock public placement in the capital market. A suitable dealer would be an investment bank, while

$$W(t;s)$$

stands for any broker acting on behalf of its customers. For the company, opportunistic behaviour is nurtured from

$$W(t;k) \subset W^{c}(t;s) \subset W^{c}(t;l)$$

For the broker, private information and financial secrecy when dealing on his customers' account, resort to the following information subset:

$$W^{c}(t;k) \subset W(t;s) \subset W^{c}(t;l)$$

Perhaps the broker is submitting significant buying orders from institutional investors, or he is covering up a transaction in the market for corporate control.

Therefore, any information set holds a subset that is privy to each actor. That is to say, agent "k" hoards some information that he keeps under wraps, and the same holds true for agent "s". On the other hand, the intermediary takes care of his private knowledge, as in environment 3:

$$W^{c}(t;k) \subset W^{c}(t;s) \subset W(t;l)$$

Informed agents may have better information than the intermediaries about the value of the asset. They may know the asset is undervalued at the ask price, or overvalued at the bid price. As they trade, it is the intermediary who loses. On the other hand, uninformed agents trade for liquidity. Intermediaries manage their bid-ask spread so as to balance losses from trading with informed investors making profits with uninformed investors.

Speculators can distort prices by introducing "misinformation" into a market. By so acting, speculators behave not as rational traders do; it is said that they behave irrationally. Hence, they buy or sell securities without sensible information. They become "noise traders", mistakenly following irrational information as the fundamental or rational information; they trade on noise instead of fundamental values. They hardly meet the passive investment strategies that the Efficient Markets Model forecast for traders with poor or none information. But if irrational traders become a great crowd they can overwhelm rational traders and bring about price distortions. They can be misinformed but not irrational at coping with transaction prices or price changes. What is at stake here is the grabbing of informational rents and the performance of arbitrage against the information sets.

Environment 5: <u>An agent shares information with the intermediary but not with the other agent.</u>

This environment is the customary concern, as far as bilateral negotiations are at stake. The dealer can improve his relationship with agent "k" because both of them may share information not accessible to agent "s"

$$W(t;k) \subset W^{c}(t;s) \subset W(t;l)$$

This information subset could be seen as information production on behalf of agent "k", and it comes at a cost for him. The dealer can claim this service through a higher fee than he would charge otherwise by only using the common knowledge set.

By the same token, the dealer can improve his relationship with agent “s“ because both of them may share information not accessible by agent “k“.

$$W^c(t;k) \cap W(t;s) \cap W(t;l)$$

Environment 6: <u>Framing the information brokerage</u>

Assuming that agent “k” is a seller of security ABC, for example, and agent “s” is a prospective buyer of it, the dealer could handle the transaction immediately as a round-off trade. If there were not an agent “s” available at the moment, it would be for the dealer to provide immediacy to agent “k”. This is a usual way of trading, rather mechanical.

But let us regard a more complex setting, as when big blocks of bonds or shares are at stake, new private or public placements are the concern of an agent “k”, or perhaps agent “s” is a portfolio arbitrageur. In this case, instead of designing a spread on the grounds of a common knowledge set

$$W(t;k) \cap W(t;s) \cap W(t;l)$$

the dealer engineers a truly distinctive spread in the knowledge that agents are taking advantage of their respective enhanced information sets:

Agent “k“: $[\, W(t;k) \cap W^c(t;s) \cap W^c(t;l) \,] \cup [\, W(t;k) \cap W(t;s) \cap W(t;l) \,]$

Agent “s“: $[\, W^c(t;k) \cap W(t;s) \cap W^c(t;l) \,] \cup [\, W(t;k) \cap W(t;s) \cap W(t;l) \,]$

so the final spread will be grounded on the new dealer enhanced information structure:

$$[\, W(t;k) \cap W^c(t;s) \cap W^c(t;l) \,] \cup [\, W(t;k) \cap W(t;s) \cap W(t;l) \,] \cup [\, W^c(t;k) \cap W(t;s) \cap W^c(t;l) \,]$$

that means that agent “k“ may accept a bid price less than the bid price would have amounted to with only the common knowledge set. On the other hand, agent “s“ will accept an ask price higher than the ask price would have amounted to with only the common knowledge set. Therefore, the final spread is wider than otherwise, because it has impounded the differential rate the dealer charges because of his brokerage of asymmetric information.

<u>Remarks:</u>

a) Quantitative grounds on this issue can be found in Apreda (2000c).

b) Flood et al. (1998) have proved that, in certain contexts, the search component in the spread may amount a third of the whole bid-ask spread.

CONCLUSIONS

What has been our main contention through this paper can be summarized this way:

- Economic agents can only access to imperfect information sets, because of bounded rationality.
- Most of the time, counterparts in any transaction take advantage of asymmetric information, because of opportunistic behaviour.
- Real markets cope with asymmetric information, because of specialization and division of labour.
- At departure from generally held views, we have shown that intermediaries behave and collect money as brokers of asymmetric information.

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