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PROPERTY RIGHTS IN PRICE AND QUOTE INFORMATION

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Abstract

Specifying the property rights and obligations associated with price and quote data is difficult. Many bodies of law and regulation are relevant, many conflict, and most are currently being reformed. Six important bodies of law are examined governing, respectively, intellectual property rights, confidentiality, misappropriation, competition, a new sui generis property right in databases and the securities markets. Determining the optimal allocation of rights and obligations associated with price and quote data is currently impossible. There is great ignorance and uncertainty about the role of information in markets, and fundamental disagreements on many other key issues. The commonly held view that exchanges should charge for price and quote information on a marginal-cost basis is argued as often being an inappropriate policy.
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1. Introduction

No analysis of the property rights associated with the price and quote data emanating from a market or an exchange can be complete without a similar evaluation of the obligations also associated with their use (Honoré, 1961). There are many different such rights and obligations (this chapter draws heavily on Lee 1998b, and also Lee 1995 and 1998a). In any one jurisdiction, there are typically several bodies of law and regulation that impinge on the dissemination of this type of information. These frequently conflict, and it is not always clear which take priority. Furthermore, there are many such areas that are either in the process of being reformed or the subject of great controversy. The ease with which data are transmitted globally also makes cross-border concerns important and adds additional difficulties. National law and regulation governing the same topics can differ substantially, conflict between different jurisdictions' laws is common, and only infrequently is there any international law or treaty governing how such conflicts should be resolved.

There is also great contractual complexity and uncertainty with regards the use and distribution of price and quote data. Advances in computer and data transmission technology have made it relatively cheap to receive data electronically, to manipulate them, and then to re-distribute them. The traditional industry model of how price and quote data were distributed around a market assumed a simple three stage path: an exchange disseminated them to vendors, and vendors in turn re-disseminated them to end-users. The flow of data now, however, typically follows a much more labyrinthine path than this. Furthermore the commercial strategies of market participants have become blurred, as the number of participants and the ranges of services offered have grown, and the rapidity with which it is possible to enter new markets has increased. Market participants are therefore using a variety of untested legal approaches in an attempt to protect what they perceive as their rights.

The four key ownership questions of critical interest to all users and suppliers of price and quote data are: What precise types of data are published? To whom and how quickly are they disseminated? What prices are charged for them? What constraints, if any, are placed on their use - most importantly regarding their manipulation and re-distribution, and their employment in establishing proprietary trading systems? Six branches of law and regulation which affect the property rights and obligations that determine the answers to these questions in a range of jurisdictions are outlined here. They govern, respectively, intellectual property rights, confidentiality, misappropriation, competition, a new *sui generis* property right in databases, and the securities markets. The various situations and laws from different jurisdictions are chosen, both because they provide good examples, and also because a party working in this area must deal with a variety of countries' laws, not least because new technology now has made it relatively cheap to disseminate information across jurisdictions.

An assessment of the optimal allocation of rights and obligations associated with price and quote data is even harder than determining what these rights currently are. There are no universally accepted answers to any of the four key questions. Differences of opinion are widespread, not least because there is great ignorance and uncertainty about the role and effects of disseminating price and quote information. An analysis of some issues determining what might be considered a fair price for price and quote data, is presented here. A brief conclusion is presented in the last section.

2. Intellectual Property Rights

The owner of a copyright in a work has the right to prevent unrestricted copying or use of the work for an extended period. Most exchanges therefore claim copyright in the price and quote data they disseminate, in order to restrict copying of such data other than on a historical basis. It is universally held that copyright does not subsist in facts. Compilations of facts or databases may, however, attract copyright, and the criteria for assessing whether they do differ across jurisdictions.

In the UK, the primary statutory criterion for assessing whether copyright subsists in a compilation is whether it exhibits sufficient originality (Section 1(1), *Copyright, Designs and Patents Act,* 1988). The central judicial criterion that has been developed to assess whether a work should be deemed original is whether enough labour, skill and capital, have been expended by the author in creating it (*University of London Press Ltd. v. University Tutorial Press Ltd.*). Since 1896, it has been assumed that a list of stock exchange prices exhibits sufficient originality to warrant copyright protection (*Exchange Telegraph Co. v. Gregory and Co.*). The value of an exchange's copyright in a compilation of its price and quote data may, however, be limited as it may not take much embellishment to obtain copyright in a slightly modified work. Most other market participants who disseminate data derived from an exchange's data, may themselves also be able to claim copyright in these compilations.

Although the primary statutory criterion for the assignment of copyright is also that of originality in the USA (Section 102(a), *Copyright Act*, 1976), judicial interpretation of the term there has been quite different than in the UK. In particular, it is the 'creative selection approach' that has been confirmed as the key test of originality in the USA (*Feist Publications Inc. v. Rural Telephone Service Company Inc.*). This holds that copyright subsists in a compilation only if it exhibits a minimal amount of creativity in its selection and arrangement of facts. The expenditure of labour, capital or other assets in the production of the compilation is therefore irrelevant for assessing whether it is protected by copyright or not. Under the creative selection approach it is arguable that a list of exchange prices and quotes does not exhibit sufficient originality to warrant copyright, given that the selection and arrangement criteria used to create this type of list could not be more obvious. Furthermore, even if such a compilation were to attract copyright, it would only subsist in the compilation's selection and arrangement. Other market participants would therefore be allowed to employ the data of which the compilation was composed, and repackage and redistribute them as they saw fit.

3. Confidentiality

An obligation of confidentiality arises when one party imparts to another party secret information, on the understanding that the information is to be used only for a restricted purpose. Many exchanges therefore attempt to impose a contractual obligation of confidentiality upon all parties receiving their information not to divulge it in a proscribed manner.

In order for a breach of confidence to be actionable in the UK, three criteria must be fulfilled (*Coco. v. Clark (A.N.) (Engineers) Ltd.*, and more generally Gurry, 1981). First, the information in question must have the necessary quality of confidence about it, meaning that it must not be public knowledge. The courts have tended to evaluate the confidentiality of commercial information by assessing whether any special economic effort would be necessary to reproduce it. They have also been concerned about how much revelation of the information is required before it is deemed to be in the public domain. Although the legal response to the question of when any ‘relative secrecy’ disappears has been stated as being dependent on the technology currently available (*Franchi v. Franchi*), ‘widespread use’ of information has been viewed as ‘driv[ing] a hole into the blanket of confidence’ (*Dunford & Elliott Ltd. v. Johnston and Firth Brown Ltd.*).

The second criterion that must be met for a breach of confidence to be actionable stipulates that the person receiving the information should have done so in circumstances importing an obligation of confidence on him. A confidant will thus be subject to an obligation of confidentiality if he is aware of the obligation, or if he ought to be aware of the obligation. An obligation of confidentiality is also imposed on third parties, namely people who obtain confidential information indirectly as a result of a breach of confidentiality on the part of a direct confidant, as soon as such third parties become aware that they received the information as a result of an initial breach of confidentiality. The third criterion requires that the confidant must make an unauthorized use of the information, possibly to the detriment of the party initially confiding the information.

When an exchange disseminates its price and quote data, it has the express aim of disseminating them as widely as possible, for the appropriate fees. For an exchange to attempt to classify these data as confidential, when its aim in releasing them is to publicize them as much as practicable, may be considered perverse. The very act by an exchange of offering to sell its prices and quotes to whomever is willing to buy them, may thus dispel any notion of confidentiality imposed on the purchasers of the information. Establishing a duty of confidentiality with regards the distribution of price and quote data in other more restricted contexts, for example when brokers submit their bids and offers to an inter-dealer broker, may, however, be easier.

4. Misappropriation

The law of unfair competition in the USA may provide a protection against the misappropriation of a property right in price and quote data. The nature and importance of this body of law is, however, controversial for several reasons. Given that it is a doctrine developed in state case law and thus has no statutory backing, the manner in which it may be applied is relatively flexible. Its relevance to a particular case therefore depends critically on the precise details of the case. In addition, it is a matter of great debate whether the law of unfair competition is preempted by federal copyright law and, if so, to what extent. As of mid-1997, the tension between federal copyright law and state misappropriation law in the context of the dissemination of time-sensitive news was the subject of a highly disputed case, *National Basketball Association v. Sports Team Analysis and Tracking Systems, Inc. (NBA).*

Prior to *NBA*, there were a range of cases concerning the misappropriation of time-sensitive or 'hot' news. A seminal one was *Board of Trade of the City of Chicago v. Christie Grain and Stock Company*. At the time, the Chicago Board of Trade (CBOT) required recipients of its quotes to pay appropriate fees and to sign a contract promising to keep the data confidential. Christie Grain obtained the CBOT's quotes without signing a contract with the exchange or paying the appropriate fees. It then used these quotes to set up an off-exchange trading business. The CBOT then sought an injunction to stop this. The Court found that the CBOT's collection of quotations was entitled to the protection of the law, as it was 'like a trade secret'.

Another key case for the commercial misappropriation doctrine with regards hot news was *International News Service v. Associated Press (INS).* Associated Press (AP) was a cooperative news service which, through its expenditure of money, skill and effort, obtained news. This was then passed to AP's members who in turn published it in their newspapers. INS managed to establish a source for this news by bribery and by copying it from pre-publication sources or early editions of AP members' newspapers, and then sold the news in competition with AP. The court recognised that 'the peculiar value of news is in the spreading of it while fresh; and it is evident that a valuable property interest in the news, as news, cannot be maintained by keeping it secret' (248 U.S. 215 @ 235 (1918)). The court then argued that in taking the news from AP and selling this news as its own, INS had been 'endeavoring to reap where it has not sown', and thus appropriate to itself, 'the harvest of those who have sown'. This was viewed clearly as an act of unfair competition, and the court granted AP injunctive relief in order to stop INS' misappropriation.

The question of whether federal copyright law preempts the state law of unfair competition with regards the dissemination of hot news is controversial. The Copyright Act preempts state protection of rights if two conditions are satisfied (Section 301, Title 17, U.S.C. 1976). The first requires that the relevant state law must vindicate 'legal or equitable rights that are equivalent' to those within the 'general scope' of copyright law. The second requires that the work that it is sought to protect under state law must be of a type within the 'subject matter' covered by the Copyright Act. The legislative history of the Act also states, however, that, "misappropriation" is not necessarily synonymous with copyright infringement, and thus a cause of action labeled as 'misappropriation' is not preempted if it is in fact based neither on a right within the general scope of copyright ... nor on a right equivalent thereto' (H.R. Rep. No. 94-1476 @ 132).

The conflict between copyright law and state misappropriation law was under consideration in *NBA*. The facts of the case were as follows. The NBA produced and promoted basketball games, and sold licenses for the broadcast and reporting of real-time information about these games. In transmitting this information, the NBA imposed a range of restrictions on its customers, most importantly that they were not allowed to disseminate comparable information to the NBA's without due compensation. Similar restrictions were placed on people who viewed the NBA games from the sports arenas. Motorola manufactured and marketed a portable beeper device, SportsTrax, on which statistics about various sports were relayed to its clients. Sports Team Analysis and Tracking Systems (STATS) supplied the game information that was transmitted to these pagers. STATS entered into negotiations with the NBA to carry information about the NBA's games. When these negotiations broke down, STATS began disseminating information about the basketball games, which was obtained by reporters watching the NBA's games on the television or listening to them on the radio. NBA then filed suit against STATS.

Initial judgment gave a broad interpretation of the validity of state misappropriation law. It first determined that the NBA games themselves were not copyrightable, because they were not 'works of authorship', and thus did not fall within the subject matter of copyright law. Although the court accepted that the NBA's broadcasts were copyrightable as motion pictures or other audiovisual works, it also determined that STATS had not violated this copyright in its actions, as what it had done, at most, was to copy the idea of the games and the facts from the broadcasts.

The court then discussed whether the Copyright Act preempted the relevant state law. In discussing the general-scope requirement, it noted that state laws had been held not to establish rights equivalent to the Copyright Act if they required proof of an 'extra element' that changed the nature of the action so that it is qualitatively different from a copyright infringement claim (*Computer Associates International, Inc. v. Altai, Inc.* @ 716). Among the claims which were stated as satisfying the extra element test were 'unfair competition claims based upon breaches of confidential relationships, breaches of fiduciary duties and trade secrets'. The court asserted that the NBA had not identified any material extra element.

In considering whether the subject-matter criterion necessary for preemption was satisfied, the court determined that because the NBA's broadcasts were copyrightable, the NBA's misappropriation claim was preempted to the extent that it relied on property rights in these broadcasts. In contrast, however, because the NBA's games were not copyrightable, the NBA's misappropriation claim was not preempted to the extent that it relied on property rights in its games. Whether a work attracted copyright protection was therefore not determinative in assessing whether copyright law preempted state misappropriation law. Rather, what was important was whether a work was of a type that could in some circumstances attract copyright, but for its lack of originality, or a failure to meet a technical requirement.

Having thus determined that the relevant state law was not preempted by the Copyright Act, the court then assessed whether STATS and Motorola had in fact engaged in unfair competition by misappropriating the NBA's property interest in its games. Citing *Metropolitan Opera Association v. Wagner-Nichols Recorder Corp.*, the court argued that the law of unfair competition was developed to respond both to the 'ethical as well as the economic needs of society', that it had evolved as a broad and flexible doctrine with a capacity for further growth to meet changing conditions, and that there was no complete list of activities which constituted unfair competition (101 N.Y.S.2d 483 @ 488-92). The court concluded that the NBA games had tremendous commercial value, and that STATS and Motorola did not contribute in any manner to this value. It therefore decided that the defendants had attempted to reap profits where they had not sown any effort, and thereby misappropriate NBA's rights in the NBA games.

This decision was reversed in the Court of Appeals, which provided a much more limited vision of the sort of claims that fit within misappropriation law. The Appeals Court argued that 'although game broadcasts are copyrightable while the underlying games are not, the Copyright Act should not be read to distinguish between the two when analyzing the preemption of a misappropriation claim based on copying or taking from the copyrightable work'. Adoption of the partial preemption doctrine proposed by the District Court was therefore rejected.

The Appeals Court concluded that only a narrow hot-news INS-type misappropriation claim could survive preemption by copyright law. The Court identified five criteria all of which such a claim had to satisfy '(i) a plaintiff generates or gathers information at a cost; (ii) the information is time-sensitive; (iii) a defendant's use of the information constitutes free-riding on the plaintiff's efforts; (iv) the defendant is in direct competition with a product or service offered by the plaintiffs; and (v) the ability of other parties to free-ride on the efforts of the plaintiff or others would so reduce the incentive to produce the product or service that its existence or quality would be substantially threatened'. After assessing Motorola's and STATS' actions against the above criteria, the Appeals Court determined that their transmission of real-time NBA game scores and information tabulated from television and radio broadcasts of games in progress did not constitute a misappropriation of any property of the NBA.

5. Competition

If an exchange captures a large percentage of the trading in a commodity, or if it is granted any property rights in the information it disseminates, it may become the dominant or even the sole source of information about trading in the commodity. Such an exclusive position may bring the exchange within the remit of anti-trust legislation and regulation. Two important instances of potentially anti-competitive conduct by an exchange concerning the dissemination of its information are when it charges too much for its information, and when it discriminates between different clients (*Pont Data Australia v. Australian Stock Exchange and Australian Stock Exchange Operations*).

The determination of what is a fair price for an exchange's price and quote data, when the exchange is the sole source of the data, has been contentious. Two opposite approaches may be taken in deciding how the costs of running an exchange should be apportioned to the production of its price and quote information. On the one hand, an exchange may be viewed primarily as the operator of a trading system. The production of price and quote information is then seen as a byproduct of this function, and the cost of producing the information is thus seen as marginal. On the other hand, an exchange may be perceived primarily as an organization for making prices. The cost of producing this information is then seen as being the total cost of running the exchange. Lee (1995, pp. 185-192) argues that neither of these approaches is valid. The attempt to apportion costs either to the production of trading services, or to the production of information, cannot be made on anything other than an arbitrary basis, given that information and trading services are joint products.

Competition law, the general aim of which is to dismantle exclusive arrangements, by its very nature conflicts with the assignment of an intellectual or economic property right, that grants exclusivity over the right to sell or reproduce a particular good or service. This conflict has proved particularly acute in the European Union (EU) for two reasons. First there is little harmonization of EU copyright law, and thus for the most part it is national legislation which determines copyright. The diversity of such national legislation has been thought to obstruct trade between Member States, and thus to act as an impediment to the development of an integrated market. Both the freedom of movement and competition provisions in the Treaty of Rome (Articles 30-36, 59-66, and 85-86) have therefore been employed to attenuate the perceived adverse effects of such diversity.

The second reason why the conflict between competition and intellectual property rights has been so intense is that there is a tension between different elements of the Treaty itself. The right to move goods freely throughout the EU is subject to the exemption that it not be allowed to prevent restrictions on the protection of industrial and commercial property. Intellectual property has been taken to be included in such industrial and commercial property. The Treaty also requires, however, that such restrictions not constitute a means of arbitrary discrimination or a disguised restriction on trade between Member States. In addition, these prohibitions often conflict with the Treaty's competition provisions. The question of which part of the Treaty is pre-eminent, and of whether the protection of industrial and commercial property on the one hand, or the pursuit of competition or free trade on the other, should dictate policy, has therefore had to be resolved in the courts.

The European Court recently repeated its traditional view that mere ownership of an intellectual property right was not sufficient to confer a dominant position in a market (*RTE and ITP Ltd. v. EC Commission*). It confirmed, however, that when an organization enjoyed a *de facto* monopoly over some information, this *de facto* monopoly might allow the organization to prevent competition, and therefore to occupy a dominant position. In the case in question, the Court found three instances of anti-competitive activity. These were: first, when a company's refusal to provide certain information prevented the appearance of a new product that the company did not offer, and for which there was a potential consumer demand; second, when there was no justification for this refusal, either in the activity the company undertook or in that of a derivative activity; and finally, when by denying others access to the information that was indispensable to their activities, the company reserved to itself a secondary market thereby excluding all competition. Given these anti-competitive abuses, the Court maintained it was unnecessary to examine the conflict between national intellectual property rights and the freedom to trade between Member States.

Given that most exchanges operate a *de facto* monopoly as the sole source of the price and quote data emanating from their trading systems, they are likely to be seen as having a dominant position in the market for the provision of these data. Any refusal by an exchange to license the use of its data, notwithstanding any copyright claimed in them, would therefore probably also be viewed as abusive in the EU.

6. *Sui Generis* Rights

A *sui generis* right has recently been developed in the EU to protect databases (Directive 96/9/EC), and a similar right is currently under legislative scrutiny in the USA (US Congress: House of Representatives 1996). The goal of the EU's *sui generis* right is to ensure that the creator of a database can protect his investment against any harm, misappropriation or copying, that does not infringe whatever copyright that might exist in the arrangement of the database. The maker of a database was given the right to prevent the extraction and re-utilization of the whole, or a substantial part, of the contents of the database. The term of the right was set at fifteen years. The term could also be extended if the database was changed in an appropriate manner.

The extra protection granted to database owners was believed necessary for several reasons. The diversity of national copyright legislation in the EU governing the protection of databases, together with the fact that in some Member States databases were not clearly protected, were seen as major impediments to the achievement of the Single Market. It was also recognized that the development of electronic databases required considerable investment, that they could often be cheaply copied and accessed, and that in the absence of a harmonized system of unfair-competition legislation or of case-law, other measures in addition to copyright were required to protect them.

Exchanges are likely to be able to protect their price and quote data under this *sui generis* right (Bull, 1996). As with any copyright held, however, if an exchange has a monopolistic position with regards the database of its price and quote information, competition law would probably require it to license the use of the database on fair and non-discriminatory terms.

7. Securities Markets

The most detailed legislation and regulation supervising the dissemination of price and quote information in securities markets has been developed in the USA. The Securities Exchange Act 1934 (SEA) lays out a complex hierarchy of objectives which the Securities and Exchange Commission (SEC) is obliged to pursue. At the most general level, it is required to further the public interest, to protect investors, and to maintain fair and orderly markets. Five subsidiary objectives have been set out as part of the National Market System, the most important of which in this context is that information with respect to quotations for, and transactions in, securities be made available to brokers, dealers, and investors. In order to deliver this objective the SEC has mandated that the prices, sizes and locations of all trades and all quotes in the largest exchange-listed and NASDAQ-listed equities be published via the Consolidated Tape Association and the Consolidated Quotation System (*Code of Federal Regulations*, Sections 240.11Aa3-1, 240.11Ac1-1 and 240.11Ac1-2).

The SEA imposes a range of constraints on exchanges that are relevant for the dissemination of price and quote data, and also on so-called ‘exclusive securities information processors’. These are organizations that act on an exclusive basis on behalf of exchanges in collecting, processing, and preparing for distribution, the exchanges’ information about trades and quotes. Exclusive securities information processors are viewed as both monopolists and public utilities, and as such are required to be absolutely neutral with respect to all market centres, market makers and private firms, to make their services available on reasonable and nondiscriminatory terms, and not to set unreasonable charges.

The SEC has made a series of key decisions concerning the dissemination of price and quote information. It has ruled that an exclusive securities information processor may set a fixed access charge for the price and quote information which it sells (SEC, 1978). It has also determined, however, and been backed judicially, that if an exclusive securities information processor also retails its information, it should only recover those costs it would incur if it operated a pure pass-through system, when setting its charges (*NASD Inc. v. SEC and Instinet*). In certain very restricted circumstances, and particularly in an attempt to repatriate order flow to the USA, the SEC has relaxed the amount of price and quote information that an exchange is required to release (SEC, 1990a, 1990b).

Regulatory examination of transparency in other jurisdictions has also been undertaken. The Office of Fair Trading (OFT) in the UK, for example, has examined the rules of the London Stock Exchange several times (OFT, 1990, 1994), and has concluded that a delay in the publication of the details of large trade by the exchange was likely to restrict and distort competition significantly. It argued that delaying trade publication would increase the information risk associated with taking on a trade, with the attendant consequences of increasing spreads, increasing transactions costs, reducing market liquidity and possibly declining trading volume.

To date the only supranational law that determines how markets should be regulated across jurisdictions is the Investment Services Directive (ISD) of the EU (Council Directive 93/22/EEC). The Directive provides the legal basis under which a ‘regulated’ market from one Member State may operate in other Member States. In order to be classified a ‘regulated’ market, an institution must satisfy the so-called transparency provisions of the Directive. These stipulate the minimum data, with respect to prices, quotes, and volumes on the market, that the market must disseminate publicly. Given the controversial nature of the negotiations that culminated in the ISD, particularly with regards transparency, it is unsurprising that in order to reach a compromise the actual text agreed in the Directive is essentially so ambiguous as to be meaningless (Lee, 1996, p. 198). The international controversy over transparency has also been reflected in other relevant global discussions (International Organization of Securities Commissions, 1992).

An assessment of the influence of transparency on markets is difficult for many reasons: the multiplicity of criteria by which the policy may be judged, the possibility of disagreement about the appropriateness of the criteria, the difficulty of obtaining an objective assessment of many of them, and the problem of evaluating how much of what occurred in a marketplace happened on the one hand as a result of the presence of transparency or on the other hand despite its presence. It is in the USA that a policy requiring the full publication of trades and quotes in the securities markets has been employed for the longest period, namely since 1975, and it is there too that the strongest supporters of this approach are found. The SEC, for example, has claimed many times that transparency has played a major role in effecting this success (SEC, 1994, IV-1). Notwithstanding the strength with which this view is held, however, the opposing position has also been argued as being as, if not more, convincing (Lee, 1995, pp. 224-226; Mulherin, Netter and Overdahl, 1991a, 1991b).

These authors argue that unless competition is impaired, mandated transparency in the securities markets is an inappropriate regulatory policy for a range of reasons. Our current state of knowledge about the economic effects of transparency can best be characterized as one of ignorance, confusion and uncertainty. What theoretical intuitions and empirical evidence we do have, appear relevant for only very specific environments and in many instances contradict each other. The risk of creating regulation that does not deliver the intended consequences is therefore not insignificant. All attempts to impose a regulatory structure for transparency have also been subject to such a level of inconsistency as to lead to significant regulatory difficulties and inequalities. Finally, as long as competition is not impaired, market participants themselves face the appropriate incentives to disseminate enough information. In order both to attract order flow to their trading systems, and to ensure the perceived fairness and integrity of their markets, exchanges have sufficient motive to publish speedily details of their prices and quotes.

8. A Key Issue: Pricing

The determination of what is a fair price for the price and quote data emanating from an exchange is controversial. Exchanges are frequently believed to be acting anti-competitively when they set a price greater than marginal cost. The standard argument against monopolistic, that is. non-marginal cost, pricing is that it leads to economic inefficiency because the sum of consumer and producer surplus is not maximised (Varian, 1984, ch. 2.1). This is thought not to occur in a competitive environment where prices are set at marginal cost. It is argued here, however, that such a conclusion may in many circumstances be wrong in the context of an exchange disseminating its data.

In order to apply the standard logic to an exchange, many extra factors must be incorporated into the model. Account must first be taken of the fact that the marginal cost to the 'producer' (in this instance the exchange) of supplying an extra unit of the 'good' (in this instance the information) is typically very low, and thus the average cost which the producer faces declines with the total amount of the good produced. Once a digital feed containing the relevant information has been constructed, it is relatively cheap to deliver the feed to whomsoever wants it. The socially optimal outcome in such circumstances would still be when the producer sets the price for the good at the marginal cost of producing it, in this case close to zero (Varian, 1984, ch. 7.6; Atkinson and Stiglitz, 1980, ch. 15.2). Unfortunately if a producer were to do this, the total revenues which he received would not cover his total costs of production, and he would therefore incur losses. In a first-best world, in which all forms of taxation were allowed, it is typically advocated that the resulting deficit should be financed by charging consumers some form of lump-sum fee. Such fees are 'non-distortionary' in that they do not affect the marginal costs which consumers face, and therefore would still allow for the possibility of achieving an efficient outcome.

In most jurisdictions, however, the idea of charging a fixed sum and marginal cost pricing, or more generally a lump-sum fee, to support the operations of an exchange is unacceptable, and some other form of financing for the exchange must therefore be found. In such a second-best world, the best outcome in terms of output produced and price charged may not be close to that obtaining in the first-best world. One way of asking the question of what price an exchange should charge is to view the exchange as a public utility, and to require it to maximise social welfare, subject to the constraint that it not operate with a deficit.

Under these circumstances, the price the exchange should charge is inversely related to the elasticity of demand for information. The extent to which the exchange should set its price above marginal cost depends on the budget constraint, namely on the amount of losses it would incur if it did price the information at marginal cost and on the extent to which these losses could be financed by lump-sum charges. When the constraint is non-binding, for example when lump-sum fees may be charged, the price should be set at marginal cost to achieve the first-best outcome. If the required profit approaches the maximum possible in order to finance a large loss, and no lump-sum charges are allowed, the price the constrained producer should charge approaches the price that the monopolist will charge. Once again this is when marginal revenue equals marginal cost.

A further complication in the context of an exchange disseminating its price and quote information, is that this information is a joint product. It can only be 'produced' by an exchange which operates a trading system. The service of converting orders into trades, which is delivered by all trading systems, necessarily produces information about both the orders routed to the trading system, the quotes, and the prices and volumes of the executed trades. In these circumstances, the optimal price an exchange should charge for its information is thus also dependent on the sale of its trading services. As with the single good situation, if the exchange is required to maximize social welfare while still not making a loss, it can be shown that it should charge a price for each good which is inversely related to the elasticity of demand for that particular good (assuming that there are no income effects). The intuitive reason for this is that if consumers are relatively insensitive to changes in the price for one of the goods, they will still buy that good at a relatively high price, and the producer will be able to charge a relatively low price for the other good, for which consumers are relatively sensitive to changes in price.

The analysis should also be extended to the allow for the possibility that the demands for the two products are interdependent so that, for example, the more trading market participants undertake, the more they wish to buy information about the market on which they are trading. The optimal prices for each of the services offered by an exchange will then depend on the cross-elasticities of demand, namely on how sensitive consumers' demands for each of the goods are to changes in the price of the other good.

The model outlined above provides useful insights into some of the factors that are important in determining what should be the optimal price for an exchange's information. To apply the model to a real exchange, however, would be difficult, if not impossible. Full numerical specifications of the exchange's costs of production, of the demand for information, of the demand for trading services and of the cross-elasticities of demand, would all be required. There are also various other conceptual and practical difficulties which the model does not incorporate but which would nevertheless affect the optimal price in a real environment.

The first is that no account is taken of uncertainty. The second is that the model does not recognise that information has two characteristics which are typical of public goods: its consumption is 'non-rivalrous' and to some extent 'non-excludable'. Typically public goods are under-supplied when privately provided, compared to their optimal level of provision. The third shortcoming is precisely that the model describes the socially optimal pricing decision of a monopolistic exchange. In most real environments, however, the market participants trading on an exchange have a choice as to where they can send their orders, and thus exchanges operate in some form of competitive environment. The fourth weakness of the model is that it takes no account of the fact that most exchanges are required to undertake regulatory activities which have to be funded in some manner. Finally, the model does not take into account the fact that the members of an exchange may form an important subset of the market participants who receive the exchange's price and quote information, and who may also have some governance rights at the exchange. They may have an incentive to ensure both that the volume traded on the exchange is maximized, and that any fees charged for information are limited.

9. Conclusion

A specification of the property rights and obligations associated with price and quote data is difficult. Many bodies of law and regulation are relevant; many of them conflict, and most of them are in the process of being reformed. Six pertinent branches of law and regulation from a range of jurisdictions are outlined here. They govern, respectively, intellectual property rights, confidentiality, misappropriation, competition, a new *sui generis* property right in databases, and the securities markets.

An assessment of the optimal allocation of rights and obligations associated with price and quote data is even harder than determining what these rights currently are. Among the most important economic questions that need to be addressed are: What precise types of data should be published? To whom and how quickly should they be disseminated? What prices should be charged for them? and What constraints, if any, should be placed on their use - most importantly regarding their manipulation and re-distribution, and their employment in establishing proprietary trading systems? There are no universally accepted answers to any of these questions. On the contrary, differences of opinion are widespread, not least because there is great ignorance and uncertainty about the role and effects of disseminating price and quote information. One commonly made assumption is that exchanges should be obliged to charge for their price and quote information on a marginal-cost basis. It is argued here that this may often be an inappropriate regulatory policy.

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