economists incorporated
Economists Ink
a brief analysis of policy and litigation
special issue 2001

Economists Incorporated is pleased to provide you with this special issue of Economists Ink *in conjunction with the opening of our San Francisco Bay Area office.* Economists Ink *provides brief commentaries by our economists on issues of policy and litigation in matters of antitrust, damages, regulation, employment and other practice areas. I hope you find the articles useful and interesting.*

Bruce M. Owen

In This Issue

Valuing Employee Stock Options

By Robert Petersen

Stock options have become a popular form of employee compensation, especially among start-up firms in industries such as pharmaceuticals and high tech. They are popular because of the favorable tax treatment they receive, but also because employee stock options are a way for small, start-up firms to attract and retain the talent necessary to compete with larger, more established rivals. Lately, employee stock options have played a prominent role in litigation matters, and their proper valuation has become an important consideration.

Stock options are complicated investment instruments whose valuation requires a formal statistical model. The most popular option-pricing models, such as the Black-Scholes model or the binomial model, provide highly accurate estimates of the value of a stock option. Standard option-pricing models, however, were designed for use with short-term, fungible investment instruments that typically are traded on public exchanges. Standard option-pricing models may not, without modification, be appropriate for valuing employee stock options. In particular, research has shown that standard option-pricing models can dramatically overstate the value of employee stock options and, as a consequence, dramatically overstate damages estimates.

The right valuation model for an employee stock option is one that adjusts for the options' unusual nature. Whereas publicly traded stock options tend to have relatively short terms (e.g., 6-12 months), can be exercised immediately, and can be bought and sold freely, employee stock options are very different. Employee stock options typically have 5-10 year terms and can be exercised only after a lengthy vesting period. More significantly, employee stock options are not transferable.

The nontransferability of employee stock options is an important restriction. Standard option-pricing models are based on the assumption that stock options will be exercised at or near the optimal exercise time. When options are easily transferable, the transferability feature ensures that an option will not be exercised prematurely. For example, if the holder of an option does not wish to retain possession of the option until the appropriate exercise time, the option can be sold to another investor. That investor will then retain possession of the option until the optimal time, or sell the option to yet another investor. In this way, the option may change hands several times but will never be exercised prematurely. On the other hand, if, because of risk aversion or a desire to diversify his or her investment portfolio, the holder of an employee stock option wishes to divest, his or her only choice is to exercise the option. This may mean exercising the option before the optimal exercise time and receiving less than optimal value.

Continued on page 4

Convergence of U.S. and E.U. Merger Enforcement

By Robert D. Stoner

In recent years, a substantial convergence has occurred between merger enforcement practices in the United States and the European Union. Prior to 1989, E.U. merger enforcement was accomplished through two statutes not specifically designed to deal with mergers. With the passage in 1989 of the E.U. Merger Regulation, E.U. merger enforcement began a process of rationalization.

Historically, several differences have been noted between U.S. and E.U. merger enforcement practices. The E.U. merger statute is couched in terms of competitive effects emanating from the creation or strengthening of "a dominant position," and more emphasis has been placed on single-firm effects than on collusion. Thus while U.S. agencies consider both market share and concentration in their analysis, the E.U. authorities have not tended to consider high market concentration to be a decisive factor against allowing a merger.

In the last five years, however, several mergers in the European Union have been analyzed based on the theory that they created an oligopoly. In May 1998, the merger of two U.K. tour operators, Airtours and First Choice, was halted because it was said to contribute to the creation of "collective dominance." This followed closely the finding of the European Court of Justice in an important appeals case that the European Commission was obligated to analyze possible oligopolistic outcomes and needed to improve its economic analysis of potential coordinated effects. Most recently, the European Commission investigated the creation of a potential "duopoly" in the manufacture of certain flat-rolled products from the Alcan/Alusuisse/Pechiney aluminum merger. Thus, the practical approaches of the United States and European Union towards merger issues are converging despite different technical language in their statutes.

The E.U. analysis of dominance has also tended historically to be a simplistic, market share-based exercise that involved little more than defining the market and calculating shares. More recently, however, E.U. analysis of dominance increasingly mirrors a more refined unilateral-effects inquiry. In the recent merger of Alcoa and Reynolds, the Commission appeared to be concerned that Alcoa and Reynolds were each others' closest alumina competitors in bidding situations and the removal of Reynolds would allow bidding prices to rise. Whether or not this analysis was done correctly, it is clearly an effort to apply the type of unilateral-effects inquiry that has become a staple of U.S. merger enforcement.

Although the process of product market definition in the United States and European Union is generally similar, the area of captive output has sometimes been treated differently. The standard practice in the United States has been to include in the market output that is internally consumed, based on the theory that a price increase may bring an expansion of production or a shift away from internal use. In almost every recent Commission case where the issue has come up, internal sales have been excluded from the relevant market, which has been deemed to be "third party" sales. Despite the differences in past practice, definition of a "non-captive" market is becoming more likely in the U.S. enforcement context as well.

E.U. and U.S. merger policies have also converged in their reliance on empirical analysis as a central and often critical component of the competitive assessment. E.U. antitrust authorities now appear to recognize that when a rich body of data on prices and outputs is available, it can be used to test claims made by the parties. Increasingly, more sophisticated econometric techniques are being used to estimate elasticities of demand. Sophisticated empirical studies of bidding patterns have also been used when bidding for contracts is important, such as in the Boeing/McDonnell Douglas investigation. Analysis of bidding patterns has also been performed in other mergers in the European Union to determine whether two merging firms are each others' closest competitors.

Convergence of the basic approaches to mergers in the United States and the European Union has led to the suggestion that a joint E.U./U.S. merger board be established to regulate mergers that affect the interests of both jurisdictions. The rationale is to avoid the politicization of the antitrust process that may underlie the different decisions of the U.S. and the E.U. antitrust authorities with respect to mergers like the Boeing/McDonnell Douglas merger. This merger was not challenged in the United States, allegedly because McDonnell Douglas was too weak to be a competitively relevant factor. E.U. authorities, however, challenged the merger, allegedly responding to a politically charged atmosphere in which Airbus would benefit from challenge. Some have argued that such a divided outcome could be avoided if there were joint reviews of mergers. The differences that have been observed in recent cases, however, may simply lead to disputes within the joint review process that would slow decision making and may not lead to superior joint decisions in politically tough cases. Nonetheless, joint review appears easier to implement today since the current substantive approaches to antitrust enforcement are very similar.

Senior Vice President Robert D. Stoner has recently worked on matters involving E.U. antitrust review and has testified before the European Commission. He has also addressed this issue before the American Bar Association.

Network Effects and Antitrust in the Computer Industry

By Bruce R. Snapp

In recent years, the concept of "network effects" has played an increasingly important role in antitrust analysis, particularly in matters involving high-tech, information-based industries such as computers and software. In principle, network effects enable firms with large market shares to get larger, thereby raising the issue of natural monopolies. It does not follow, however, that industries with network characteristics necessarily exhibit network effects that raise antitrust concerns.

Network effects exist when the value users place on a product or service increases as the number of other users increases. The value of telephone service to any single user, for example, is clearly a function of the number of other subscribers. Few would pay much for a telephone that was not connected to anyone, and most would pay more for phone service linked to a national network rather than just a local network. Similarly, many computer users would pay more for a computer system that allowed them to exchange information readily with other users.

Network effects are demand-side externalities that are analogous to supply-side economies of scale and scope. Both generate a positive feedback effect in which successful products become more successful. As a firm increases output, economies of scale lead to lower average costs, permitting the firm to lower prices and gain additional business from rivals. Similarly, the positive feedback from network effects builds upon previous successes. In the computer industry, for example, users will pay more for a more popular computer system, all else equal, or opt for a system with a larger installed base if the prices and other features of two competing systems are equivalent. As with economies of scale, large firms tend to get larger. Thus, network effects suggest the possibility of natural monopoly.

It is appropriate to take this possibility into account in analyzing network industries. Nevertheless, several potential pitfalls must be avoided. The first is the assumption that because an industry can be viewed as a network, user demands are necessarily interrelated and generate network effects. Not all networks exhibit network effects. Cable television, for example, can be viewed as a network of interconnected elements, but the value users place on subscribing is largely unaffected by the number of other users. A resident of an area with poor over-the-air television reception may value a cable system highly, even if that resident were the only subscriber in the local area. The same cannot be said of telephone service with a similar customer pattern.

> "It does not follow that industries with network characteristics necessarily exhibit network effects that raise antitrust concerns."

The second pitfall is the assumption that network effects, when they are present, are necessarily of sufficient magnitude to produce a natural monopoly. As with economies of scale, the positive feedback from network effects may be limited. For example, while the Windows operating system may exhibit network effects, the Macintosh and Unix operating systems have had a fairly stable (if smaller) share of total PC operating systems over time.

The third pitfall is that in many indus-

Continued on page 4

Selected EI Cases

State of California v. Sutter Health System/ Summit Medical Center

Principal Margaret E. Guerin-Calvert and Vice President Stephanie M. Mirrow provided economic and extensive empirical analyses of the merger of two Bay area hospitals, Sutter Health's Alta Bates Medical Center in Berkeley (represented by Jones, Day, Reavis & Pogue) and Summit Medical Center in Oakland (represented by Crosby, Heafey, Roach & May). Their work included assistance in the FTC review process. Guerin-Calvert testified as the economic expert at trial for the defendants when the merger was challenged by the State of California. The District Court decision denying the preliminary injunction highlights geographic market and failing firm issues as bases for the decision for the hospitals.

DRAM Dumping Order

Vice Presidents Robert D. Stoner and Matthew G. Mercurio worked with Willkie, Farr & Gallagher on behalf of Hyundai Electronics for the sunset of a 1993 International Trade Commission dumping order concerning Dynamic Random Access Memory computer chips. They demonstrated that the price and volume effects in the U.S. of the original order were insignificant. They also showed that revocation of the order was unlikely to injure domestic producers. The matter was settled by the domestic industry agreeing to support revocation of the order.

Stock Options . . . (Continued from Page 1)

The tendency towards early exercise of employee stock options is so significant that special option-pricing models have been developed specifically for use with employee stock options. Employee stock option-pricing models include the usual data, such as the expected growth in stock price, but also include data specific to the employee, such as an employee's risk aversion and the size of his or her non-option wealth. These employee-specific variables provide information about how likely an employee is to exercise a stock option prematurely. Unfortunately, while employee option-pricing models are theoretically superior for use with employee stock options, they are difficult to use in practice because the models are very complicated and some of the required data are not readily available. As a result, one must often construct "upper" and "lower" valuations that bracket the true valuation.

Estimation of an upper bound may, for example, begin with a standard valuation model, such as the Black-Scholes model, and involve replacing the maturity date of the option with an estimate of when the employee is likely to exercise the option. This one change will produce a valuation that reflects the lower value the employee may receive due to early exercise of the option. The valuation produced by such a "modified" Black-Scholes model will be more accurate than a standard Black-Scholes model yet will still tend to overstate the option's true value. So, for example, changing the term of an option from the stated expiration date of ten years to the expected exercise date of seven years will produce a valuation that is higher than the value of the ten-year option after seven years. Nevertheless, a modified Black-Scholes model can be used to create an upper valuation of the employee stock option.

For a lower valuation, the so-called "minimum value" model can be used. The minimum value model yields an estimate of option value based on conservative assumptions regarding growth in stock price and stock price volatility. The valuation produced by the minimum value model produces an accurate estimate in some cases but tends to understate the true value in others. For this reason, the minimum value model is a good candidate for producing a lower valuation.

The increased use of stock option compensation has led to increased scrutiny of standard option-pricing models as a means of valuing employee stock options. Standard option-pricing models have been shown to overvalue employee stock options. Revisions to standard option-pricing models enable the calculation of upper- and lower-bound estimates that are more accurate and avoid the overestimate produced by standard option-pricing models.

Vice President Robert Petersen has recently joined EI, specializing in employment discrimination, commercial damages and intellectual property matters. He has testified numerous times in employment discrimination cases, including cases involving employee stock options.

Network Effects . . . (Continued from Page 3)

tries network effects may be only one of a number of externalities, and not necessarily the most important. While network effects are an important structural feature of the telephone industry, economies of scale are important in the tendency toward natural monopoly at the local level. Network effects in the computer software industry may create positive feedback effects that allow some firms to increase in size, but economies of scale are also important for these products. Fixed costs of software development dominate, and average cost falls dramatically and possibly continuously with succeeding units produced.

While concern about the possible impact of network effects is relatively recent, antitrust concerns about network industries have been the object of scrutiny for many years, as *U. S. v. IBM* indicates. Network effects could play an important role for many computer industry products. Like other considerations, such as economies of scale and scope, however, network effects may be more important in some industries than others, and these other considerations may be more important in some cases. It would be incorrect to assume that conclusions regarding the importance of network effects in one industry necessarily carry over with the same force to others. In addition, it is important to recall that the potentially problematic conduct identified in connection with network industries has been explored before in the computer industry and that one can likely learn from these prior experiences. In the end, of course, the merit of specific allegations will depend on the facts of each specific case.

Principal Bruce R. Snapp has worked on matters involving network industries. This article summarizes his presentation at a ABA conference on network industries.

Economists Incorporated

Suite 400
1200 New Hampshire Ave.
Washington, DC 20036
Phone: (202) 223-4700
Fax: (202) 296-7138

EmeryStation North
5980 Horton Street
Emeryville, CA 94901
(510) 547-6910

Website: www.ei.com

President: Bruce M. Owen, Editor: David A. Argue
Layout: Crystal D. Simpkins

In affiliation with Case Associates, London, UK