DETECTION SUPPORT SYSTEMS AND THE EVALUATION OF REAL ESTATE SALES

by Jack T. Hogue

In recent years real estate value, particularly in downtown metropolitan areas, has increased dramatically. As the U.S. workforce continues to engage in information handling at an accelerating rate, the concentration of such workers in metropolitan office towers and complexes will continue. These trends serve to focus attention on an increasingly important and complex decision for companies which buy and sell corporate office properties—the terms of sale or acquisition.

The case study research is a large multi-industry corporation with headquarters in Dallas, Texas. Annual revenue exceeds eight billion dollars and company employment exceeds 60,000. In 1982 corporate management was in a position to sell one of its properties, a large downtown Dallas office tower. As management began to investigate terms of sale for the property, it became apparent that there were two major factors which work in concert or opposition to one another for the human mind to be able to consider them all jointly.

In such situations it is common to simplify the problem by reducing the number of variables to be considered, thus providing a more easily identifiable set of solutions. However, management wished to be able to consider all of the variables relevant to the future financial value of the property—and in terms of the hundreds of perceived variations of the future, all believed to be possible. Of added importance was a time limit for the decision which would have made a strictly human evaluation of the property's financial value limited in scope. Management did not believe the property could be adequately evaluated without a computerized financial model enabling any "what if" scenario to be considered.

Decision Support Systems

A decision support system (DSS) is defined as "interactive computer-based aids designed to assist managers in complex tasks requiring human judgment."1 Such decision support systems (DSSs) differ from traditional computer systems in several ways.2 First, they are often developed by the user (management or staff) for a specific decision utilizing computer software which is user-friendly, thus requiring little to no prior computer expertise. The decision supported by the DSS may be a recurring decision of continued importance (financial planning) or a one-time decision of major importance (sale of a multimillion dollar office building). DSSs may be developed separately from the data processing (DP) department, thus bypassing the typically long, turnround time for DP applications development. As the DSS is developed it can be changed quite easily and quickly as the user determines needed modifications. A DSS is

in July, for sale in December, he/she risks the changes in value due to fluctuations in the price of wheat. If he/she simultaneously sells a future contract promising to deliver 1,000 bushels of wheat at a given date in December at a price of $1.52 per bushel, he/she is "hedging" because his/her wealth is affected only by relative movements in the price of wheat and of futures contracts. If the wheat merchant waits until December to deliver the wheat, he/she will make a gain of seven cents per bushel out of which he will deduct his carrying costs. If the price of wheat rises between July and December to $1.55, in October without a rise in December futures prices, the wheat merchant could make a profit by selling the wheat in October and then buying back a December futures contract to cover the one he/she sold. Coonter (1981) states that the effect of the hedge is to provide an option to benefit from certain minimum relative price movements (but) with the freedom to take a larger gain if the opportunity arises.3 Hedging allows the wheat merchant to reduce his/her personal risk by shifting it to the speculator, who accepts the risk in the expectation of making gains, or in the case of futures contracts, losses. Hedging does not reduce the total risk that must be borne in the market. Hedging can occur in the wheat market because a futures market exists which makes it possible to sell short. Hedging does not exist in the urban property market because owners of urban property cannot usually make short sales. The option of shifting the risk is not open to the property owner who must bear the risk of changes in real estate values due to changes in expectations.

Under certain conditions, hedging implies a shift between markets for assets which can give rise to speculative gains or losses. A shift from holding money to holding real goods such as land during periods of rapid inflation is a case in point. The realization of speculative gains would depend on whether inflation is anticipated or unanticipated and on the rate of change of inflation.

This latter type of hedging characterized various real property markets over the period 1968 to 1977. Given the poor performance of the various financial markets in the early 1970s, combined with rising rates of inflation, Gilder suggests that a shift from financial assets to real assets, including gold, objects d'art and real estate has taken place in the United States.

Arbitrage may be defined as "... the simultaneous purchase and sale of equivalent assets at prices which guarantee a fixed profit at the time of the transaction although the life of the assets and hence the consumma-
tion of the profit may be delayed until some future date. Nonetheless, if the price of eggs in Chicago is more than transportation and transactions costs, an opportunity for profit from arbitrage exists. Eggs can be purchased in Chicago for sale after delivery in New York at a later date. Arbitrage reduces the price spread between the buying price in Chicago and the selling price in New York; the transfer of eggs from Chicago to New York increases the price in Chicago and reduces the price in New York.

Specialized arbitrageurs will increase social welfare if they are more responsive to detecting market imbalances than other market participants. Arbitrageurs, in their pursuit of profits, force the price of the commodity in all markets toward equilibrium; "shopping-around" costs are reduced as a result.

Because expectations are assumed to have remained unchanged over the period in question, arbitrage profits are earned not as a result of risk bearing but for providing search and information services. In practice, arbitrage profits may often occur simultaneously with speculative profits due to changed expectations making it difficult to distinguish arbitrage profits from speculative profits. In real estate markets, an opportunity for arbitrage exists if, given fixed expectations, the full information price of a particular piece of property is not known.

The figure illustrates the situation in which the full
information price, P, is unknown at time t = T. A price spread exists between the bid and ask price indicated. Over time, as more information regarding the full
information price of the property becomes available, the spread would narrow both the bid and ask price converge on P, the full information price.

Given the assumption of fixed expectations, P will remain unchanged. The arbitrageur can earn a profit by placing two (this bid in between but below the full

FIGURE

Arbitrage in Urban Property Markets

<table>
<thead>
<tr>
<th>Time</th>
<th>Bid Price</th>
<th>Ask Price</th>
<th>Full Information Price</th>
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<tbody>
<tr>
<td>t0</td>
<td>P</td>
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<td>t1</td>
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Jack T. Hogue is an assistant professor of management information systems at the University of Texas at Arlington. He specializes in the development of decision support systems for upper-level management. Mr. Hogue's articles are frequently published in the MIS Quarterly.
At any point in time a set of opinions or economic expectations concerning the outcome of future events will exist. The term "economic expectations" reflects the set of imagined and temporary projected economic consequences of a given action.

Speculative profits and losses occur only if expectations or opinions about the future change. A price change by itself does not necessarily imply the existence of speculative profits, if the price change is anticipated and discounted in advance. If the future were certain, all expectations would remain fixed and risk would not occur. However, the existence of uncertainty about the future generates the possibility of changing expectations over time as unanticipated events occur. This situation creates the possibility of speculative profits and losses.

Speculative profits and losses are spontaneously generated as a result of changes in economic expectations in an economy where the future cannot be perfectly anticipated and discounted.

The uncertainty about future events that is found in all asset markets is increased in real estate markets due to the nature of real estate. Government intervention in the real estate market tends to increase uncertainty. The development of a new supply of real estate stock is dependent upon the approval of various government agencies. Lengthy approval periods and numerous regulations regarding upland development requirements and construction permits increase uncertainty on the supply side as well as development costs.

The government has enacted housing programs to stabilize demand and make housing more affordable to various income groups. In some markets with an inelastic supply, the subsequent government programs may have been capitalized into the purchase price thereby distorting the real demand. One unanticipated indirect effect of various subsidies programs may have been increased uncertainty concerning the real long-term demand in housing markets.

Increased uncertainty resulting from an enlarged government program can alter investors' expectations about future prices. Risk is increased as is the potential for speculative profits and losses.

High rates of price appreciation may motivate themselves to prove that speculative profits have been created. Such price increases may occur under conditions of fixed expectations. In such cases the price increase has been anticipated and the market price is a speculative profit has not been created. In discussing the discounting process, Milligan notes that "To the extent that growth and change may be realistic, they may not be realistic. The value of the investment will reflect the risk that expectations concerning the future value of a property will not change. Given that real property markets are not perfect, the relevant prediction becomes: What is the best method of bearing risk? Who is most efficient at bearing risk?"

Costs of transferring ownership and the dilution of rapid price increases and the speculation of large speculative profits. Property taxes on land reduce its base value because taxes reduce the rent that land can support. The land lacks speculators except maturity. For example, if a wheat merchant purchases 1,000 bushels of wheat at $1.45 a bushel then heavily dependent on its using decision maker, since its accuracy will be dependent on the accuracy of the computer model specified, and this model often exists only in the decision maker's mind.

In addition to a DSS being quickly and easily developed by users, it must be easy to update during the process of examining potential decision outcomes. This means that users should be able to interact on a one-to-one basis with the DSS, using unimposing technology. Commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary. The user's commands should be simple and logical extensions of the decision maker's vocabulary.
DSS Operation And Use

Once the DSS was available to assist in evaluating the terms of sale for the building, both the analyst and the manager operated the model anywhere from 5-20 times per week (for three weeks). The analyst had taken one computer course in school and the manager none. Neither had used the computer directly as a tool before. Company training was and is available for use of IFPS. The analyst had received this training (two days) but, of course, there is no training available for the DSS since it was relevant for use only the one time.

Maintaining the decision making approach of the manager was easy in this case because of several factors. Frequently, the manager did his own operation and could thus direct the DSS as he pleased. Also, if the analyst were operating, the manager would occasionally be there to direct the analyst's actions. If not physically present during the analyst's operation, the manager was usually next door and thus readily available to the analyst. Further, turnaround time for output was usually instantaneous, thus allowing for rapid feedback.

The impact of the DSS on both the analyst and the manager was similar. Both are now using the computer and computer output as a part of their job. For the upper manager, an increased self-assurance has been possible since much faith is placed in the model. More think time was available for considering the decision and the decision could be made more quickly. Management believes that use of the DSS significantly improved the terms of sale of the Dallas office space. Many factors were considered than could have been without the DSS, and in a time frame which was considered prohibitive before the DSS.

Conclusions

Decision support systems are computer-based information systems designed to assist decision makers in the task of making upper level, ill-structured decisions. The terms of sale of corporate office properties is a decision which requires considerable analysis due to the large number of relevant variables and the unpredictability of the future. For this reason, such decision making can be aided through the use of a DSS.

The base presented in this study is one example of the application of such technology to the determination of terms of sale of a major property. In a four week period of time, two non-computer oriented individuals (one management and one staff) developed a DSS of perceived high quality which had a major impact on the sale terms decision. The DSS consists of hundreds of financially interrelated equations, each representative of some facet of the building's potential value. Interaction with the DSS is quite simple since commands are very English-oriented. The user must simply respond to menu prompts in using the model, and then supply required data. Its greatest impact on management's decision making comes in its ability to react with a scenario to questions posed by management. Once the model was defined, management was able to pose "what-if" types of questions to get a financial picture representative of the "what-if" proposition.

The development of decision support systems in the real estate field should not be restricted to such high price properties. Similar systems would be of major value in any situation where a similar single high priced property were involved, or whenever the terms of sale (or acquisition) decision is made on a regular basis. If such a DSS were developed for a recurring buy-sell decision, the DSS would need to be more general in its ability to evaluate any property rather than designed for a single application, as in this case.

NOTES


SPECULATION IN REAL ESTATE MARKETS: IS IT SOCIALLY UNDESIRABLE?

By L. M. Farrell

Real estate speculation has been attacked frequently as a fundamental underlying cause of rapidly increasing rates in the price of both land and housing, particularly in areas undergoing increased levels of urbanization. It is often argued that real estate markets are in disequilibrium over the long term, due to the existence of imperfections and the extended lag adjustment periods which characterize these markets. It is also argued that the socially desirable efficiency effects usually associated with speculation in the commodities or foreign exchange markets are imperceptible in real estate markets. Some form of government intervention is often suggested as a means of controlling speculation and improving the efficiency of real estate markets.

Notwithstanding the obvious differences between real estate and other asset markets the argument could be made that in the long run real estate markets are relatively efficient and that the effect of government intervention is to increase uncertainty, reduce the efficient allocation of risk bearing and impose additional costs on the owning, developing and transacting of real estate.

Real estate speculation may be considered to be socially desirable if it increases the efficiency of the intertemporal allocation of risk. This determination for a particular real estate market is an empirical question which cannot be known a priori.

Speculation: A Direct Consequence Of Uncertainty

Speculation exists because of the uncertainty of future events. The risk of fluctuations in the future value of an asset is a fact of life which must be borne either by the asset holder or by someone else. For investors who have different degrees of risk aversion, the existence of a mechanism for shifting risk is socially desirable because it allows each investor to select his/her optimal degree of risk thereby increasing investor utility or well being. The existence of a speculative market for risk bearing contributes to economic productivity when it increases the efficiency of the intertemporal allocation of risk.

Risk and uncertainty are often distinguished on the basis of the availability of information concerning future investment returns. Risk is associated with projects for which a probability distribution of future returns can be estimated, either subjectively or objectively. Uncertainty involves situations in which these probabilities are not known. Investors reduce the degree of uncertainty by insuring against risk and by data collection and analysis. Nevertheless, an area of uncertainty which is not able to be quantified often remains.

L. M. Farrell is Professor of Finance and Real Estate Economics, Chair of the section in Finance of the Enterprise, at the University of Quebec in Canada. He received his Ph.D. at the Graduate School of Management at the University of Southern California. He is an Associate Professor at the University of Southern California, California State University, and at McGill University in Montreal. His articles have appeared in various academic journals on real estate, finance and urban economics.