OBSTRUCTION OF VIEW AND ITS IMPACT ON RESIDENTIAL APARTMENT PRICES

YU SHI MING and CHAI CHEE HIAN
National University of Singapore

ABSTRACT

The factors that influence house prices have been well researched. One of these factors is the view that can be seen from the dwelling unit, particularly high-rise units. Most studies, using multiple regression analysis, show that good views, such as sea view do enjoy a premium in value. This paper focuses on the impact of the obstruction of view on house prices. Using data from two condominium projects, the study analyses the change in price when a new condominium project, which would obstruct the existing view of units in the two condominiums, was launched. The paper uses intervention analysis to investigate the impact of the obstruction of view on property prices. The results show that the impact will set into the prices of the obstructed development once the construction of the new development begins. In addition, the results show that the impact is of a pure jump function and depresses the prices of the obstructed development by around 8% in the long term. The paper further suggests the implications of information transparency, given that planning information is widely available to developers and potential buyers in Singapore.

Keywords: Value of view, obstruction of view, impact on residential apartment prices, intervention analysis

INTRODUCTION

The views that can be seen from a residential unit, particularly in high-rise apartments, are generally regarded to have a positive impact on the price or value of the property. Several previous studies have shown that houses with a good view can attract a premium (Darling, 1973; Plattner and Campbell, 1978; Gillard, 1981; Rodriguez and Sirmans, 1994; Benson, et al, 1998; Bond, Seiler and Seiler, 2002). Benson et al (1988), for example, conclude that buyers are willing to pay more for a scenic view, with the best ocean views increasing the market price by almost 60%. Bond, Seiler and Seiler (2002) similarly observe that properties having a desirable lake view add nearly 90% premium to the value of residential homes in Cleveland. Most of these studies are, however, based on single family houses in established neighbourhoods, where the views are unlikely to be obstructed. In a land scarce country such as Singapore, residential properties are predominantly high-rise, and new developments are likely to be even taller and built at higher densities, given the limited supply of land. This has resulted in existing apartments with views being obstructed as new apartment blocks are developed.

This paper focuses on the obstruction of views of high-rise apartments when new developments are built in the vicinity. Past research has shown that real estate returns, prices and rents are often affected by special events or circumstances such as policy changes, strikes, catastrophic events, advertising promotions, environmental regulations and similar events, which Box and Jenkins (1970) refer to intervention events. Such intervention events will often cause a change in the mean of a time series. To study the impact of such events on time series, Box and Jenkins (1970) and Box and Tiao (1975) introduced an intervention analysis model to capture the possible dynamics of both the interventions and noise. In our study, we applied the intervention analysis model to determine the impact of the obstruction of view arising from new developments has on the prices of existing high-rise apartments. This has implications for urban planners, developers and potential home buyers. The significance for potential home buyers is especially significant, given that urban planning information is widely available and can be incorporated into the home buyer’s decision making process.

The paper is organized as follows. A brief review of past studies on property prices using intervention analysis is given following the introduction. A description of the data and the proposed methodology is then given in the following section. Section 4 provides the estimation results and analysis. The last section concludes with some applications of this study and implications for policy makers, developers and potential home buyers.

PAST STUDIES USING INTERVENTION ANALYSIS

Several studies have been carried out using the intervention analysis model to estimate the impact of events on price or other change phenomena. Narayan and Considine (1989) present a case study to show how intervention analysis can be used to obtain accurate estimates of the impact of two price changes on ridership in a transit system. A method is proposed in which the components of a time series together with the intervention components are explicitly modeled in a multiple input transfer function model. The method thus combines techniques from regression analysis with those from the ARIMA methodology. In another example, Wong (1989) examines the patterns of impact resulting from the Federal Reserve's regime change in 1979 on inflation expectations and real economic activity using time series intervention analysis.

Enders *et al* (1990) employ intervention or interrupted time series analysis to assess the effectiveness of four specific terrorist-thwarting policies undertaken between January 5, 1973 and April 15, 1986. Spiegel (1990) employs intervention analysis on the Mexican capital control policy of August 1982 and shows the policy to have had a negative but temporary impact on the Mexican deviation from interest rate parity. Fomby and Hayes (1990) use intervention analysis to examine the impact of the war on poverty and the proportion of income received by families in the lowest quintile of the income distribution in the United States.

Blackley (1992) uses intervention analysis to assess the impact of the October 1987 stock market crash upon employment in the securities industry in New York City. Fox (1996) examined the impact of catastrophic event (hurricane Hugo) on public hospital operating environment using intervention analysis. Toppings *et al* (1997) investigate the impact of healthcare reforms on stock returns of publicly traded hospital companies using both traditional event study analysis and intervention analysis. Shao (1997) uses multiple intervention analysis to assess the impact of multiple marketing strategies on sales.

Hultkrantz and Olsson (1997) estimate the impact of the Chernobyl nuclear accident on domestic and international tourism in Sweden using a combination of ARIMA time series forecasts, outlier search and intervention analysis. Lloyd *et al* (1998) estimated the effects of antidumping actions in the presence of a domestic cartel on import prices and volumes. Yoo (1998) analyzed the impact of elections on tax policy in Japan using an ARIMA (autoregressive integrated moving average)-intervention analysis from 1953 through 1992 on discretionary tax revenues. Sharma and Khare (1999) uses intervention analysis to test the impact of government's CO pollution control measures on CO concentration.

Bausell *et al* (2001) examine the price effects on crude oil of removing the U.S. export ban on Alaskan North Slope crude oil in 1996 through the use of a time series intervention analysis. Ho and Wan (2002) tested the effects of Asian Financial Crisis on the stock return series of Australia, Hong Kong, Singapore and the US and found that the crisis is significant in the case of Hong Kong and Singapore, but not in the case of Australia and U.S. Karagozula *et al* (2003) adopted the use of multiple intervention analysis with various dynamic response functions to examine the effects of the split of the S&P 500 Futures Contract on market and liquidity variables while taking into account several other major market events surrounding it. This wide range of studies shows the versatility in the application of the intervention analysis model.

While the above studies are not related to real estate, the intervention analysis methodology has been applied in diverse situations to measure the impact of different phenomena. In this study, the obstruction of view can be considered as a phenomenal change and, hence, justifies the application of intervention analysis.

DATA AND METHODOLOGY

To test our hypotheses that the obstruction of view has an impact on house prices, we chose two developments, The Bayshore and Bayshore Park, located in the eastern part of Singapore and are separated from the sea by the East Coast Parkway and the adjoining East Coast Park. The distance to the sea in the south is approximately 500 meters (see Map 1). Both condominiums were developed by the same developer, with Bayshore Park completed in 1986 and The Bayshore in 1996. The latter was touted to be one of the prime condominiums in Singapore, enjoying a full sea view, when it was launched and fetched a premium over the older Bayshore Park. In the second quarter of 1997, the developer of Costa del Sol tendered successfully for the land from the Urban Redevelopment Authority (URA) and construction work commenced in the first quarter of 1998. The land was acquired under the public tender system administered by the URA and given the location of the site facing the sea, the developer intended a high-class residential development. However, the developer had decided to hold back the launch of the project as the residential market was depressed by the anti-speculation measures introduced by the government in 1996, as well as the Asian Financial Crisis in 1997. Typically, residential developments are pre-sold by developers, i.e., before the start of construction, in stable and rising markets, to take advantage of the progress payments which help to reduce financing costs. Costa del Sol was launched in the second quarter of 2000 after the residential market turned and rose in 1999.

We use data from The Bayshore as the experimental set and data from Bayshore Park as the control set. From Map 1, it can be seen that the new development Costa del Sol, would obstruct the sea view previously seen from The Bayshore, but not Bayshore Park. A total of 1214 private residential property transactions in The Bayshore and Bayshore Park from 1st Quarter 1995 to 2nd Quarter 2003, are extracted from the URA's Real Estate Information System (REALIS). The data include details of transaction such as transacted prices, project name, property type, tenure, planning area, planning region, address, postal code, postal sector, type of sale, floor area, contact date, purchaser's nationality and purchaser's previous property type.

Map 1: Location of Subject Residential Developments

The methodology comprises two main parts. In the first part, a price index is constructed for the obstructed development. A similar price index is estimated for a non-obstructed development in the neighboring location. The price index is obtained via the hedonic analysis of K number of transactions in our sample. The hedonic function is specified as:

$$\log(Y_k) = \alpha_0 + \sum_{i=1}^{I} \alpha_i X_i + \sum_{j=1}^{J} \beta_j Y_j + \sum_{t=1}^{T} \theta_t Z_t \qquad [1]$$

where Y_k is the transacted price of the *k* transaction, X_i being the *i* housing characteristics, Y_j being the *j* purchaser's characteristics, Z_t being the series of time dummies and α, β and θ being the estimated coefficient parameters. The price index is then derived by:

$$PI_t = \exp(\theta_t) * 100 \qquad [2]$$

Table 1: Summary of Variables of Transaction Data

Coefficients	*Variable*
P	Continuous dependable variable representing the sale price
AREA	Continuous variable representing the floor area of the individual unit
LEVEL	Continuous variable representing the floor level of the individual unit
NEW	Dummy variable equals one if the transaction is a developer sales
FOREIGN	Dummy variable equals one if the purchaser is foreigner
COM	Dummy variables equals one if the purchaser is a company
PRIVATE	Dummy variable equals one if the purchaser is a previous private property owner
Q190-Q203	Dummy variables to control temporal market effects, equals one if the transaction takes place in the particular quarter

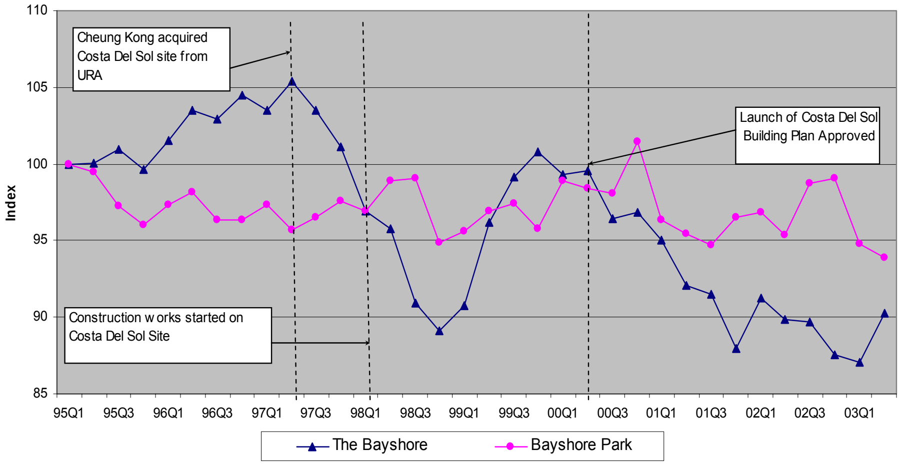
Table 2: Descriptive Statistics of Transaction Data

	Min	*Mean*	*Max*
P	29000	730091	2780000
AREA	58	107	353
LEVEL	1	13	32
NEW	0	0.1444	1
FOREIGN	0	0.2232	1
COM	0	0.0131	1
PRIVATE	0	0.5848	1

No of transactions:	1214
No of projects:	2
Sample Period:	1/1/1995-7/11/2003
Source:	URA REALIS

Table 1 shows the summary of variables in this analysis and Table 2 shows the descriptive statistics of the data. Figure 1 shows our derived price indices for the obstructed and non-obstructed development. Since both developments are situated next to each other, they should follow the same market price dynamics over time after controlling for housing characteristics. Visual inspection of Figure 1 reveals that there is indeed divergence in price trends which we conjecture that the obstruction of view would be the underlying reason. To confirm our hypotheses, we set up a formal statistical test (intervention analysis) for such a purpose.

Figure 1: Price Indices of The Bayshore and Bayshore Park



Following Box and Tiao (1975)'s intervention analysis model, we will test the hypothesis that the divergence in price trends is a result of the obstruction of view using an ARIMA-intervention analysis. The Box-Tiao fits a time series as a sum of an ARIMA process and an intervention term where the intervention impact coefficient measures the impact of view obstruction on property prices. Intervention analysis requires the specification of both a starting point for intervention and of the shape of the intervention impact. The starting point for intervention is simply the time at which the intervention occurs. From our analysis of the media reports, we chose the date of announcement of land acquisition; date of construction and date of project launch of the obstructing development as the possible starting point of intervention (see Figure 1). The shape may be modeled by a pulse function which determines the price change phenomenon after the starting point. The possible functions considered in this paper are shown in Figure 2.

Consider the model by Box and Tiao (1975):

$$Y_t = \frac{\omega(B)B^b}{\delta(B)}\xi_t + \mathrm{N}_t \qquad [3]$$

where the term $\mathsf{Y}_t = \delta^{-1}(B)\omega(B)B^b\xi_t$ represents the effects of the intervention event in terms of the deterministic input series ξ_t, and N_t is the noise series which represents the background observed series Y_t without intervention effects. It is assumed that N_t follows an ARIMA (*p,d,q*) model, $\varphi(B)N_t = \theta(B)a_t$ with $\varphi(B) = \phi(1-B)^d$. The deterministic input variables ξ_t are modeled as indicator variables taking only the values 0 and 1 to denote the occurrence and nonoccurrence of intervention. The two common types of function used is step and pulse functions. The *step function* at time *T*, given by:

$$S_t^{(T)} = \begin{cases} 0 & t < T \\ 1 & t \geq T \end{cases} \qquad [4]$$

which indicates that the intervention effects remain permanently after time *T*. The other type is a *pulse function* at time *T*, given by

$$P_t^{(T)} = \begin{cases} 0 & t \neq T \\ 1 & t = T \end{cases} \qquad [5]$$

which represents an intervention effect that dies out after time *T*. Several different response patterns $\mathsf{Y}_t = \delta^{-1}(B)\omega(B)B^b\xi_t$ are possible through different choices of the transfer function. Figure 2 shows the responses for various simple transfer functions with both step and pulse indicators as input. For example, the model $\mathsf{Y}_t = \omega B S_t^{(T)}$ in Figure 2b can be used to represent a permanent step change in the level of unknown magnitude ω after time *T*, while the form:

$$\mathsf{Y}_t = \frac{\omega_1 B}{1-\delta B}P_t^{(T)} \quad 0 < \delta < 1 \qquad [6]$$

in Figure 2c, which implies that $Y_t = \omega(1-\delta^{t-T})/(1-\delta), t \geq T$, corresponds to a gradual change with rate δ that eventually approaches the long-run change in level equal to $\omega/(1-\delta)$. Similarly, the model

$$Y_t = \frac{\omega(B)B^b}{\delta(B)}\xi_t + \frac{\theta(B)}{\varphi(B)}a_t \qquad [7]$$

in Figure 2d, which implies that $Y_t = \omega_1\delta^{t-T-1}, t > T$, would represent a sudden "pulse" change after time *T* of unknown magnitude ω_1, followed by a gradual decay of rate δ back to the original pre-intervention level with no permanent effect. More complex forms of response can be obtained by various linear combinations of the simpler forms, such as in the case of Figure 2e. The function Y_t represents the additional effect of the intervention event over the noise or "background" series N_t. Hence, when possible, the model $N_t = [\theta(B)/\varphi(B)]a_t$ for the noise is identified based on the usual procedures applied to the time series observations available before the date of intervention, that is, $Y_t, t < T$. Also, it is assumed in model [3] that only the level of the series is affected by the intervention and, in particular, that the form and the parameters of time series model for N_t are the same before and after the intervention. In general, the parameter estimates and their standard errors for the intervention model

$$Y_t = \frac{\omega(B)B^b}{\delta(B)}\xi_t + \frac{\theta(B)}{\varphi(B)}a_t \qquad [8]$$

are obtained by the least squares method of estimation for transfer function-noise models. If view obstruction has an impact on property prices, it should reduce the price premium and ω should be negative.

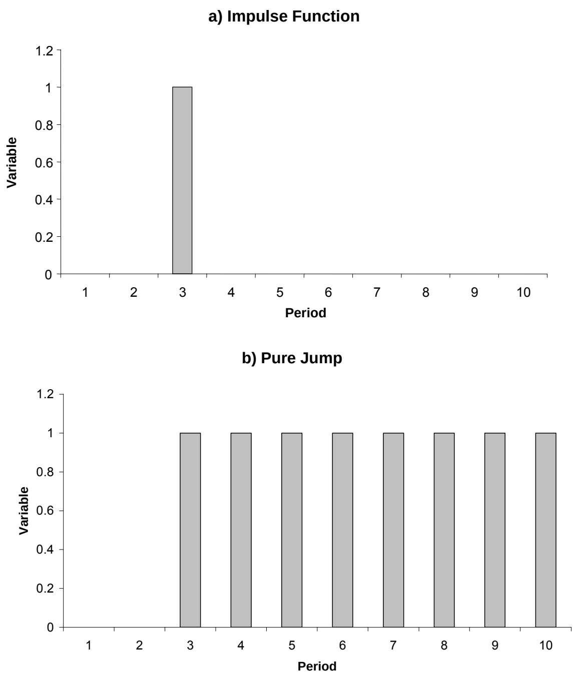
Like the ARIMA approach, intervention analysis involves an iterative three-stage procedure of identification, estimation, and diagnostic checking. Model identification tools such as SACF (sample autocorrelation function), SPACF (sample partial autocorrelation function), unit root tests (Augmented Dicker Fuller Tests) are used for identifying adequate models. Once the model has been tentatively specified, the intervention and noise parameters can be estimated simultaneously by the least squares method. We use two model selection criteria, the R-square and the Schwartz's Bayesian criterion. After parameter estimation, we have to assess the model adequacy by checking whether the model assumptions are satisfied. The basic assumption is that the residual series is white noise. Hence, the model diagnostic checking is achieved through a thorough analysis of the estimated residual series via the autocorrelation of the residuals and its squared series.

ESTIMATION RESULTS AND ANALYSIS

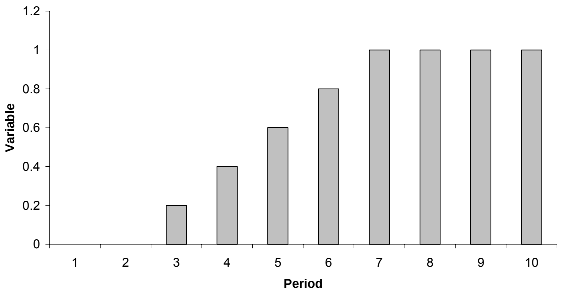
Using these transaction data, we run two separate hedonic functions on The Bayshore and Bayshore Park transactions (as specified in [1]). From the estimated hedonic coefficients from [1], we use equation [2] to extract two price index series representing the price movement of The Bayshore and Bayshore Park over time (as shown in Figure 1).

The price indices are first checked for stationarity. If a variable is nonstationary, shocks to it will have permanent effects and the application of standard time series techniques can lead to misleading results. Table 3 contains the results of the unit root test. For The Bayshore and Bayshore Park price index series, the null hypotheses of a unit root can be rejected at the 5% level and 1% level respectively, which means both price index series are stationary.

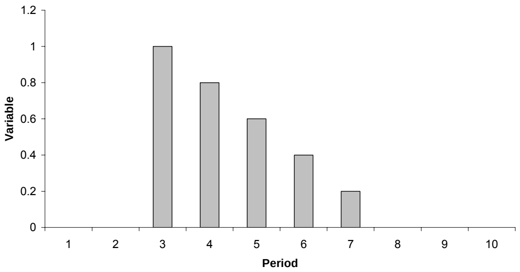
Figure 2: Intervention Transfer Functions



c) Gradually Changing



d) Prolonged Impulse



e) Prolonged Jump

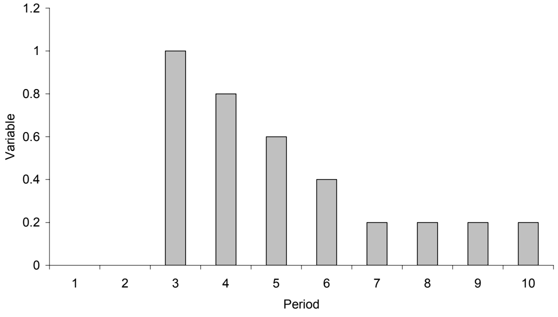


Table 3: Augmented Dickey-Fuller Test Statistics

Data Series	Model Type	t-Statistic	Prob.
The Bayshore	Constant, linear trend, with 2 lags	-3.804153	0.0299*
Bayshore Park	Constant, linear trend	-4.296432	0.0092**

Note: *Significant at 0.05 level, ** Significant at 0.01 level

After going through the three-stage procedure of identification, estimation, and diagnostic checking, we modeled the ARMIA part of the price index series as:

$$N_t = \omega_1 + \delta Y_{t-1} + \delta Y_{t-4} + \delta Y_{t-5} + a_t - \phi a_{t-1} - \phi a_{t-3} - \phi a_{t-5}$$

The next part of our analysis is to experiment the intervention function with all possible starting points of intervention and possible transfer functions. We attempt a total of 30 model specifications on the two price indices with all possible combinations of starting points and transfer functions. The intervention analysis results for the two price indices are presented in Table 4. For Bayshore Park, the impact coefficients are insignificant at the 5% level for all specifications which is expected, since the Bayshore Park does not suffer from any view obstruction, there should be no intervention impact. On the other hand, for The Bayshore, the impact coefficients are significant at the 5% level for three specifications (model 5, 8 and 9) and their signs are negative as expected. Of all the various specifications for The Bayshore, we adopt model 5 as our best fit specification, since the model has the highest R-square and the lowest Schwarz Bayesian coefficient. Model 5 reveals that the impact of view obstruction occurs only in the 1st Quarter of 1998 which is the start of the construction of the obstructing development (Costa del Sol). The adequate transfer function in model 5 is chosen as a pure jump function as shown in figure 2b. Because the price changes are expressed as indices with reference to the base year in 1Q1995, we can estimate the effect of view obstruction. From the analysis, the obstruction of view would reduce prices by 8.4% from the base year (see Table 4 – Impact Coefficient).

Table 4: Summary of Intervention Analysis

	Model	Intervention Function	Event Date	Impact Coefficient	Std Error	t-Statistics	Prob.	R-squared	Schwarz criterion
The Bayshore Index	1	Impulse function	97Q2	2.9149	1.6485	1.7683	0.0915	0.8861	5.0831
	2	Impulse function	98Q1	-1.6368	1.0514	-1.5567	0.1345	0.9321	4.5650
	3	Impulse function	00Q2	1.4359	1.4523	0.9888	0.3340	0.9643	3.9242
	4	Pure Jump	97Q2	2.0441	2.1632	0.9449	0.3554	0.9271	4.6363
	5	**Pure Jump**	**98Q1**	**-8.4220**	**1.2036**	**-6.9972**	**0.0000**	**0.9818**	**3.2488**
	6	Pure Jump	00Q2	-1.7071	1.5533	-1.0990	0.2842	0.9208	4.7196
	7	Gradually Changing	97Q2	-5.2129	9.0580	-0.5755	0.5711	0.9184	4.7491
	8	**Gradually Changing**	**98Q1**	**-8.8279**	**1.0682**	**-8.2644**	**0.0000**	**0.9740**	**3.6063**
	9	**Gradually Changing**	**00Q2**	**-7.3977**	**1.0386**	**-7.1228**	**0.0000**	**0.9510**	**4.2387**
	10	Prolonged Jump	97Q2	4.9231	2.5390	1.9390	0.0661	0.9109	4.8372
	11	Prolonged Jump	98Q1	-5.8359	2.9758	-1.9611	0.0633	0.9592	4.0572
	12	Prolonged Jump	00Q2	1.0931	1.7441	0.6267	0.5376	0.9550	4.1549
	13	Prolonged Impulse	97Q2	3.5289	1.7776	1.9852	0.0603	0.9266	4.6437
	14	Prolonged Impulse	98Q1	-1.7918	1.6809	-1.0659	0.2986	0.9207	4.7210
	15	Prolonged Impulse	00Q2	0.0503	1.4476	0.0348	0.9726	0.9247	4.6688
Bayshore Park Index	16	Impulse function	97Q2	0.7220	1.8682	0.3865	0.7030	0.9431	1.9131
	17	Impulse function	98Q1	-1.0851	1.7637	-0.6152	0.5450	0.9511	1.7622
	18	Impulse function	00Q2	1.6568	2.0580	0.8050	0.4298	0.9595	1.5721
	19	Pure Jump	97Q2	-1.4415	0.7733	-1.8641	0.0764	0.9340	2.0611
	20	Pure Jump	98Q1	-1.2976	0.9130	-1.4212	0.1699	0.9389	1.9837
	21	Pure Jump	00Q2	0.1599	0.6198	0.2580	0.7989	0.9613	1.5262
	22	Gradually Changing	97Q2	-0.8918	0.7707	-1.1572	0.2602	0.9505	1.7735

	23	Gradually Changing	98Q1	-0.3055	0.5761	-0.5303	0.6014	0.9639	1.4583
	24	Gradually Changing	00Q2	-0.4155	0.7285	-0.5703	0.5745	0.9549	1.6812
	25	Prolonged Jump	97Q2	-0.1581	1.3673	-0.1157	0.9090	0.9560	1.6563
	26	Prolonged Jump	98Q1	-0.6606	1.5388	-0.4293	0.6721	0.9553	1.6716
	27	Prolonged Jump	00Q2	2.7367	1.5431	1.7735	0.0907	0.6160	3.8221
	28	Prolonged Impulse	97Q2	-0.1943	1.4265	-0.1362	0.8929	0.9544	1.6910
	29	Prolonged Impulse	98Q1	-1.9669	1.7496	-1.1242	0.2736	0.8920	2.5534
	30	Prolonged Impulse	00Q2	1.9523	1.7095	1.1420	0.2663	0.5884	3.8916

CONCLUSION

Using the intervention analysis model, we have determined that the obstruction of existing view from a new development does have an adverse impact on the prices of the affected properties. The two developments chosen, The Bayshore and Bayshore Park, were developed by the same developer and the former was sold at a premium as it was deemed to be more up market by the developer, as compared to the older Bayshore Park. However, when Costa del Sol was developed to the south of The Bayshore, it became apparent that the previous full sea view enjoyed by the apartments in The Bayshore would be obstructed. Our analysis shows a reduction of about 8% in prices transacted in The Bayshore after construction of Costa del Sol started. This phenomenon while not new could occur in other projects as new developments are built to greater heights and densities. There are several implications.

First, from the urban planning perspective, the Master Plan sets the legislative framework for all new developments in Singapore. This plan is revised five yearly under a broader Concept Plan that is reviewed every decade. The Master Plan sets out in detail the zoning and density of every parcel of land in Singapore. Over the years, the Master Plan has been changed to satisfy the increasing demand for both accommodations as well as commercial and industrial enterprises. As a result, two distinct trends can be seen in the overall land use planning in Singapore in recent years. The first is the intensification of use and site densities, particularly for sites which are in prime locations. The second is the change of use for some old areas where the existing use does not support the overall needs of the country. These have led to the en-bloc redevelopment of many old residential properties to take advantage of the increase in plot ratios as well as the conversion of some uses such as industrial and hotels to residential. Together with the sale of new sites for development, the residential landscape in Singapore has changed dramatically with taller and more complex buildings. This has led to many cases of the obstruction of views when new developments are built. However, the URA, which is responsible for the planning as well as the sale of land for new developments, has so far maintained information transparency, i.e., the Master Plan is public information. That owners of The Bayshore had to suffer a drop in their apartment value is therefore not the result of the lack of information.

While it is not the original intention of this study, a second implication of the phenomenon of the impact of the obstruction of view is that should developers inform potential buyers that such an occurrence could happen to their project. On the other hand, the developer could rightfully claim that at the point of their marketing of The Bayshore, they did not and need not anticipate the sale of other land for future developments. As all vendors would say – *caveat emptor* – that is, that it is the responsibility of buyers to be aware of all the details of the purchase.

This leaves the implication squarely on the potential buyers. Singapore, being a small island surrounded largely by the seas, does provide opportunities to achieve scenic views of water bodies from high-rise residential developments. However, being small also implies that future developments are likely to be taller and more dense. Existing views could be obstructed as new developments are launched. Potential buyers should therefore do their own homework to ensure that when they buy properties with good views that these will not be affected by future developments. They should not merely be sold on the developer's claim but rather use the available information to enhance their decision-making in the house hunting process.

REFERENCES

Bausell, C.W., Jr, Rusco,. F.W, and Walls,W.D. (2001) Lifting the Alaskan Oil Export Ban: An Intervention Analysis. *Energy Journal*, Vol 22(4), 81-94.

Benson, E.D., Hansen, L.J., Schwartz, A.L., Smersh, G.T. (1998) Pricing Residential Amenities: The Value of a View. *Journal of Real Estate Finance and Economics,* Vol 16, 55-73.

Blackley, P.R. (1992). The 1987 Stock Market Crash and New York City Employment: An Intervention-Multiplier Analysis. *Journal of Regional Science,* Vol 32(3), 367-74.

Bond, M.T., Seiler, V.L, Seiler, M.J. (2002) Residential Real Estate Prices: A Room with a View. *Journal of Real Estate Research,* Vol 23, 129-137.

Box, G.E.P. and Jenkins, G.M. (1970) *Time Series Analysis, Forecasting and Control,* San Franciso: Holden-Day, 1970.

Box, G.E.P. and Tiao, G.C. (1975) Intervention Analysis with Applications to Economic and Environmental Problems. *Journal of the American Statistical Association,* Vol 70, 70-74.

Darling, A. (1973). Measuring Benefits Generated by Urban Water Parks. *Land Economics,* Vol 49(1), 22-34.

Enders,W, Sandler,T. and Cauley, J. (1990). Assessing the Impact of Terrorist-Thwarting Policies: An Intervention Time Series Approach. *Defence Economics*, Vol 2(1), 1-18.

Fomby, T.B and Hayes, K.J. (1990). An Intervention Analysis of the War on Poverty: Poverty's Persistence and Political-Business Cycle Implications. *Journal of Econometrics,* Vol 43(1-2), 197-212.

Fox, R.T. (1996). Using Intervention Analysis to Assess Catastrophic Events on Business Environment. *International Advances in Economic Research,* Vol 2(3), 341-49.

Gillard, Q. (1981). The Effect of Environmental Amenities on House Values: The Example of a View Lot. *Professional Geographer,* Vol 33, 216-220.

Ho, A.K.F, and Wan, A.T.K. (2002) Testing for Covariance Stationarity of Stock Returns in the Presence of Structural Breaks: An Intervention Analysis. *Applied Economics Letters,* Vol 9(7): 441-47.

Hultkrantz.L. and Olsson,C. (1997) Chernobyl Effects on Domestic and Inbound Tourism in Sweden-A Time Series Analysis. *Environmental and Resource Economics*, Vol 9(2), 239-58.

Karagozoglu, A. K, Martell,. T.F, and Wang, G.H.K. (2003) The Split of the S&P 500 Futures Contract: Effects on Liquidity and Market Dynamics. *Review of Quantitative Finance and Accounting,* Vol 21(4), 323-48.

Lloyd, T, Morrissey, O. and Reed, G. (1998). Estimating the Impact of Anti-dumping and Anti-cartel Actions Using Intervention Analysis. *Economic Journal*, Vol 108(447), 458-76.

Narayan, J. and Considine, J. (1989). Intervention Analysis to Assess the Impact of Price Changes on Ridership in a Transit System: A Case Study. *Logistics and Transportation Review*, Vol 25(1): 53-61.

Plattner, R.H. and Campbell, T.J. (1978). A Study of the Effect of Water View on Site Value. *Appraisal Journal,* Vol 46, 20-25.

Rodriguez, M. and Sirmans, C.F. (1994). Quantifying the Value of a View in Single-Family Housing Markets. *Appraisal Journal,* Vol 62, 600-603.

Shao, Y.E. (1997). Multiple Intervention Analysis with Application to Sales Promotion Data. *Journal of Applied Statistics*, Vol 24(2), 181-91.

Sharma, P. and Khare, M.(1999) Application of Intervention Analysis for Assessing the Effectiveness of CO Pollution Control Legislation in India. *Transportation Research: Part D: Transport and Environment*, Vol 4(6), 427-32.

Spiegel, M. M. (1990). Capital Controls and Deviations from Proposed Interest Rate Parity: Mexico 1982. *Economic Inquiry*, Vol 28(2), 239-48.

Topping, S, Carroll,C. and Lindley, J.T. (1997). The Impact of Health Care Reform on Capital Acquisition for Hospitals. *Financial Review*, Vol 32(4), 751-78.

Yoo, K.R. (1998) Intervention Analysis of Electoral Tax Cycle: The Case of Japan. *Public Choice*, Vol 96, 241-58.