ADJUSTING Market Value over Time

BY MIKE WOLFF

In the analysis and appraisal of real estate, evaluating prices over time is often required. This article will attempt to show how real estate price/time trends may be developed and analyzed, how reliable time-related market condition adjustments can be derived using a trend analysis of similar sales, and how individual sales for any given time period can be adjusted to another.

ADJUSTING PRICES OVER TIME

Although market conditions and characteristics can be reflected by measurements like size, number of sales, amenities/features, demand/supply and ratios of one thing to another, the market movement for a group of commodities over time can best be represented by price, and in particular, a measurement that reflects their overall price. This is because price tends to not only represent a completed sale transaction, but also the culmination of the buyer/seller negotiation process.

Prices typically vary over time and do so because changes in the many and varied market forces (particularly supply and demand) vary over time. Prices, of course, do not vary because of time; time itself is not causative.

In the analysis of real estate, it is often necessary to adjust the prices of comparables, as they are frequently outdated relative to current time or the date of valuation. The further away in time one must go to find useful comparable sales, either before or after a specific date, the more likely there has been some price variation over time in the market place, and the more likely a time/price adjustment will be needed. However, it should also be noted that prices can go up and then come back down and vice versa, so that an older comparable sale may require no adjustment, while a newer one may have to be adjusted.

A COMMON TIME ADJUSTMENT METHODOLOGY

Having been in appraisal for many years, I have had the opportunity to examine real estate appraisals that included adjustments for time. From what I have seen, time adjustments seem to be developed in some very strange ways, typically ranging from an odd mixture of generalized discussion, to somewhat vague numerical analysis based on previous sales of the comparables used in a given appraisal. Often adjustments appear as if by magic, with no clear explanation.

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Many think that sales and re-sales of the same property are the best indicators of value change over time. In a typical assignment, appraisers will usually narrow down their data sets into a handful of so called "best comparables," and from these estimate subject value. The typical method for making time adjustments is to compare the most recent sale for a given comparable with its immediate prior sale and then from this establish some sort of rate of change to the date of value, either forward or backward as needed.

For example, let's say that an appraiser derived several useful comparable sales for his analysis of the subject property. Let us also say that comparable sale #1 sold two weeks ago for $112,000, and that 12 months prior, it had sold for $100,000. Thus, it rose 12% in one year ($1,000 per month), which equates to 1% per month simple interest. Comparable #2 sold five months ago for $125,000, and 36 months earlier, it sold for $119,000. Thus, it rose 5% over three years (approximately $167 per month), which equates to .14% per month. Perhaps comparable #3 sold two months ago, with no recent sales prior to that. Thus, no price-time trend can be made. Perhaps another sale went down in price. The appraiser would evaluate each comparable sale in a similar manner. There are obviously many potentially different resultant trend possibilities; some might go up, some might remain flat, and some may go down. Not all are likely to go in the same direction at the same rate. Such methodology, if it can be called that, is difficult to put together into a logical whole.

The various rates derived are often blended in intuitive and subjective ways by the appraiser to arrive at some overall rate or amount, which is then applied to each comparable sale as an adjustment.

There are several significant problems with approaching things this way:

1. **Small sampling versus the market:** Can only a handful of comparable sales adequately represent and establish a trend for an entire market? A few comparables chosen to estimate a subject's value may not necessarily nor adequately represent the overall market. Just as one buyer cannot represent all buyers, one seller cannot represent all sellers.

2. **Adjustment amount from a small sampling:** From only a handful of comparable sales, can a realistic market trend and, as a consequence, an adjustment amount be derived? When only a handful of data are used to estimate market price trends, the resultant trend can be easily distorted by individual price variations. In small data sets, each datum has great significance; thus, the potential for trend distortion is very high. On the other hand, when large data sets are used, individual price variations tend to be smoothed out, showing a more realistic overall trend.

3. **Comparable sale actual price versus its market value:** If only a handful of comparable sales are used, each comparable's actual sale price must be equal to its market value at each time of sale, otherwise, no realistic time/price trend can be developed. It cannot be assumed that an actual sale price at the time of sale was equal to its market value. Prices change for many reasons, not just because of the overall market trend. In the example mentioned above, Comparable 1's most recent sale price was $112,000, and its prior sale was $100,000. These prices may have resulted from causes other than general price trends, such as buyer and seller motivation changes, property additions or demolitions, highest and best use changes or financing differences. Taking this example a little further, it is possible that prices in general went down, but the comparable's price went up because of a new room addition or new garage. Thus, an appraiser must in effect estimate market value for each comparable twice; once for the most recent sale at the time of that sale and once for its prior sale at the time of that sale.

4. **Trend from two data points:** Can a comparable's most recent sale and its immediate prior sale represent a trend? Clearly, including only two points will yield a straight line. Price fluctuations that occur before, after and between these two points will be unknown. In reality, prices are not likely to follow a straight line for very long.

So with all these statistical weaknesses, why not simply let the market represent the market instead of trying to work with only a handful of sales? That is, why not use a dataset large enough to represent all the sales of a particular commodity? And then, from its trend, an estimated time/price adjustment can be made for each comparable used in a property-specific appraisal.

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OTHER TIME ADJUSTMENT METHODS

There are a variety of other economic measurements that can also be used to establish price trends, such as consumer price indexes, various national economic measurements, the stock market overall or various industry groupings within it, building permit or construction activity and assessor's values. However, these types of measurements tend to be too broad in their construction. They may also be politically influenced and probably do not adequately represent specific real estate characteristics and locations. Therefore, these other methods are not given any consideration in this article.

THE USE OF LARGE DATA SETS

To properly understand market trends or to make market condition adjustments associated with changes in time, one should use a data set large enough to represent the market for the particular real estate under consideration. Using only a handful of comparables is statistically weak and will not likely represent the overall market, except perhaps by coincidence. Surely, the larger a database of similar/substitutable sales is, the more likely it will represent its overall market. In any case, it is important that the database fits the property under consideration and the property fits the database.

Before the advent of computerized databases, getting, using and analyzing large data sets was impractical and very difficult. Today, this is not the case. Data is readily available through the internet, and large data sets are easy to analyze using computer spreadsheets.

Having said this, how does one go about putting together such a data set? Conceptually, this would involve gathering together a large number of sales of similar commodities over the time period under consideration, and refining them to derive a trend. Comparison constraints might include distance, improvement quality and size, land size, and various other amenities, depending upon the capabilities of a given data source and the appraiser's knowledge of the property in question. This concept can be illustrated by example.

EXAMPLE

I have done appraisal work throughout Arizona for many years. For this example, I used sales in Prescott, AZ, an area I live near and in which do most of my work. The data chosen represents single-family residential site-built homes, primarily because of the large amount of data available and its consistency.

Prescott, which is located in Yavapai County, Arizona, has a population of slightly over 43,000 (roughly 20% of the county's total). Yavapai County covers a geographic area almost the size of New Jersey. Its population is approximately 213,000, while New Jersey's is almost 8,700,000. Much of it is mountainous with open ranges and high deserts. It is primarily rural in character, with increasing suburbanization in the areas surrounding its cities. Contributing to its rural character is the fact that 38% of the land is owned by the National Forest Service, 25% by the State of Arizona and 12% by the Bureau Land Management. While urbanization is minimal, I have found that houses of similar age, quality, size and construction tend to have similar values, regardless of their location. In any case, when amalgamated, a time/price trend can be discovered.

To demonstrate market time/price trends, the database used in this example comprises sales of 2,687 homes in and around Prescott. It includes site-built homes with living areas ranging from 1,400 to 2,300 square feet that were built between 1956 and 2007. Lot areas ranged from 5,000 to 80,000 square feet, and sale prices ranged from $165,000 and $749,000. While each sale was not verified through recorded instruments, all sales used appeared to be arm's length and realistic. The time period under consideration ranges from the first quarter of 2000 through the second quarter of 2008.

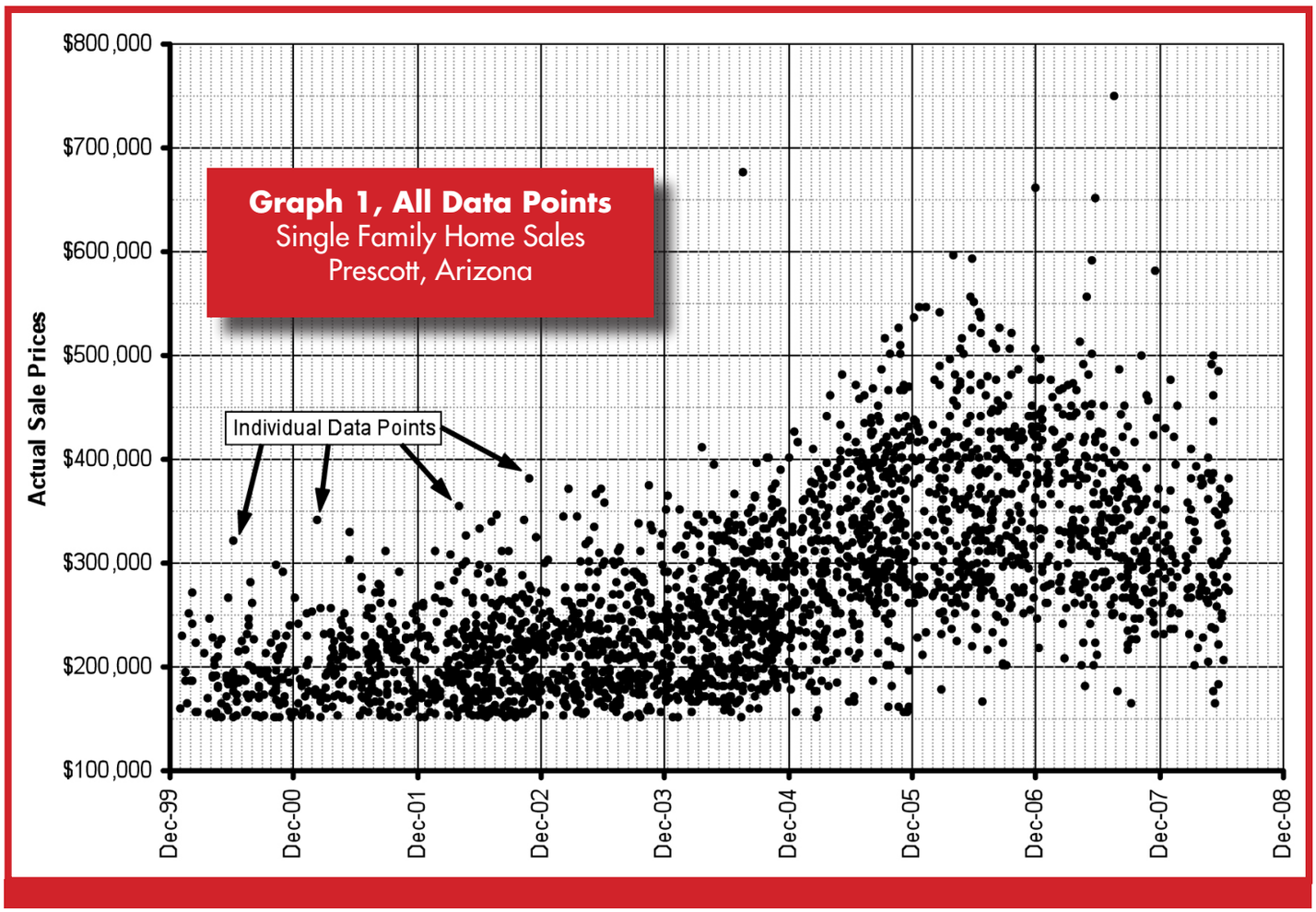
At first glance, this dataset may seem too spread out, as the highs and lows look extreme. After all, home sizes vary by 900 square feet, construction ages by 51 years and lot sizes by 75,000 square feet. A narrower dataset would be preferred, as it would more closely represent a given subject property or a project-specific need. However, sometimes one must go farther afield (age, size, location, quality, etc.) to find a dataset that adequately represents what is happening. The analyst must then define the limits of a database, keeping in mind both the quality and quantity of the data available.

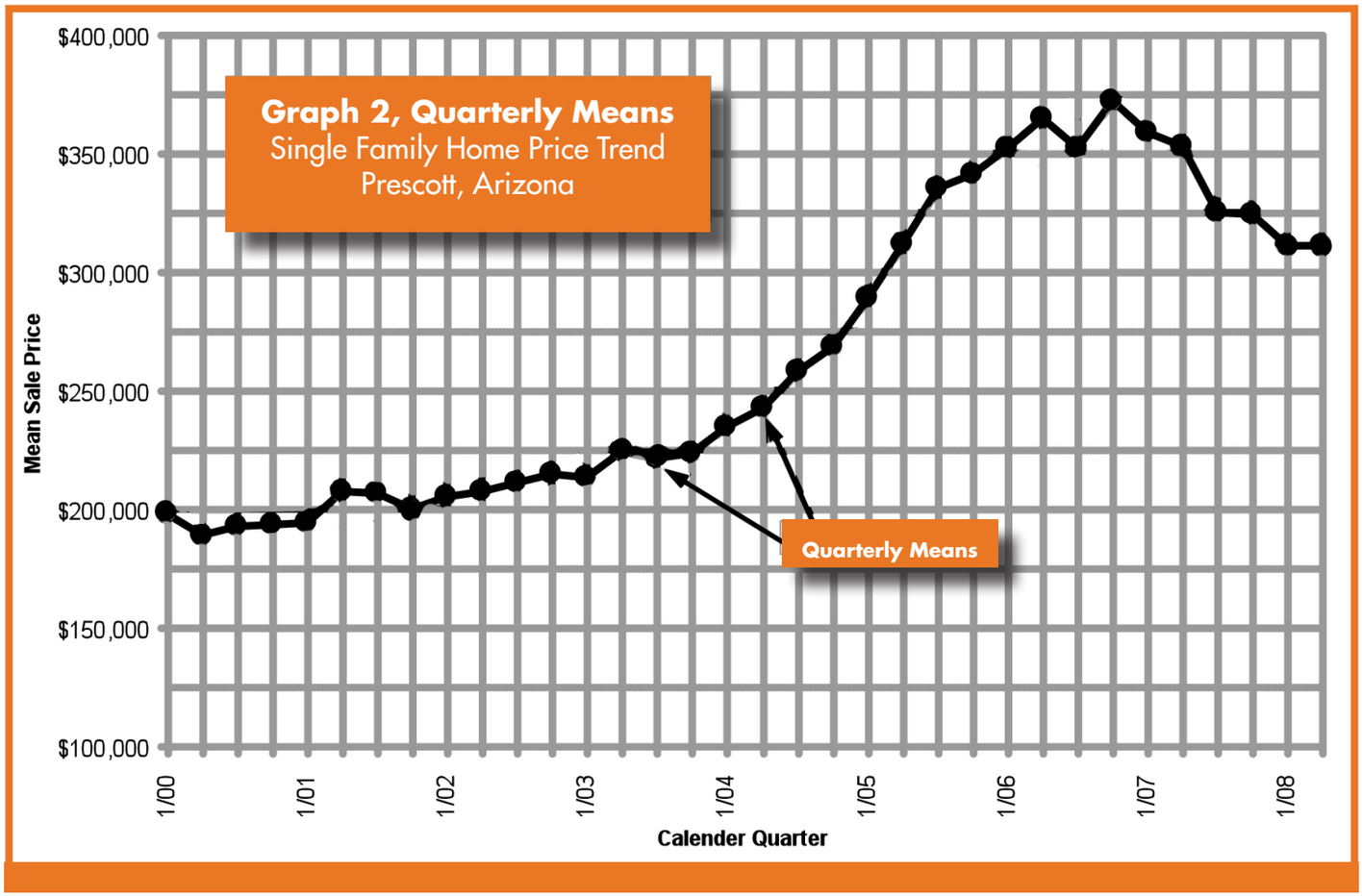
Although plotting all these data points will take only a few seconds using a computer spreadsheet, their apparent result may seem a little overwhelming (see Graph 1). For someone unfamiliar with the Prescott residential market or inexperienced using large data sets, even these refined data may appear too diverse to be useable and to reflect a realistic trend. However, as Graph 2 suggests, if the data is refined, it will show a discernable, though hidden, trend. This resultant trend also approximates statewide and national trends, further suggesting its reasonableness.

For Graph 2, quarterly means of actual sale prices were used to represent the price/time trend. While this was based on personal market experience, other time frames could certainly be used, such as semi-annually, monthly and/or other measures of central tendency, such as median or sale price per square foot. Each analyst will need to make his own decision based on experimentation, availability, uniformity and reliability of data. One could also work directly with all the data at once, such as when the set is much smaller or when a distinct pattern is readily apparent. Averaging, such as was done here, tends to smooth out the extremes of the trend pattern.

Graph 1 shows all sales in the data set over time, with actual price plotted against the date of sale. Many of the plotted points overlap each other. The graph looks like an explosion, scattered every which way, with no apparent trend.

At first glance, the data points appear confusing, and one might even question the feasibility of trying to make sense of this scattered data set. However, buried beneath this apparent confusion, a trend does exist. With just a bit more work, a central tendency of the data over time can be uncovered.





Applying a little statistical methodology will reveal this hidden trend. Graph 2 shows the mean of the actual sale prices for any given calendar quarter plotted over time. This is calculated by adding all sales within a given calendar quarter and then dividing it by the number of sales in that quarter. A time-price trend is now clearly apparent.

From the quarterly mean data points, time-to-price adjustments, which would then be applied to the comparable sales used in an appraisal, can be calculated. These calculations are shown on the Time Adjustment Charts. The middle columns show the quarterly sale price means, as plotted on Graph 2, and this provides the basis for the time adjustment ratios/factors in the right columns.

CALCULATING TIME ADJUSTMENTS

Once a data set has been refined and its time trend is developed, it becomes relatively easy to calculate time adjustment factors. This is done by creating a ratio between the mean of current time against a given time period and then multiplying this result by a given comparable sale's actual selling price. This will result in a time adjusted sale price for the comparable.

The price/time adjustment factor for any given time period can be represented by the following formula:

CT$ / ST$ = TAF

Where:

CT$ = the mean of the sale prices at Current Time of the time trend dataset. Current Time is the time period for which actual sale prices must be adjusted to and can be either the present time or some time in the past.

ST$ = the mean of the Sale prices of the time trend dataset at the Time of the comparable's sale (not the comparable's sale price), which can be either before or after Current Time.

TAF = Time Adjustment Factor. This is the resultant ratio that, when applied to a comparable sale's actual selling price at the time of its sale, results in a time adjusted sale price, which is equivalent to current time.

Time Adjustment Chart 1 shows the mean sale prices for each quarter and the calculated TAF's for each quarter, where CT is the present time, or in this case, the second quarter of 2008. For example, sales occurring in the first quarter of 2007 need to be multiplied by 0.87 ($310,682 ÷ $359,071) to be made equivalent to current time. Sales occurring in the fourth quarter 2004 need to by multiplied by 1.16 ($310,682 ÷ $268,034).

Time Adjustment Chart 2 shows the mean sale prices for each quarter and the calculated TAF's for each quarter, where CT is in the past or, in this case, the first quarter of 2005. For example, sales occurring in the forth quarter of 2005 need to be multiplied by .85 ($288,970 ÷ $341,528) to be made equivalent to current time. Sales occurring in the first quarter of 2004 need to by multiplied by 1.23 ($288,970 ÷ $234,900).

Note: The highlighted entries on Charts 1 and 2 represent the data used in the specific examples.

To illustrate this idea let us consider two time periods for sale price adjustment: present time, per the second quarter of 2008 example, and past time period, say the first quarter of 2005.

Time Adjustment Chart 1
Adjusting to Present Time (2nd qtr 2008)

Quarter	Mean	Factor
1/2000	$198,010	1.57
2/2000	$189,145	1.64
3/2000	$192,678	1.61
4/2000	$193,063	1.61
1/2001	$194,387	1.60
2/2001	$207,454	1.50
3/2001	$206,399	1.51
4/2001	$200,321	1.55
1/2002	$205,415	1.51
2/2002	$207,475	1.50
3/2002	$210,795	1.47
4/2002	$214,564	1.45
1/2003	$213,397	1.46
2/2003	$224,316	1.39
3/2003	$221,332	1.40
4/2003	$223,447	1.39
1/2004	$234,900	1.32
2/2004	$242,859	1.28
3/2004	$258,410	1.20
4/2004	**$268,034**	**1.16**
1/2005	$288,970	1.08
2/2005	$311,994	1.00
3/2005	$335,152	0.93
4/2005	$341,528	0.91
1/2006	$351,850	0.88
2/2006	$364,858	0.85
3/2006	$351,839	0.88
4/2006	$372,423	0.83
1/2007	**$359,071**	**0.87**
2/2007	$352,693	0.88
3/2007	$325,196	0.96
4/2007	$324,035	0.96
1/2008	$311,170	1.00
2/2008	**$310,682**	**1.00**

Time Adjustment Chart 2
Adjusting to A Past Time (1st qtr 2005)

Quarter	Mean	Factor
1/2000	$198,010	1.46
2/2000	$189,145	1.53
3/2000	$192,678	1.50
4/2000	$193,063	1.50
1/2001	$194,387	1.49
2/2001	$207,454	1.39
3/2001	$206,399	1.40
4/2001	$200,321	1.44
1/2002	$205,415	1.41
2/2002	$207,475	1.39
3/2002	$210,795	1.37
4/2002	$214,564	1.35
1/2003	$213,397	1.35
2/2003	$224,316	1.29
3/2003	$221,332	1.31
4/2003	$223,447	1.29
1/2004	**$234,900**	**1.23**
2/2004	$242,859	1.19
3/2004	$258,410	1.12
4/2004	$268,034	1.08
1/2005	**$288,970**	**1.00**
2/2005	$311,994	0.93
3/2005	$335,152	0.86
4/2005	**$341,528**	**0.85**
1/2006	$351,850	0.82
2/2006	$364,858	0.79
3/2006	$351,839	0.82
4/2006	$372,423	0.78
1/2007	$359,071	0.80
2/2007	$352,693	0.82
3/2007	$325,196	0.89
4/2007	$324,035	0.89
1/2008	$311,170	0.93
2/2008	$310,682	0.93

1) PRESENT TIME

In this example (see graph 3), current time is the most recent time period of the time trend dataset, namely the second quarter 2008. Let's look at two comparable sales, each selling for the same price but at different times. Sale #1 sold for $100,000 in January 2007 and Sale #2 for $100,000 in November 2004. The adjustment factors for these are .87 and 1.16 respectively. Using Chart 1, current time value is therefore:

Sale #1: $100,000 x 0.87 = $87,000. This is reasonable, as prices were higher at this sale date and, therefore, must be adjusted downward.

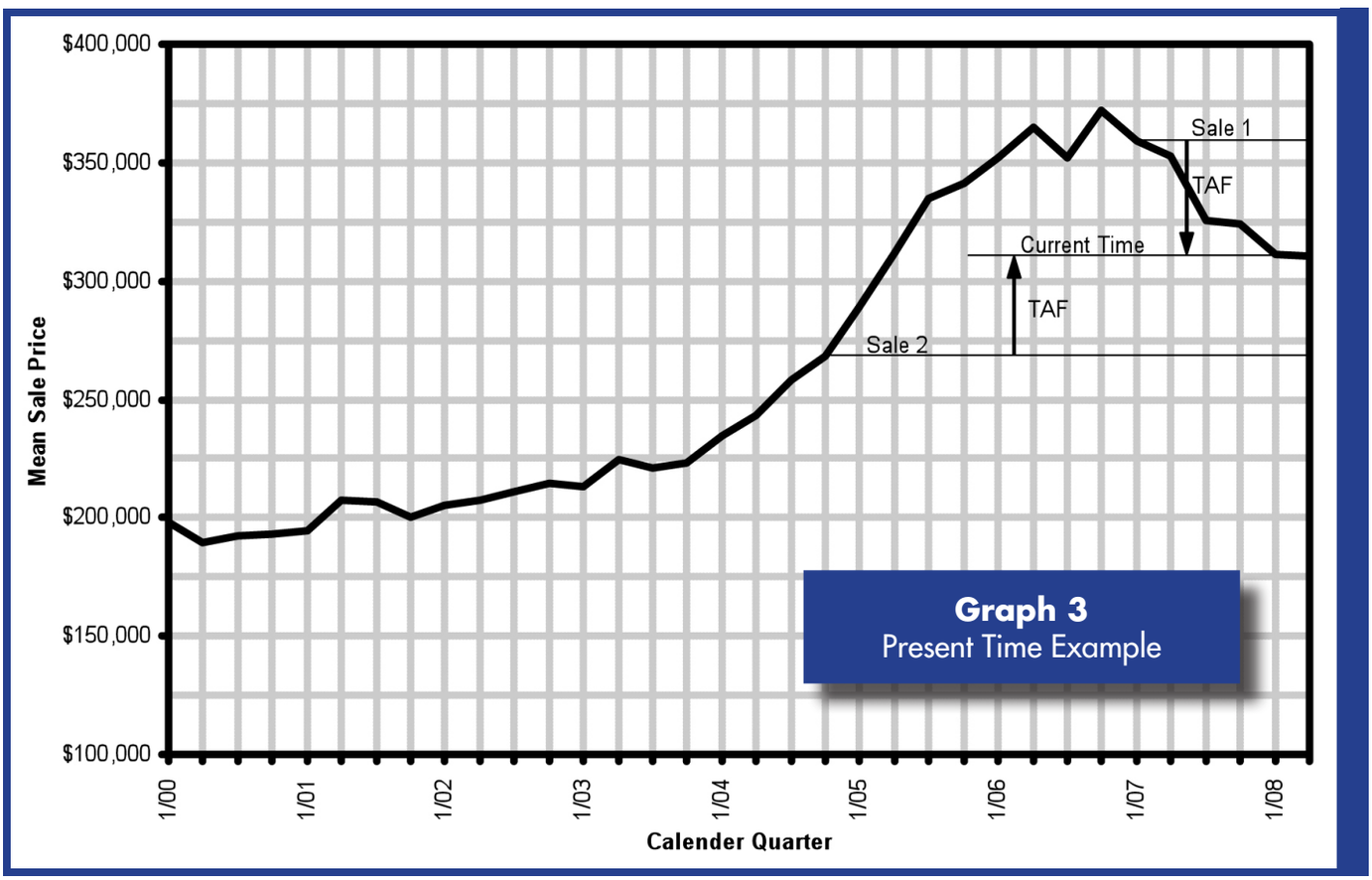
Sale #2: $100,000 x 1.16 = $116,000. This is reasonable, as prices were lower at this sale date and, therefore, must be adjusted upward.

2) PAST TIME

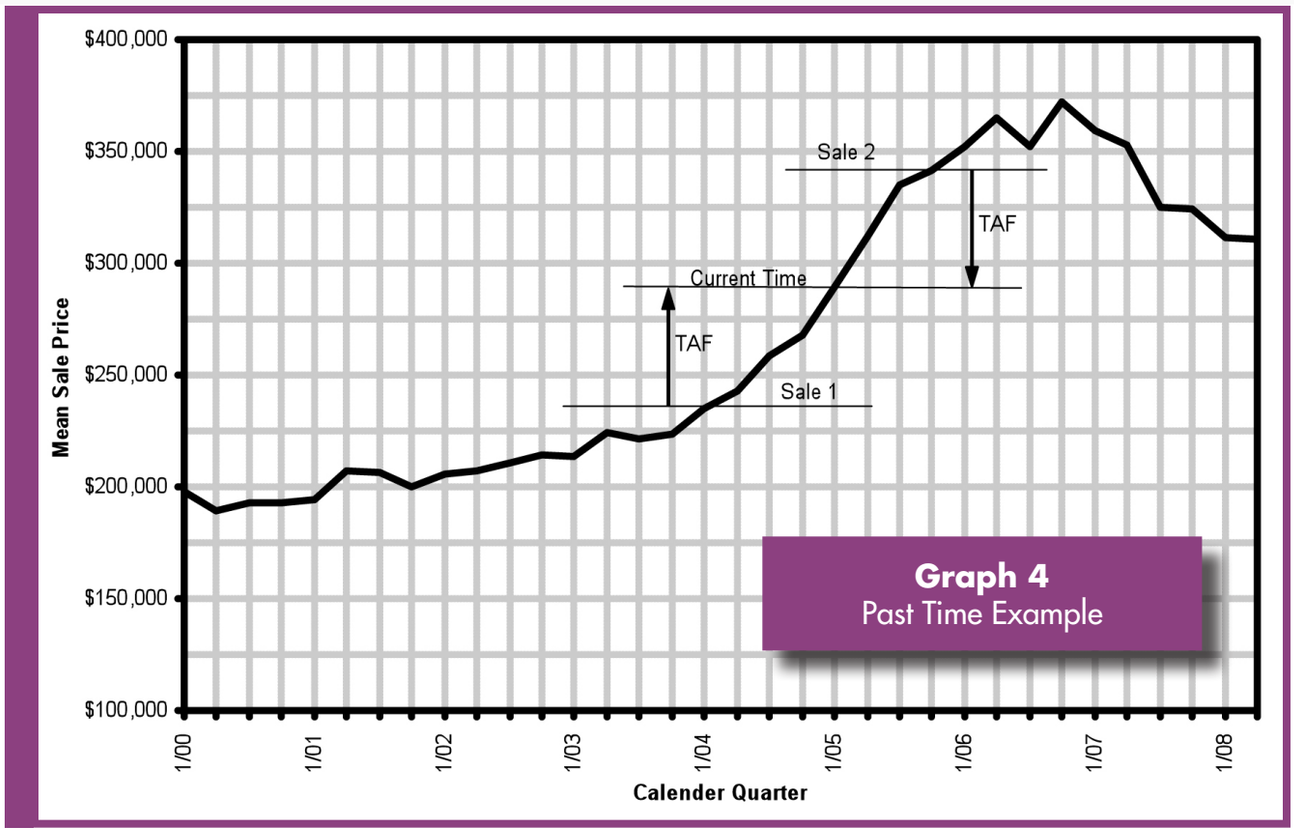
In this example (see graph 4), current time will be in the past, namely the first quarter of 2005. Here we are trying to calculate what both a comparable's and the subject's value would have been in the past. Let's look at two comparable sales, each selling for the same price but at different times. Sale #1 sold for $100,000 in January 2004 (before current time) and Sale #2 for $100,000 in November 2005 (after current time). The adjustment factors for these are: 1.23 and .85 respectively. Using Chart 2, current time value is therefore:

Sale #1: $100,000 x 1.23 = $123,000. This is reasonable, as prices were lower at this sale date and, therefore, must be adjusted upward.

Sale #2: $100,000 x 0.85 = $85,000. This is reasonable, as prices were higher at this sale date and, therefore, must be adjusted downward.



Graph 3
Present Time Example



SUMMARY

The process for developing and utilizing a large database for evaluating time/price trends or for estimating time/price adjustments may be summarized as follows:

1. Define the constraints of a dataset of sales (for example: set the upper and lower limits for each chosen criterion) that will encompass and portray a given subject property or the market being evaluated.

2. Download the data on to a computer spreadsheet.

3. Refine the data, as needed. That is, remove the sales that are not arm's length or that have other peculiarities that could distort derivation of a realistic trend.

4. Calculate the quarterly means (or calculate the measures of central tendency for the time periods you have chosen).

5. Plot the means graphically for further analysis.

6. Construct a time adjustment chart, which includes the calculated TAF's.

7. Apply the TAF's to each comparable sale, to arrive at a CT equivalency.

Although this process may seem a little daunting at first, once the database is set up, it can be applied to other appraisal or analysis assignments of similar properties or situations and is easily updated each quarter or chosen time period, as needed. Further, it provides a solid statistical basis for the time/price trend analysis or the time adjustments and a strong defense, if challenged. While I spent considerably more time developing and analyzing the database used in this article, in a normal working situation, it would typically take me less than an hour to do the same. ✪

[1] Mean: the value of each datum within a given dataset added together and then divided by the total number of data within that set; laymen's term "average".
[2] For the mathematically inclined, dividing the CT mean by another time mean (either before or after CT) results in a TAF that is a pure number, i.e. the units of measure, dollars in this case, cancel each other out.