

Excerpt from manuscript:

## **Common Statistical Errors and Mistakes: Valuation and Reliability Estimation**

### ***Information Loss Error: Fannie Mae Form 1004MC – Trend Analysis***

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#### **Abstract:**

**This excerpt summarizes how the 1004mc form always provides a *false indication* of market trend and size. The cause is the grouping of data when the exact information is known. The mathematics/statistics may be correct, but the model is bad.**

**Additional information is available on the [www.valuemetrics.info](http://www.valuemetrics.info) website.**

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## **Some Specific Gross Errors**

We have considered some ‘large’ errors. These are errors which may pervade in or impact the entire professional culture. We now turn to smaller errors and mistakes. In spite of these mistakes being ‘small’, they can have great impact because of influence or regulatory power or simply social inertia.

Again we do well to remember, our goal is *usefulness* not theoretical perfectionism. It is understandability, not obfuscation. We will first examine a case, in common practice, which defeats its own purpose due to significant and unnecessary *information loss*.

### ***Market analysis – form style***

This case demonstrates the application of a valid statistical tool – *matched pair comparison*. (This is termed “grouped” pair comparison in most appraisal literature). This example presents an improper model because it does not meet the stated needs of the user nor the public good. It is perhaps a first attempt at enforcing the use of market analysis for residential appraisers. It is the Fannie Mae (and Freddie Mac) form 1004MC. This is a form which is now required for all form appraisals performed for loans eligible for resale to these organizations.

The **stated purpose** of this form “*is to provide the lender/client with a clear and accurate understanding of the market trends and conditions prevalent in the subject neighborhood.*” We now consider whether this model accomplishes its purpose.

It is reasonable to assume that the information desired will be **timely**, not historical. It would also be reasonable to assume that it would reflect the **correct direction** of the market relevant to the subject property. As an added bonus, it might help support the magnitude of the market trend, to coincide with the ‘time’ adjustments used in the analysis. The table below shows the part of this form relevant to this discussion.

Sales trend analysis portion of the Fannie Mae 1004mc form

ANALYSIS	Median Sale & List Price, DOM, Sale/List %	Prior 7-12 Months	Prior 4-6 Months	Current - 3 Months	Overall Trend		
	Median Comparable Sale Price				<input type="checkbox"/> Increasing	<input type="checkbox"/> Stable	<input type="checkbox"/> Declining
	Median Comparable Sales Days on Market				<input type="checkbox"/> Declining	<input type="checkbox"/> Stable	<input type="checkbox"/> Increasing
	Median Comparable List Price				<input type="checkbox"/> Increasing	<input type="checkbox"/> Stable	<input type="checkbox"/> Declining
	Median Comparable Listings Days on Market				<input type="checkbox"/> Declining	<input type="checkbox"/> Stable	<input type="checkbox"/> Increasing
	Median Sale Price as % of List Price				<input type="checkbox"/> Increasing	<input type="checkbox"/> Stable	<input type="checkbox"/> Declining
Seller- (developer, builder, etc.)paid financial assistance prevalent?		<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Declining	<input type="checkbox"/> Stable	<input type="checkbox"/> Increasing

There are several issues.

The first “statistical” issue with this analysis is the definition of the problem. Does the lender/client really want to know about “market trends and conditions in the neighborhood?”

What goes on in a neighborhood may be quite different from what goes on in a competitive market segment. For example, an area may have both high rise view condominiums and affordable apartment conversions. A neighborhood has both. The median price aggregated for all condominiums combined may indicate a stable market with price trend near zero. But is this this information useful? Is it even relevant? It may be that the expensive high-rise units are falling in value, while the cheaper units are rising in value – or vice versa. The author has found occurrences of each case at one time or another. Thus the indication of a market which includes these several sub-markets is not useful for either type of subject property. This error of colloquiality further ignores that the market area sometimes matches the neighborhood, and sometimes does not.

The appropriate model would include only the competitive market segment (or district), not the neighborhood.<sup>1</sup> Let’s say the appraiser does not wish to be forced into an irrelevant analysis. He or she, confronted with this conflict between the user’s (Fannie Mae) colloquial definition and the professional definition required and being tested for appraiser licensing (and for professional designations) -- chooses expediency and pretends that the neighborhood is actually the competitive market segment. This uncomfortable conflict between a client requirement and basic appraisal education

<sup>1</sup> *The Appraisal of Real Estate*. Thirteenth ed. Chicago: Appraisal Institute, 2008. 54-55. Print. This discussion distinguishes clearly between a market area, a neighborhood, and a district. The definition of ‘neighborhood’ is defined as a group of *complementary* land uses. Thus it leaves undefined whether even gas stations or detached homes should be included in the analysis. In the understood professional sense, there would be little purpose in analyzing say neighborhood values, without first restricting to a specific (competitive) land use. But this then is not a neighborhood, it is a property type in a given area.

typifies the relationship to real-world competence and ethical behavior. This forms the appraiser context for dealing with this form-versus-content issue.

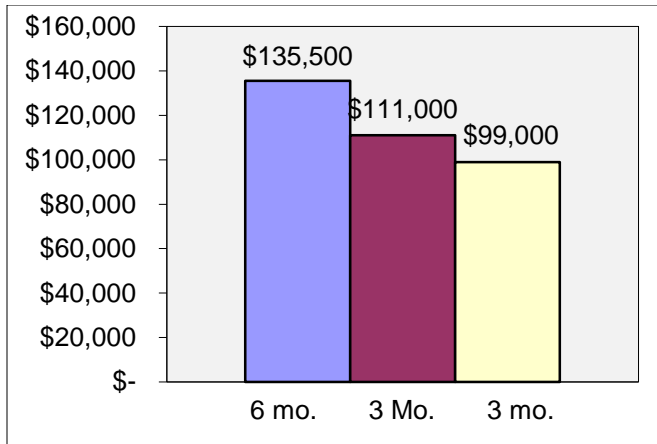
Having dealt with (or avoided) this problem of client’s instructions versus competency requirements, the appraiser then proceeds to fill in the form. Most residential loan appraisers now use a spreadsheet application to generate the results to fit the form. The following data set is an example, typical of market conditions trends in many areas in the U.S.A. during 2009-2010.

<b>Closed date</b>	<b>Sale price</b>	<b>Closed date</b>	<b>Sale price</b>	<b>Closed date</b>	<b>Sale price</b>
1/12/2009	\$ 141,000			10/1/2009	\$ 95,000
1/22/2009	\$ 139,000			10/10/2009	\$ 94,000
2/15/2009	\$ 137,000	7/3/2009	\$ 117,000	10/21/2009	\$ 101,000
3/6/2009	\$ 139,000	7/13/2009	\$ 115,000	10/22/2009	\$ 97,000
3/28/2009	\$ 135,000	8/6/2009	\$ 115,000	11/5/2009	\$ 93,000
4/15/2009	\$ 136,000	8/25/2009	\$ 110,000	11/8/2009	\$ 97,000
4/29/2009	\$ 133,000	9/10/2009	\$ 105,000	11/18/2009	\$ 103,000
5/12/2009	\$ 121,000	9/16/2009	\$ 106,000	11/22/2009	\$ 101,000
6/1/2009	\$ 124,000	9/27/2009	\$ 112,000	12/5/2009	\$ 108,000
6/28/2009	\$ 111,000	9/30/2009	\$ 100,000	12/17/2009	\$ 110,000
	<b>6 month median \$ 135,500</b>		<b>3 month median \$ 111,000</b>		<b>3 month median \$ 99,000</b>

Based on the analysis dictated by the form, it is clear the trend is downward. Lacking other understanding of statistical analysis, presumably this provides an *“accurate understanding of the market trends and conditions prevalent in the subject neighborhood.”*<sup>2</sup>

We could go the next step and provide a bar-chart column graph with these values to better illustrate the declining market.

<sup>2</sup> FannieMae form 1004mc (Market Conditions Addendum)



The appraiser concludes to a declining market. The data and the graph both show a *steady* decline of about \$12,000 per 3-month period, or about \$4,000 per month over the entire year.

He now also has clear support for a downward time adjustment for his three comparables, all compliant to some 'guidelines' that sale dates be within six months of the date of value.

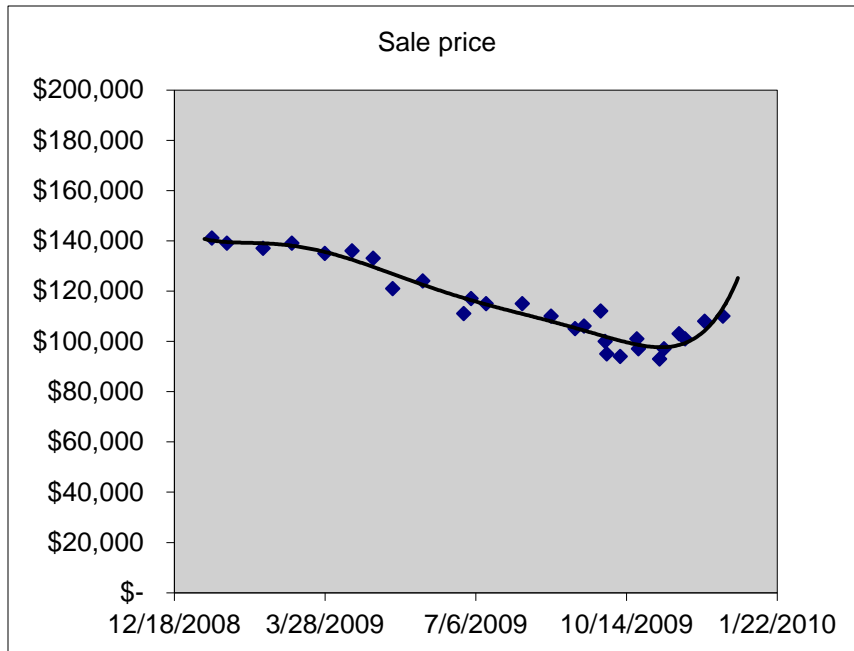
So what's the problem?

While this solution to the market trend problem seems intuitively beneficial – it is a striking graphic example of the cost of information loss. In this case, the model error defeats the purpose of the exercise. How is this so?

How would a 'best practices' econometric model for time-series analysis eliminate such failures of intent and process?

First the analyst would look at the data. Typically a scatter graph. In this case we have the exact date of each sale. If possible, it is wise to first look at the data without rounding the date of sale to the 6 month, 3 month, 3 month groupings. Rounding or a summary statistic is a form of information loss. When we took the medians of each time period, we discarded data about the exact date, and proceeded to analyze only the summarized 'rounded' values, the medians. We compared medians of large groups.

What should we have done? For two variables, we have exact dates and exact prices. A scatter graph is generally the indicated form of chart. It is the right visual model for this type of time-series analysis. The graph now enhances the ability of the human brain to see the market. To "let the data speak".



For this market, it is clear, using the right tool, that the market has clearly reversed its trend, hitting bottom some near three months prior, and requiring an *upward* adjustment since September 1. (A *linear* trend simple regression would provide a good time adjustment for sales occurring in the last three months, the otherwise most reliable comparable sales.

Is this a circumstantial event? Does this tool indicate the wrong direction only in some circumstances? No. For each and every market bottom, it will show the wrong trend 100% of the time!<sup>3</sup> And it will be wrong at the relevant decision window – when it matters.

So what is the cause? It is the information loss problem which results when the measurement is taken on a parameter (the median), rather than utilizing correctly the exact date of closing for each market data point.<sup>4</sup>

How can this be avoided? The solution is already evident. The analyst/appraiser must be steeped in the use of the right graph for the right situation. The scatter graph visually explains the market trend to the analyst (and to the lender/client). From there the analyst can fit a curve, whether a linear, a spline model, or a polynomial.<sup>5</sup> The change

<sup>3</sup> It will however be correct by coincidence for any market which does not *change* its trend for at least a six month period. E.g., if a market stays level for the six months prior to the date of value, the median will stay the same between the two periods. The level market will be confirmed some six months after it begins!

<sup>4</sup> Dell, George, MAI, SRA. *Introduction to Real Estate Econometrics*. San Diego: Real Estate Econometrics, 2002. 40-42. Print

<sup>5</sup> The choice of curve fitting, whether order of polynomial, linear spline, or other functional form – is a modeling decision. There are modeling guidelines for these offered in [valuemetrics.info](http://valuemetrics.info) workshops, but they are beyond the scope of this paper.

in trend is indicated immediately. The resulting time adjustment reflects *all* the known market information as of the date of value.<sup>6</sup>

The use of the right procedure and the right model is actually easier for appraisers to implement, as well as accomplishing the result desired. Other statistical and economic tools can be used to improve and even predict this result.

While this may seem like a small issue. It has great economic and political impact. A half million appraisals reporting declining markets three months after the market has turned -- extends the depth and length of the recession, increases the size of government subsidies, puts greater pressure on our public servants, and further damages the reputations of our public and semi-public organizations.

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<sup>6</sup> Dell, George, MAI, SRA. *Stats and Graphs 1*. San Diego: Valuemetrics, Inc., 2006. 32. Print