**Case Question Answers**

We provide three files. PRD Statistic.xls computes the PRD statistic for 10 hypothetical houses TEST-VM.txt is a textfile that provides the SAS code to run the TEST-VM and AVM Performance Metrics.xls allows the reader to reproduce the AVM Performance Metric values seen in Exhibits 6, 7, and 8.

1. Which AVM Performance Metrics for a target property are most important? How do these AVM Performance Metrics map to accuracy and precision?

ANSWER: For accuracy, the mean and median (percentage) sales errors are most important because they assess any aggregate bias in the AVM. For precision, the FSD and 95% confidence intervals best assess precision, because they provide a range of value in which the market value of the target property value most likely falls.

2. Compare and contrast the mean versus median percentage sales error, as measures of AVM accuracy? Why is it necessary to test whether the mean and median percentage sales errors are statistically significantly different from zero?

ANSWER: The mean is the balance point of the distribution of (percentage) sales errors, while the median is the 50th percentile. The mean takes into consideration the magnitude of the (percentage) sales errors, while the median does not.

Since the mean and median (percentage) sales errors are calculated using a specific set of housing sales, one does not expect an unbiased AVM to produce a perfect value of zero for the mean/median (percentage) sales error. In addition, had another set of housing sales been used, then a different mean and median would most likely have resulted. Therefore, one needs to statistically test (with a t-test for the mean and a sign tests for the median) whether or not the mean and median (percentage) sales errors are statistically significantly different from zero.

3. What are the strengths and weaknesses of the FSD as a measure of AVM precision?

ANSWER: Strengths: The FSD is the most commonly used industry measure of AVM precision, and as a result, AVM users understand that smaller values of the FSD mean the AVM is more precisely predicting house values. AVM users expect to see an FSD for each target property being valued.

Weaknesses: The exact methodology that each AVM vendor uses to calculate its reported FSD is not clear, nor is it intuitive how an FSD of say 19.6 relates to a specific house valuation, for example for our target property. In contrast, the 95% confidence interval for our target property ranges from $133,030 to $191,056 and, in our opinion, more naturally convey the precision of the AVM than reporting the FSD of 19.6.

4. What is the Failure Rate of an AVM and how does it differ from the +/- 15% error bucket (PPE15)? How does the Failure Magnitude measure AVM performance?

ANSWER: The Failure Rate of an AVM is the percentage of properties for which the AVM fails to predict selling prices accurately, to within, for example +/- 15 percent (PPE15). The Failure Rate is the complement of PPE15, while the Failure Magnitude is the mean (absolute percentage sales) error for those poorly predicted sales.

5. Calculate the PRD statistic, using the 10 houses in PRD Statistic.xls, that illustrates a ‘regression to the mean’, whereby the four least expensive houses are overvalued by 5%, the middle two are accurate, and the four most expensive houses are undervalued by 10%.

ANSWER: PRD = 1.0291

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| House | AVM |  | Selling |  | Ratio |
| Value | Price |
| 1 | $105,000 |  | $100,000 |  | 1.05 |
| 2 | 157500 |  | 150,000 |  | 1.05 |
| 3 | 210000 |  | 200,000 |  | 1.05 |
| 4 | 262500 |  | 250,000 |  | 1.05 |
| 5 | 300,000 |  | 300,000 |  | 1.00 |
| 6 | 350,000 | 350,000 | 1.00 |
| 7 | 360,000 |  | 400,000 |  | 0.90 |
| 8 | 405,000 |  | 450,000 |  | 0.90 |
| 9 | 450,000 |  | 500,000 |  | 0.90 |
| 10 | 495,000 |  | 550,000 |  | 0.90 |
|  |  |  |  |  |  |
| Means | $309,500 |  | $325,000 |  | 0.9800 |
|  |  |  |  |  |  |
|  | PRD Value | 1.0291 |  |  |  |

6. Use the excel spreadsheet, AVM Performance Metrics.xls, to re-calculate the first 9 AVM Performance Metrics in Exhibit 7, along with the COD, COV, PRD and PRB, when the AVM undervalues each house by 10 percent.

ANSWER:

|  |  |
| --- | --- |
| Mean AVM Value | 129390 |
| Median AVM Value | 117000 |
|  |  |
| Mean Sales Error | -14377 |
| Median Sales Error | -13000 |
| Mean Percentage Sales Error | -10.00 |
| Median Percentage Sales Error | -10.00 |
|  |  |
| Mean Selling Price | 143767 |
| Mean AVM Value | 129390 |

|  |  |
| --- | --- |
| Mean Absolute Sales Error | 14377 |
| Median Absolute Sales Error | 13000 |
| Mean Absolute Pct Sales Error | 10.00 |
| MAPE | 10.00 |
|  |  |
| FSD | 0.0 |

|  |  |
| --- | --- |
| COV | 0.00000 |
| COD | 0.00000 |
| PRD | 1.0000 |
| PRB | Undefined  (Divided by 0 error |