The Real Estate Market Index

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The Real Estate Market Index ("REMI") combines sales price, sales volume and days on market into a summary measure of market activity or liquidity. The REMI, which rises with price or volume and falls with days on market, is more sensitive to market sentiment than indices based on price alone, e.g., the Case-Schiller Index. The REMI is useful to people who want a measure of market liquidity. Data from over 19,000 sales that occurred between January 2000 and November 2009 in Mission Viejo, California illustrate the calculation, calibration and application of the REMI.

Economists describe markets as a place where supply and demand meet, the upward sloping supply curve intersecting the downward sloping demand curve at an equilibrium price where the quantity supplied equals quantity demanded. Although markets are rarely in equilibrium—supply and demand are constantly changing—this concept, this useful fiction, is used to explain how market forces are interacting, pushing price and quantity up and down. In some markets (e.g., spot markets for gold, blue chip stocks, treasury bonds, and so on) this stylized view of the market is fairly accurate—daily closing prices provide a fairly accurate representation of "where the market is." In other less-liquid markets, prices do not give a very good picture of market activity. The fine art "market," for example, consists of many pieces—often unique—selling at auction, by negotiation, among dealers, and other channels. Prices in the art market do not therefore capture the full complexity of the dynamics of supply and demand. The job market for recent graduates with doctoral degrees is similar: the "prices" (salary offers) that emerge characterize neither equilibrium nor the process of matching supply and demand very well.

The market for residential real estate is somewhere between these extremes. The sales price of a house does not fully describe how supply and demand interacted in the sale of that house. Home sales, on the other hand, share certain characteristics that allow one to aggregate them, to get an idea of activity in the market for homes. Talk to any realtor, and you will hear them describe the "market' in a way that reflects these nuances. They will tell you about closing prices but also mention days of inventory (unsold homes divided by the number of sales per day), days on market (how long before a house that's listed for sale gets an acceptable offer), seasonality (more houses sell in summer, during school breaks), and so on. Many of these indicators are useful, but they are hard to compare and reconcile. Talk to one realtor and you get one view of the market; talk to

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another and that *same* market can look quite different. Although it is probably possible to reconcile these different views, it is also time consuming and confusing, which means that outsiders—pretty much everyone who is not working full time in the area—have a hard time knowing just how the market is doing. Where is liquidity this month, as opposed to last month, or last year? Is the market hot or not? Investors are especially interested in this question, as they want to compare many markets in many places, to understand relative performance.

An index provides a summary measure, the market in one number. Percentage changes in indices make it easy to compare different markets over time, even when they are based on different assets or units. Thus one might compare Hong Kong's Hang Seng to the Dow Jones Industrial Average, precious metals to bulk raw sugar. These comparisons assume implicitly that the price component of the index includes all important information. If something other than price matters, turnover as a measure of liquidity for example, then the comparison may indeed be more apples-to-oranges than apples-to-apples.

Many people use the Case-Schiller Index ("CSI") to describe the real estate market,[1] but the CSI is better at describing home *values* than market activity, or liquidity. As we know, liquidity is not just about price, but also sales volume and transaction speed, and a description of the real estate market should incorporate that information. What we need is an index that captures more information, since real estate market performance is not just a function of price.

This article presents an index that includes this information, a Real Estate Market Index ("REMI") that combines median sales price, volume (number of sales) and median days on market ("DoM") into a single measure of overall market activity. The REMI allows comparisons between periods (e.g., January 2004 and January 2008) and/or areas (e.g., San Francisco and Los Angeles).[2] As an example, I calculate the REMI for Mission Viejo (MV, a city of about 100,000 people in Southern California's Orange County) using data from over 19,000 sales that closed escrow between January 2000 and November 2009.

Next, this article reviews the literature on price indices, liquidity and activity in real estate markets. It then defines the components used to construct the REMI and their relative weights in the index. Before concluding, this article discusses the REMI's accuracy and how it might be used.

Real Estate Markets

This section describes and compares the most widespread measure of market activity—the Case-Schiller Index of repeat sales prices—to broader measures of the market, such as market liquidity (being able to sell a house at full price) and market activity (volume and velocity). Throughout this section, I test predictions from the literature with MV data, which are shown in Figure 1 and listed, with REMI values, in Table 1.

TABLE 1. Monthly REMI values from 19,380 closed escrows in Mission Viejo, California (median price, number of sales and median DoM). Jan 2000 = 100.

Date	REMI	Price	Sales	DoM	Date	REMI	Price	Sales	DoM
Jan-00	100	257,500	90	27	Jan-05	170	569,000	139	73
Feb-00	117	261,950	140	36	Feb-05	199	590,000	164	66
Mar-00	160	273,750	174	20	Mar-05	273	580,000	244	40
Apr-00	172	305,000	180	22	Apr-05	288	589,000	257	36
May-00	175	284,700	202	24	May-05	299	612,450	234	24
Jun-00	172	255,000	193	14	Jun-05	342	663,750	296	30
Jul-00	161	277,250	182	24	Jul-05	317	638,500	276	34
Aug-00	182	280,000	209	20	Aug-05	296	647,000	232	34
Sep-00	146	292,000	153	27	Sep-05	280	647,500	213	38
Oct-00	146	268,000	159	23	Oct-05	229	648,950	142	48
Nov-00	143	304,900	153	32	Nov-05	231	635,000	155	48
Dec-00	133	290,000	137	29	Dec-05	237	650,000	170	54
Jan-01	113	269,000	108	27	Jan-06	204	689,500	110	64
Feb-01	133	300,000	121	25	Feb-06	203	665,000	119	62
Mar-01	195	299,900	221	20	Mar-06	248	660,000	187	55
Apr-01	148	303,500	146	25	Apr-06	275	690,000	190	43
May-01	176	309,950	184	21	May-06	233	655,000	168	58
Jun-01	174	320,000	197	31	Jun-06	249	685,000	184	60
Jul-01	173	325,000	202	35	Jul-06	231	672,500	150	56
Aug-01	201	325,000	241	30	Aug-06	199	645,000	139	69
Sep-01	154	305,000	169	31	Sep-06	201	679,500	160	86
Oct-01	147	320,000	151	32	Oct-06	148	630,788	108	92
Nov-01	134	325,000	140	39	Nov-06	175	635,000	140	86
Dec-01	137	328,000	155	44	Dec-06	156	650,000	129	100
Jan-02	143	325,950	142	33	Jan-07	122	658,700	84	110
Feb-02	139	349,100	137	40	Feb-07	153	620,000	127	94
Mar-02	196	329,000	214	24	Mar-07	199	639,900	175	84
Apr-02	214	363,000	205	14	Apr-07	208	641,250	122	54
May-02	228	380,000	219	13	May-07	220	635,988	144	52
Jun-02	217	365,000	198	9	Jun-07	225	650,000	152	56
Jul-02	232	393,750	220	14	Jul-07	198	650,000	113	60
Aug-02	219	375,500	204	13	Aug-07	189	643,500	132	74
Sep-02	216	389,900	195	15	Sep-07	149	601,000	84	73
Oct-02	192	384,450	172	22	Oct-07	143	605,000	71	73
Nov-02	190	379,900	170	22	Nov-07	87	585,000	66	111
Dec-02	192	383,450	188	29	Dec-07	102	587,000	81	106
Jan-03	141	372,450	116	35	Jan-08	22	531,250	48	141
Feb-03	179	402,450	146	26	Feb-08	15	500,000	70	148
Mar-03	240	416,700	244	24	Mar-08	86	527,500	99	111
Apr-03	242	415,950	232	17	Apr-08	84	492,450	118	112
May-03	243	427,500	225	16	May-08	155	530,000	127	69
Jun-03	252	430,450	238	16	Jun-08	132	495,000	121	76
Jul-03	265	448,200	248	14	Jul-08	160	520,000	159	77
Aug-03	295	473,900	284	13	Aug-08	174	500,000	167	64
Sep-03	247	479,900	195	13	Sep-08	135	479,950	128	73
Oct-03	236	454,500	196	16	Oct-08	177	510,000	133	49
Nov-03	214	472,000	163	23	Nov-08	154	467,600	118	50
Dec-03	245	492,500	204	22	Dec-08	119	430,000	125	71
Jan-04	217	500,000	144	20	Jan-09	116	415,000	105	61
Feb-04	229	495,000	142	8	Feb-09	152	480,000	87	41
Mar-04	292	547,000	223	7	Mar-09	160	426,000	125	38
Apr-04	307	575,000	233	7	Apr-09	106	420,000	109	72
May-04	294	602,500	191	6	May-09	146	485,000	118	61
Jun-04	301	620,000	206	11	Jun-09	162	460,000	150	56
Jul-04	258	607,500	171	27	Jul-09	154	452,000	159	64
Aug-04	222	599,995	138	39	Aug-09	181	480,000	138	41
Sep-04	221	575,000	152	40	Sep-09	172	453,600	156	49
Oct-04	210	576,000	161	52	Oct-09	190	483,000	158	43
Nov-04	212	580,000	155	49	Nov-09	185	497,500	124	36
Dec-04	211	545,000	203	62					
					min	15	255,000	48	6
					average	190	483,961	163	45
					max	342	690,000	296	148

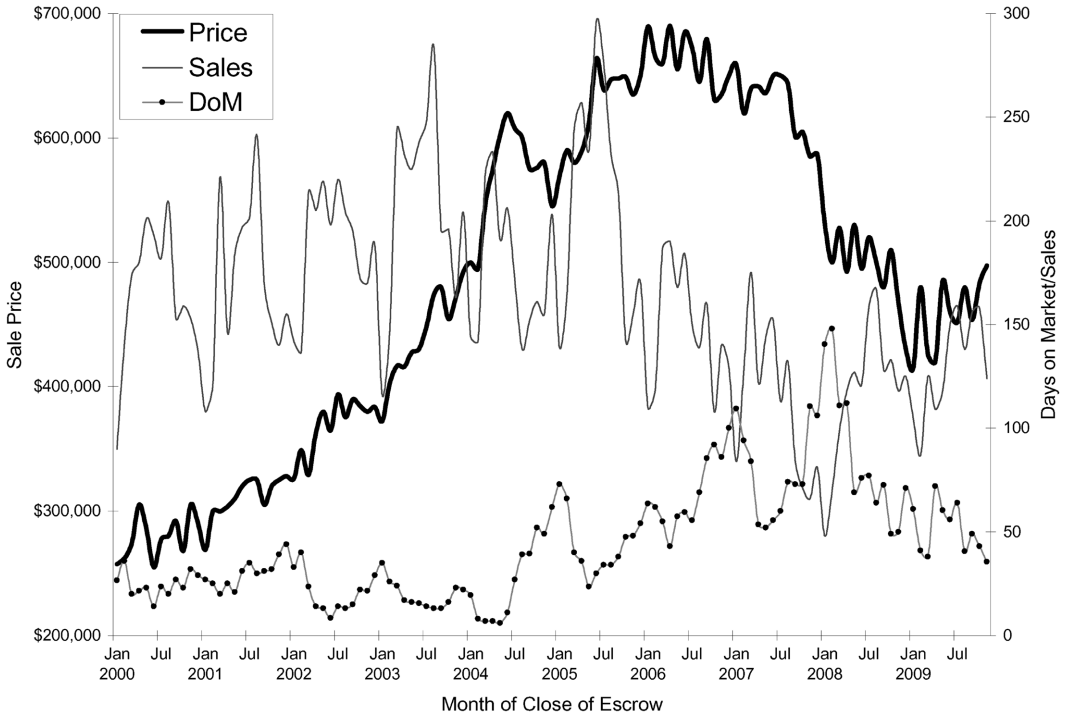

FIGURE 1. Monthly Mission Viejo data in nominal units

Price Indices

Case and Shiller (1987) described a quarterly index of weighted, repeat sales that shows smaller changes in home values than an index of median prices for *all* sales, which Case and Schiller argued are biased upwards by the inclusion of new home sales. They were rewarded for this observation: The CSI is the most widely cited measure of prices in the housing market.[3] Today, a three month rolling average CSI for 20 metropolitan statistical areas is published with a two month lag, e.g., the CSI published on the last Tuesday in February reflects average prices in October/November/December (Standard & Poor's, 2008). This rolling average design means that the CSI changes rather slowly, e.g., the correlation between the CSI for Los Angeles and its value from three months earlier is 0.994.[4] Case and Shiller (1989) cite this result as evidence that "the market for single family homes does not appear to be efficient." But is efficiency in the real estate market only a function of price? Case and Schiller would probably agree that it is not, and so would most people who participate in real estate markets. A broader definition of efficiency in the real estate market would include "liquidity," a many-splendored word.

Liquidity and Market Activity

Kluger and Miller (1990) declare that liquidity is the probability of selling a house—relative to the probability of selling another house—at market value. They are careful to say that their measure is "not quite the same" as its inverse—DoM—mostly because they are measuring the ex-ante probability of a

sale whereas DoM is an ex-post result that depends upon unpredictable, heterogeneous shocks connected with a particular sale.[5]

The model of the housing market in Stein (1995) integrates prices, sales and DoM. He suggests that more liquidity results in hot markets (higher sales and lower DoM) because a seller with greater equity will be an aggressive buyer. The "most robust prediction" of Stein's model is that prices and sales are positively correlated [p. 398]. MV data do not strongly reject his hypothesis for contemporary data (i.e., the correlation between the change in price and sales in the same period is 0.10), but there is zero correlation between price in one month and sales one, two or three months later. Another prediction—that there will be more "fishing" (listing but then canceling) when price and sales are low—is only partially confirmed in the data. A simple OLS regression of normalized measures of canceled deals on price and sales shows significant positive correlations with price and negative correlations with sales, i.e., the hypothesized relationship is rejected with respect to price but not for sales.[6]

Berkovic and Goodman (1996) create a macroeconomic measure of housing demand, which they compare to price and sales turnover. They conclude that, "for high frequency data, turnover is a superior to price as an indicator of change in housing demand" [p. 421]. indicator of change in housing demand." The mechanism for this superiority? Changes in demand affect turnover more quickly than they affect price. These observations are supported in the data: Normalized price and sales (1.00 in Jan 2000) have similar means (1.88 and 1.81) and standard deviations (0.52 and 0.54) over the entire sample period, but their standard deviations for month-on-month changes are 0.10 and 0.40, respectively. Sales are more volatile; *see* Figure 2.

Krainer (2001) says a hot market has rising prices, above average volume and short selling times (DoM). He equates fast, full price sales to liquidity and calculates—using a parameterized and stylized model—that "liquidity is much more variable than prices"—an assertion that is not rejected in MV data [p. 49]. The standard deviation of monthly changes in normalized prices (as above) is 0.10, but the standard deviation of monthly changes in DoM is 0.45.

Clayton et al. (2008) say that liquidity is a joint function of price and sales volume.[7] Echoing Stein (1995), they also say that "turnover appears to lead price movements" [p. 20]. The 0.05 correlation between the change in sales and change in price in the next month does not reject their claim, but it also fails to provide strong evidence in favor.

Novy-Marx (2009) elaborates on the liquidity story, explaining that cycles are magnified by feedback loops, i.e., a sudden increase in the number of buyers lowers DoM and removes sellers too quickly from the market—creating a shortage of houses and price bubble.[8] Unfortunately, bivariate relations in MV data reject this relationship: Median price is 87 percent of the average (mean of monthly median prices) when median DoM are below average and 119 percent of average in months where DoM are above average.[9] He also predicts that "tight" markets will have higher prices and lower DoM in roughly similar proportions, i.e., a one percent increase in tightness results from one half percent increase in price and one half percent decrease in DoM. These predications do not show up in sample data: Normalized prices in the MV data have half the standard deviation

of normalized DoM, which means that either changes in price should get twice the weight of DoM or DoM explain two thirds of tightness in the market. (*See* below for more discussion on weights.)

Calculating the REMI

The REMI is an index of past market conditions that relies on data from completed sales. This section describes the three variables that compose the REMI, explains how the REMI is calculated, and calculates the REMI for Mission Viejo.

REMI Components

The REMI combines median sales price, number of sales, and median DoM from all escrows closed in a given month in a given area. Figure 2 gives normalized values (to 1.00 in Jan 2000) for Mission Viejo data shown in Figure 1.

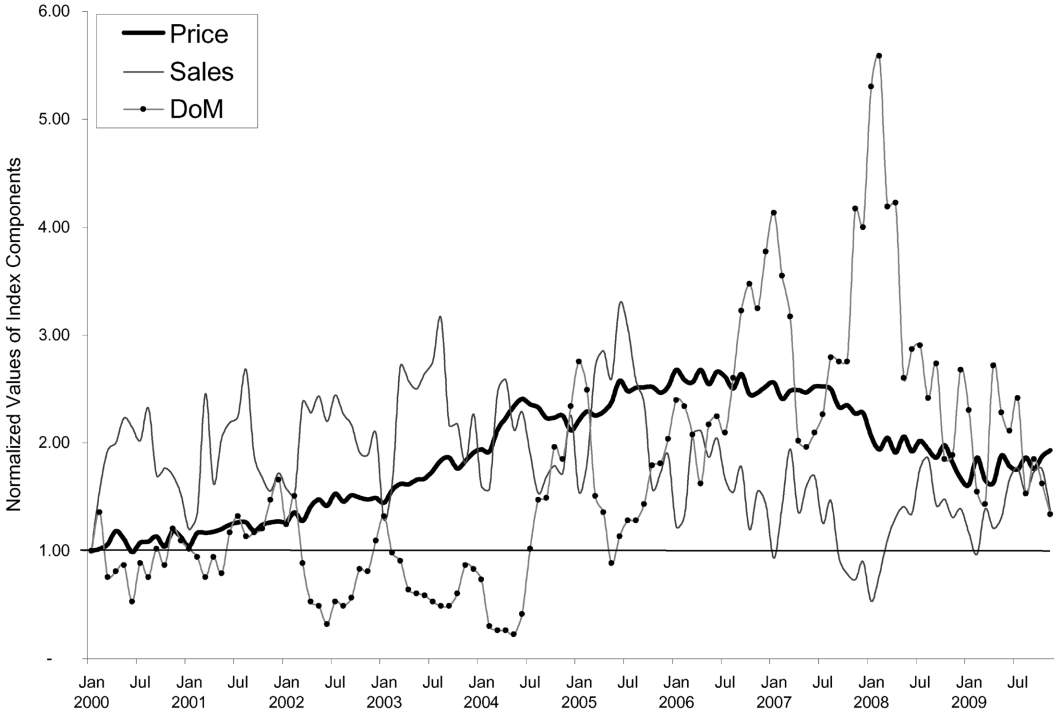

FIGURE 2. Monthly Mission Viejo data normalized to 1.00 in January 2000.

Consider the intuition of how each variable describes a hot market, i.e., prices are rising, sales volume is rising, and DoM are falling. Sales rise during the high season (generally summer) when there are more buyers and sellers. In the off-season or a slowing market, sales fall because fewer buyers and sellers are in the market, and buyers take longer to search through inventory.[10] Note that a summer market has higher sales but not necessarily higher prices. DoM fall in a hot market, e.g., DoM = 0 indicates that a house sells the day it is listed.[11] Although all of these indicators may change in a hot market, they may not change at the same rate. This imperfect correlation is common, and those who study only price or sales or DoM may

overlook liquidity changes reflected in other components.

All three variables are normalized to 1.00 for two reasons. First, normalization removes units, so that prices can be compered to DoM, relative to a baseline point in time, as a percentage change. If prices go to 1.10 and DoM rise to 1.10, then we know that they have both changed by ten percent. Second, normalization allows different areas to be compared, sales volume in New York may go from 1.00 to 1.05 in the same period as it goes from 1.00 to 1.10 in Topeka. Such a comparison allows one to see that the change in Topeka home sales volume is greater than the change in New York volume. Normalization does not indicate if a 10 percent change in price is more important than a 10 percent change in DoM, or if the New York market is worth more than the Topeka market. Normalization allows one to see the relative changes in activity, or liquidity. We look at the relative importance of these measures next.

Comp*onent Weights in the REMI*

Although each of these components captures an important aspect of the market, it is more difficult to assign their weights in the index, i.e.

> . . . in the construction of index numbers . . . it is well known that there is not a single "true" index number of prices or outputs. This is because reality is multi-dimensional and any attempt to express a multi-dimensional set as a simple number must involve arbitrary assumptions.—Boulding (1958, p. 53)

Weights should allow components to move the index without violating our intuition of the relative importance of each component. This intuition motivates my arbitrary assumptions that no one component dominate the REMI and that price have more weight than sales or DoM. I operationalize these assumptions by putting more weight on price and by setting a *goal* that the REMI rise when two of three components indicate the market is hotter and fall when two of three indicate it is cooler. In the remaining discussion of weights, I will mention how well each weighting scheme does with respect to this Goal. Weighting schemes will be identified by their price/sales/DoM weights, i.e., 50/30/20 means that the REMI value is derived 50 percent from price, 30 percent from sales and 20 percent from DoM.[12] This arbitrary goal may not be the best way to choose weights, but it is fairly intuitive. It's obviously possible to use different weights, set by the preferences of the person who wants to use the REMI, so this is merely an example. The REMI only requires three streams of data, a baseline year and set of weights to be useful. The user can set the baseline year and weighting without affecting other users, as long as they are not trying to compare REMI numbers. If people want to compare REMIs from different markets, then they have to agree on the baseline year and weights. That process is beyond the scope of this article, but it will evolve under market, regulatory and/or industry pressures for a REMI that is useful. Let us proceed with these caveats in mind.

100/0/0: In this scheme price alone represents the market. Although price indices (including the CSI) do *not* claim to measure "the market," they are often interpreted that way. A 100/0/0 REMI misses the Goal 30 times, i.e., a REMI that rises and falls with price alone falls when sales and DoM indicate the market is hot or rises when they indicate it is cold in 30 of 119 monthly observations.

50/30/20: Price gets one half share, and sales get a bigger share than DoM. Sales

get more weight than DoM because they are the second most reported market statistic and a major component of liquidity, e.g., "summer selling season." The pragmatic reason to give more weight to sales is that it is less volatile than DoM, which can vary from 0 to 120 or more days. 50/30/20 misses the Goal 11 times.

40/40/20: This weighting is too light on price, but we consider it here because these round numbers happen to coincide with a weighting that is the inverse of the variance of each component in MV data.[13] 40/40/20 misses the Goal 14 times.

33/33/33: A neutral weighting is intuitive, but many people prefer to give more weight to price, and equal weights do not work well when components have unequal variance (*see* 40/40/20). Put another way, the component with more variance will "drive" the REMI. 33/33/33 misses the Goal 17 times.

Considering all these factors and the fundamentally arbitrary measure of index weights, I discard 100/0/0 and 33/33/33 schemes. I am uncomfortable with the 40/40/20 set of weights because it was derived ex-post from sample data and because it gives price and sales the same weight. I use the 50/30/20 weights because it gives more weight to price and the least weight to DoM, which is likely to have a high variation in most markets.[14]

Constructing the REMI

The REMI-MV was constructed using the following steps:[15]

1. Gather individual transaction data based on filter criteria (e.g., by city, ZIP code, number of bedrooms, tract, etc.) for as many months as desired. I downloaded data from about 19,000 sales that closed escrow between January 2000 and November 2009 in Mission Viejo.[16]

2. Calculate median price and DoM by month (t) to get values of $price_t$ and DoM_t. Also count the number of sales to get $sales_t$.[17] Figure 1 shows nominal statistics for these variables.

3. Normalize all values to the *base month* (the first month in the series) by dividing each variable by its base month value to get indexed values, e.g.,

$$I_{price_t} = \frac{price_t}{price_1}.$$

   Figure 2 shows Mission Viejo data after they are normalized to 1.00 using base month values from January 2000.

4. Combine index values using weights to get the monthly REMI. Since the REMI rises with price and sales but falls with DoM, add the first two and subtract DoM, i.e.,

$$REMI_t = 100\left[\frac{0.5I_{price_t} + 0.3I_{sales_t} - 0.2I_{DoM_t}}{REMI_1}\right]$$

   where multiplication by 100 and division by $REMI_1$ makes the REMI an integer index with a value of 100 in the base month. *See* Table 1 and Figure 3 for REMI-MV values and Figure 4 for REMIs with different weights.

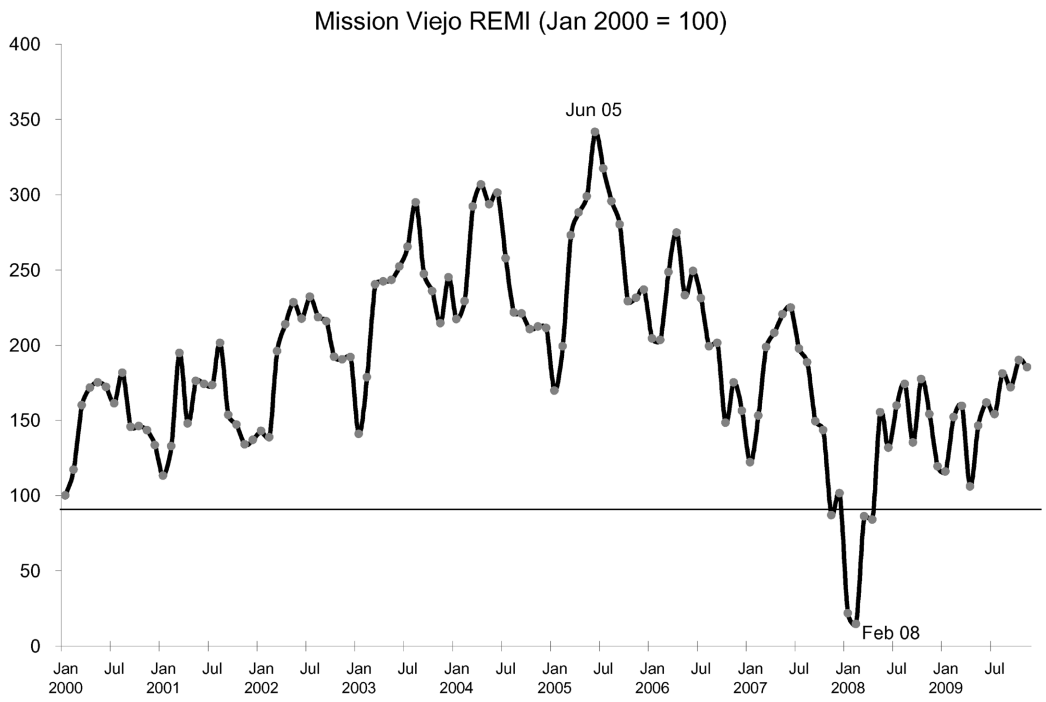

FIGURE 3. The REMI for Mission Viejo peaked in June 2005 and bottomed out in February 2008.

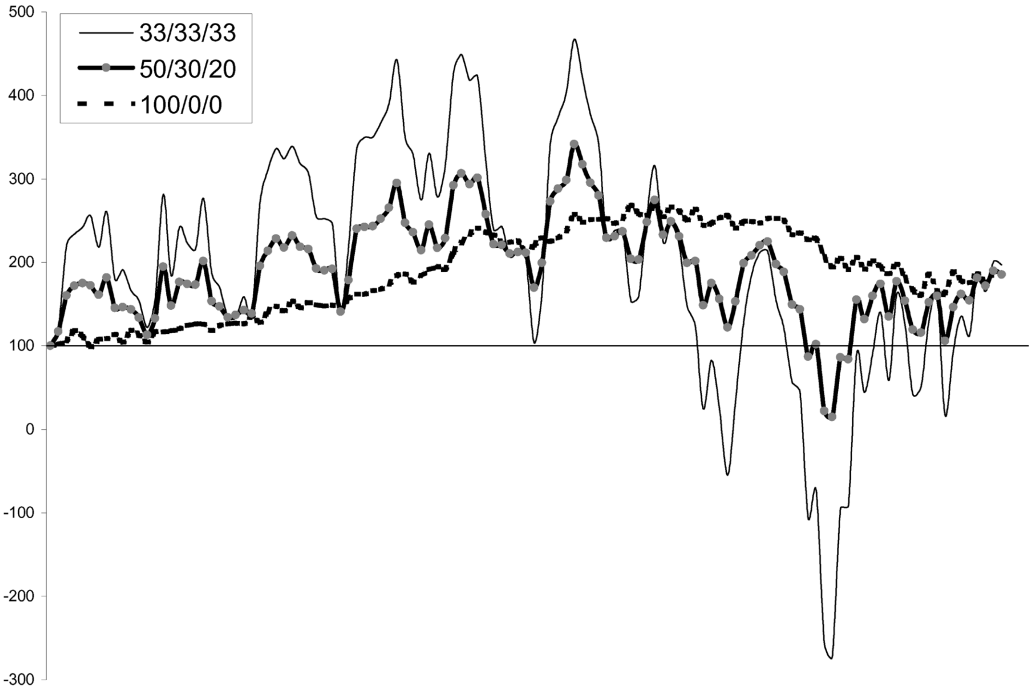

FIGURE 4. A comparison of REMIs calculated with different weights of price/sales/DoM. 40/40/20 is not shown because it is so close to 50/30/20.

Discussion

This section discusses the REMI's correlations with future REMI values and prices, and why the REMI gives a better description of market conditions than price indices.

Although the REMI may be useful as a backward looking indicator of market activity, many people want to use it to look forward. Of course, they can already use the CSI to look for future prices, but the 0.997 correlation between CSI values separated by three months means that anyone with a ruler can "predict" future CSI values. Can the REMI indicate market activity (REMI values) or prices in the future? The correlation between the current REMI and the REMI for the next month is 0.87; it falls to 0.76 and 0.65 at two and three month distances, respectively. The correlations between REMI values and prices are initially disappointing (0.39 in the same month and 0.41 between current REMI and the next month's median price), but they *improve* with more time, i.e., the correlation between current REMI and median price of two/three/four months later is 0.43/0.45/0.46. The REMI may be a reasonable indicator of where prices are going.

Second, it is important to consider the biggest problem with using prices to characterize a market, i.e., their tendency to rise but not fall. This downward stickiness is the result of sellers who prefer to wait to get *their* price rather than sell at the market price. Many sellers do not enter the market (i.e., sales fall) or exit the market as canceled, expired or withdrawn listings. These exits are not included in the REMI (or other indices), but—as Figure 5 shows—they are negatively correlated with sales (-0.40); they also have a -0.12 correlation with the REMI.

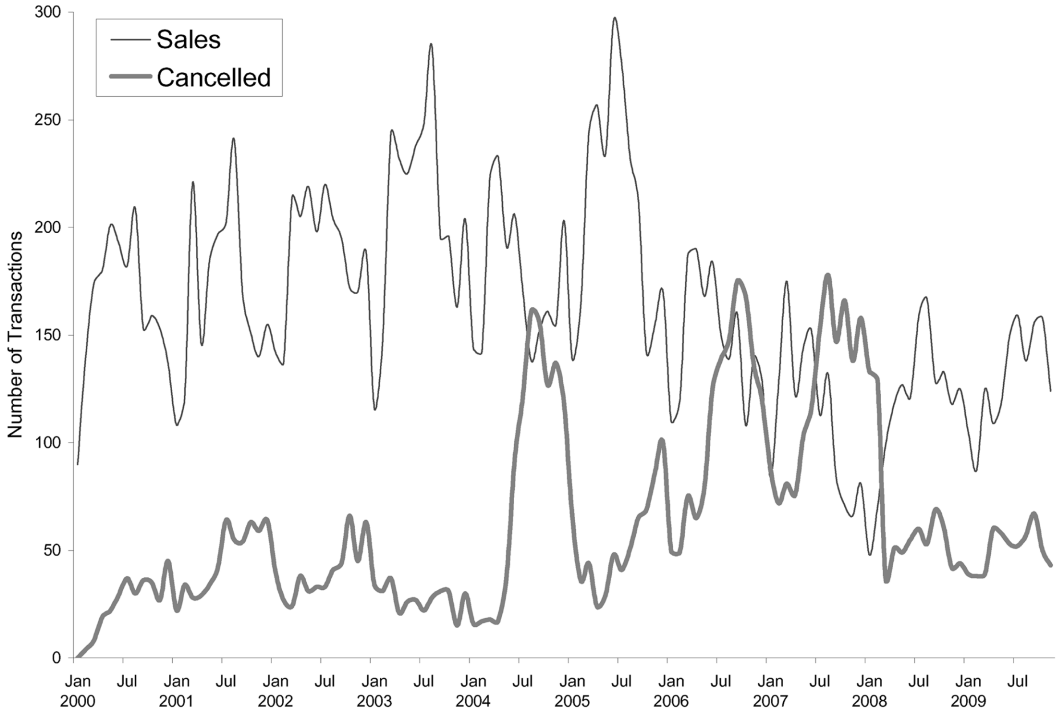

FIGURE 5. Canceled, expired and withdrawn listings are now high in Mission Viejo.

With sticky prices, markets must adjust elsewhere, i.e., in lower sales or higher DoM. Compare Mission Viejo's market conditions in February 2004 and February 2008: Although median prices are nearly identical ($495,000 versus $500,000), sales and median DoM are nearly reversed (142 sales averaging eight DoM in 2004 versus 70 sales and 148 DoM in 2008). REMI-MV values reflect those differences: The 2004 REMI is 229, but the 2008 REMI is only 15. These numbers match the conventional wisdom (e.g., "Home prices still hot" in the February 18, 2004 Orange County Register and "Tell us 'Is home market at bottom?' '' in the March 9, 2008 Orange County Register) and demonstrate how the REMI provides a more accurate description of market conditions than indices based on price alone.

Conclusion

The real estate market suffers from many statistics and little understanding of how they fit together. The REMI combines values for price, sales and days on market into a single index that can be used to understand the level and direction of market liquidity—even relative to other REMI-indexed markets. When the REMI is high, markets are hot; when the REMI is low, they are not.

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NOTES:

[1]On 26 May 2010, the Wall Street Journal reported (emphasis added) "While the two home-price indexes [CSI and another] diverged in March, they outlined the same overall trend of prices stabilizing after steep drops during the recession. But with the expiration of the home-buyer tax credit likely to pull down demand, and the potential for more foreclosures, *the housing market* is still bouncing along at low levels." (Murray, 2010)

[2]DoM is the number of days between listing a house for sale and "selling" it, i.e., opening escrow. The actual sale occurs after an escrow period (usually 30-90 days) during which buyers and sellers fulfill the provisions of the sales contract. Monthly data are for sales that close escrow in that month.

[3]Clapp et al. (1991) argue that repeat sales are no better than all sales when measuring price changes over three or more years. Although this claim holds for long term trends, it does not displace the CSI as the measure of annual, quarterly or monthly trends. Gatzlaff and Ling (1994) argue that hedonic and repeat sales based indices need and waste too much data, respectively. They calculate indices based on fewer hedonic components or assessed values, but their ideas have not displaced the CSI.

[4]Using data from http://www2.standardandpoors.com/spf/pdf/index/cs__tieredprices__022603.xls. The correlation between MV price data and average CSI values for Los Angeles and San Diego (Mission Viejo lies between them) is 0.989.

[5]Note that both the probability of sale and DoM rely on actual sales; canceled listings are excluded.

[6]The positive relationship between price and canceled listings may result from overshooting seller expectations, i.e., they list too high (and cancel) when prices are higher.

[7]They claim that a fall in sales is correlated with an increase in price dispersion. MV data fail to reject this hypothesis: A one percent increase in the standard deviation of prices is correlated with a 0.48 percent fall in sales.

[8]The reverse is also possible: Fewer buyers leads to a glut of sellers and houses and thus falling prices.

[9]In the inverse of this hypothesis, Krainer (2001) predicts that sellers will sell fast when prices are high (not waiting for the top of the market) but sell slowly when prices are low (hoping for a good match with a buyer). This hypothesis is also rejected by the data.

[10]Realtors use "days of inventory" (number of homes divided by sales per day) as a shorthand indicator of current market conditions. Sales and DoM reproduce this heuristic but only for closed sales.

[11]Because houses get stale as DoM rises, realtors cancel and relist houses as "new" properties to attract

buyers with freshness (and often lower prices). I control for this behavior by adding DoM from previous canceled listings to get the final DoM on the house that sold. I do not include cancelations, expirations and withdrawals in the direct calculation of the REMI, but those "failures" do rise when the market cools; *see* Figure 5.

[12]Since the number of times the weighted REMI misses the goal is discrete and does not capture the distance of the miss, it is very sensitive to weight changes. This non-linear characteristic suggests that it would be unwise to establish an optimal set of weights based on the "best" fit of a particular dataset. (The best fit for MV data—nine misses—occurs at 50/33/17.) It seems better to stick with "sensible" weights.

[13]Inverse weights are troublesome because they can only be used when all of the data are available (weights will be inaccurate when new data are added), and they would be different for every set of data—impeding comparison across REMIs. Dynamic weighting updates as variance-to-date changes, but it is very unstable and misses the Goal more often.

[14]More weight on price can produce "good" results (e.g., 70/20/10 violates the goal 12 times), but such heavy weights violate the notion that no one variable should dominate the REMI.

[15]Data and calculations for this example are available at www.kysq.org/pubs/remi.xls.

[16]Multiple Listing Service ("MLS") data are available to members of the local board of realtors, who are generally real estate agents. I downloaded 19,833 closed escrows from www.socalmls.com and deleted 453 incomplete records (2.3 percent) to get a population of 19,380 sales. My data include about 1,000 sales from Ladera Ranch—a housing development founded in 1999 that was included in Mission Viejo MLS data until sometime in 2006. Note also that the REMI suffers from missing sales data (a problem common to existing price indices), which reduces REMI volatility: In a hot market, the REMI is lower than it *should* be because it excludes For Sale By Owner ("FSBO") properties that are sold without being recorded in the MLS. In a cool market, the REMI is higher than it should be because seller concessions to buyers do not appear in MLS sales prices. The omission of new housing sales from the REMI reinforces these biases: Builders sell volume at full price in hot markets without listing on the MLS. In cold markets, they use the MLS and offer ex-contract concessions to buyers.

[17]I do not adjust prices for inflation. Although inflation matters over decades, most people think of prices in nominal dollars—often the price of their own home—and the REMI matches that heuristic.