

How long does it take to sell a home?

By Norm Miller

Introduction

The answer is not as simple as “that depends on how it is priced?”, although asking price relative to market value does matter. More specifically, how long it takes to sell a home or the time on the market depends on 1) the pricing strategy, 2) market conditions, 3) the season, 4) the price range of the home, and 5) how well it is marketed. How well it is marketed is beyond the scope of the discussion here, but certainly experienced agents are better at pricing and staging a home for sale. We can address the other factors and do so here. The following sections address each of these factors in turn. Towards the end of the article we conduct some empirical tests that test how well each of these factors explain how long it takes to sell a home.

I. Pricing Strategy

The decision on how to price a property for sale is nuanced, has varied over time, market conditions, and across markets. The reason there even exists a pricing strategy is primarily because housing is complex bundle of goods and some are more unique than others. Buyers are also unique, possessing different levels of information, relying on different sources of information, some with aligned interests and some that only imply their interests are aligned. Each person will value any given property differently. As a result of different values or reservation prices, a transaction eventually turns into a negotiation between potential buyers and the seller. The starting point of the negotiation is the listing price of the property. As with many things in life, the path you take and how you get started can have important implications on the outcome. This discussion below is concerned with the interaction of the listing price and how long it takes to sell the property.

Among the earliest studies on pricing and time on the market was Cubin (1974). The primary challenge for all empirical papers is to determine whether the listing price is higher or lower than the true market value. In the 1970s this was a very difficult to accomplish. Cubin (1974) introduced the notion that pricing mattered and affected how long it took to sell the property. Research by Miller (1978) had suggested it was not possible to maximize both selling price and minimize selling time. A lower price relative to market value would generally result in a faster sale, but not necessarily at the highest price. We also know that different influencers on buyer and seller behavior affected pricing. This is because different parties involved in the sale of a property have different incentives. For example, brokers may be more focused on the ease and speed of the sale, while the owner may be more focused on maximizing the selling price. Geltner, Kluger and Miller (1991) examined pricing in the context of broker efforts and probability of sale. Their results suggested that lower asking prices were in the interests of brokers, but not sellers.

Merlo, Ortalo-Magne and Rust (2013) assume the seller wants to maximize the net present value of the home and utilize a framework with a discount rate and introduce the ability to change list price. In a sample of 780 English homes sold between 1995 and 1998 they utilize a rich data set of offers and list price modifications, concluding that list prices are sticky due to minor but significant costs required to change the list price.¹ They find it rare to see bids above list price and also note that buyer arrivals are sensitive to changes in price. One interesting result from their study is that underpricing can bring more buyers in the door, thus it should shorten time on the market. Even after this shorter marketing time, this strategy generally results in a lower net value for the seller. This is in contrast to the Han and Strange (2013) results discussed below.

Using data from the 1980s, Miller and Sklarz (1987) found that asking prices are relevant for time on the market, but had less impact on the final selling price.² The marketing environment has changed since the 1980's where information travels much faster and buyers can get automated search updates on new listings and price revisions. This might explain some of the increased propensity for bidding wars as reported by the National Association of REALTORS. Han and Strange (2013 and 2014) focus on the role of asking price with particular attention to circumstances that encourage multiple bids and bidding battles.³ For example, the Han and Strange study (2014) was based on data collected during the 2003-2006 boom period. They observe several markets with sale prices above list price transactions as a percentage of all sales in 2003 and then again, but less so during 2007-2010 characterized as a bust period. These results strongly suggest that market conditions matter for testing the impact of list price strategies.

Historically the sales price has been in the mid-90% range figure as a proportion of list price. Miller and Sklarz (1986) reported on annual data from 1973 through 1985 and found a range of sale price to list prices from 90% to 96% with the lower bound during weak markets and the upper bound during stronger markets. Ortalo-Magne and Merlo (2012) found that 96% is typical using a sample from the UK from the mid-1990s and W. Strange found similar results in the US (2013). Sales prices above list price were considered rare events prior to the year 2000. The National Association of REALTORS reported a sales price to list price ratio of 98% at the peak of the housing boom in 2005. One might conjecture that in prior decades the asking price was viewed as a ceiling for a home price bid, but that today, with the speed of information transmission and the possibility of triggering bidding battles, that this assumption is no longer valid. Apparently, some real estate agents have learned to encourage bidding battles by asking a lower price for a home, relative to value, whereby they increase the probability of simultaneous multiple potential buyers.

¹ Today, one reason why we may see more frequent list price changes, usually decreases, is that it is easy to make such changes and in some cases it triggers an automated note to potential buyers that have previously viewed a listing.

² See "Pricing Strategies and Residential Property Selling Prices" in the *Journal of Real Estate Research* by N. Miller and M. Sklarz, Vol. 2, 1, Fall, 1987.

³ See in the reference list "Bidding Wars for Houses" by L. Han and W. Strange, 2014 and also "What is the role of asking price for a house?" 2013.

Han and Strange (2013) build upon the work by Yinger's (1981) a random search and matching model. Other random matching approaches include Haurin (1988), Piazzesi and Schneider (2009) and Novy-Marx (2009). Random matching models do not model the role of the asking price but help explain how it is rational to pay different prices for a similar home as a function of search costs and random information collection. In contrast, directed search models of housing markets have explicitly modeled how asking price impacts buyers' search activity and hence transaction outcome. Notable examples include Chen and Rosenthal (1996) Arnold (1999), Green and Vandell (1998). These papers treated the asking price as a ceiling. Han and Strange allow for the possibility of bidding wars where the sales price exceeds the asking price. They also allow the number of visitors to vary as a function of asking price. Not surprisingly the number of visitors increases as asking price decreases and this triggers the possibility of bidding wars. There are a number of other behavioral factors that could affect the prices paid or accepted including loss aversion, Genesove and Mayer (2001) or search costs, Miller (1978) or Miller and Rice (1981) and most of these help explain why we observe price dispersed markets making the empirical estimation of most probable market value a challenge. A few other studies attempt to examine how asking price may signal quality, the impact of price cutting behavior, and the impact of different market conditions (Sass (1988) and Novy-Marx (2009)).

Behavioral economics also sheds some light on asking prices, explaining that given modern home buyer search methods (i.e. websites like Zillow, Trulia, REALTOR.com) it makes sense to price just under a bracketed rounded off figure. Beracha and Seiler (2014) explain and suggest staying just under rounded off list prices will increase the number of viewers.

II. Market Conditions and Time on the Market

The time on the market is, almost by definition, related to market conditions. When the supply of housing is fixed or increasing slowly and demand is increasing (due to fundamentals or the availability of credit) we should expect increasing prices, bidding wars and typical homes selling quickly. In contrast, when demand is declining and supply is fixed or over built then prices should decline.

There are many other nuances that change the time on the market over the business cycle and Case and Shiller (1988) find that home buyers in boom cities had much higher expectations for future price increases. That is, they assumed recent past year price increases would continue. Such buyers were also more influenced by investment motives versus consumption motives. There is evidence of anchoring from the recent past for sellers as well. Case and Shiller found excess demand in boom markets and excess supply in the post-boom market. Boom markets, with rapidly increasing prices could occur because of declining interest rates or strong economic growth relative to supply. In such market, time on the market declines. When the economy is slowing, interest rates increasing and price increases slowing or declining, time on the market increases.

Glower, Haurin, & Hendershott, (1998) extend the literature by considering the market conditions on a single seller in a theoretical model. They conclude that changes in market conditions can affect both liquidity (time to sell) and market value.

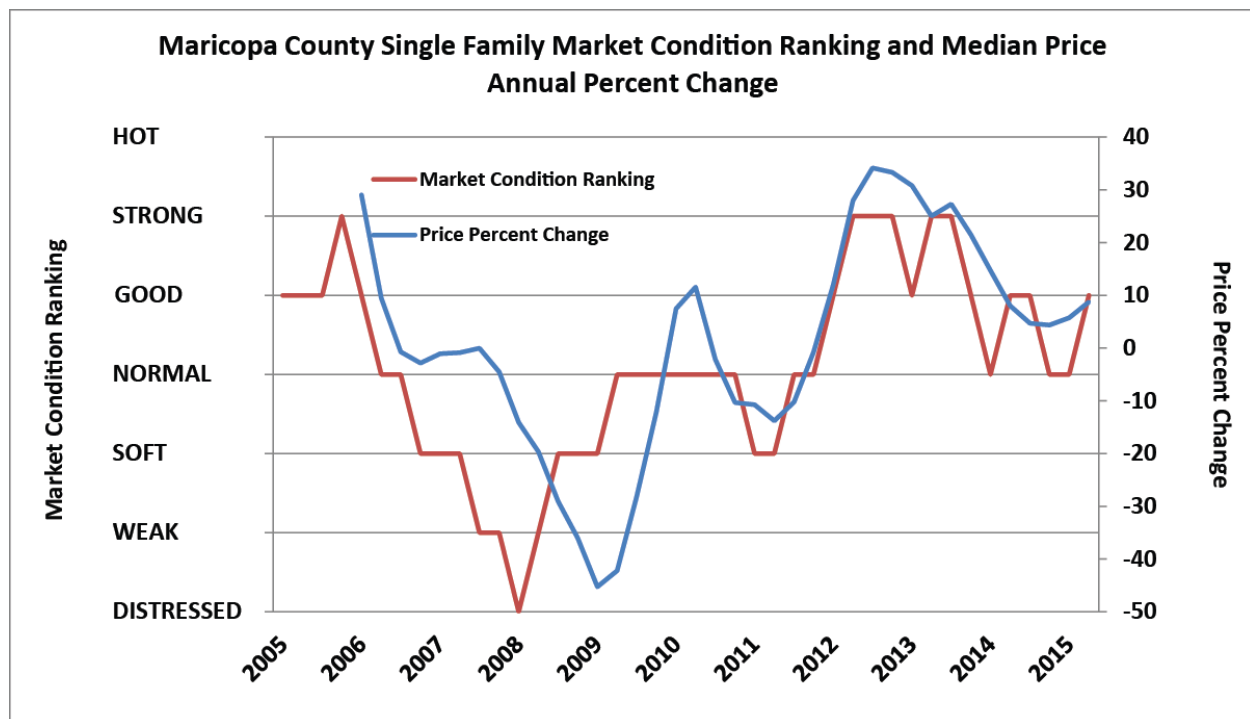
Hui, Wong and Wong (2012) explore the role of economic conditions and pricing on time on the market for property in Kowloon (near Hong Kong). They find that over-pricing does extend the expected time on the market and also mention, like Anglin, Rutherford and Springer (2003) that many homes listed for sale expire without ever selling. Like many studies before, they attempt to estimate true market value using a hedonic model and use a hazard model to estimate the probability of sale at any given point in time. The contribution they make is through a set of variables to control for current economic conditions, such as employment trends, lending rate trends, and median household income.

Sklarz, Follain and Miller (2015) used a set of much more localized market condition indicators that could affect price or days on market. Among these, for the prior year, are:

- ✓ Number of Sales
- ✓ Absorption Rate
- ✓ Number of Active Listings
- ✓ Months of Inventory Remaining
- ✓ Median Sold Price
- ✓ Median Sold Market Time
- ✓ Median Active Listing Price
- ✓ Median Listing Active Market Time
- ✓ Median Sold-To-List Price Ratio
- ✓ Number of Foreclosure Sales as a Percentage of Regular and REO Sales

Markets are graded from distressed to hot, based on seven categories. Most of the time most markets are in good or normal ranges. In 2009 and 2010 the market was soft or distressed, and in 2006 the market was strong and hot. An example of one county market, Maricopa (Phoenix) is shown below in Exhibit 1 with market conditions shown over time. We see the market condition rating in red and the price changes in blue. The data shown is simultaneous with no leads or lags. Generally we see market conditions leading price changes, but that lead seems to be decreasing over the years.

Exhibit 1: Market Conditions Vary Over Time



Market conditions are continuously graded by zip code for the entire US and this data is fed into our empirical analysis on estimating time on the market. One of the more prominent indicators of market conditions, months remaining inventory, is further explored below in section four, but first we must point out the role of seasonality, seldom controlled by most of the prior literature, in terms of impact on time to sell.

III Seasonality and Time on the Market

There is evidence of inefficiency in the housing market with respect to the volume of single-family homes over the course of a year.⁴ Sales of homes peak at different times of the year across the country, although many common factors affect these cycles like school patterns, employment patterns, holidays and weather. While it is a common knowledge among real estate agents, Goodman (1993) established the pattern of home sales peaking during the Spring-Summer season. Having seen inefficiency with respect to home volumes, it is reasonable to question the existence of informational inefficiency with respect to seasonality in home prices. This was first shown by Kapalanski and Levi (2009) and then extended by Miller, Sah, Sklarz and Pampulov (2017). Both studies demonstrated that not only do volumes vary, but prices also vary over the course of a year, more so in extreme weather markets and less so in more stable weather markets.

⁴ See Goodman (1993) and Figure 1.

Miller et al added to the work by Kaplanski and Levi (2009) by greatly expanding the sample size, exploring new theories and analyzing the seasonality effect in home prices at the Core Base Statistical Area (CBSA) level. If homeowners wished to maximize investment gains, they would certainly sell during the peak months and purchase during the troughs. Unfortunately for most homeowners, the decision to move often creates the need for both selling and buying, lest the homeowners decide to temporarily rent and move twice, adding significant transactions costs to the move and negating much of the benefits from timing the purchase and sale. To the extent these moving costs are significant, the variations in price observed here over the course of the year is rational and explainable. Still, it does allow for some exploitation by first-time buyers or last-time sellers as well as speculators in the housing market.

IV Months Remaining Inventory, MRI, by Price Range

Among the market conditions indicators, one is fairly dominant. It is months remaining inventory or MRI. Generally, markets with less than three months of inventory are strong or hot. Those with three to six months are fairly normal, while those with more than six months are softer. But we do see that what is normal also varies by price range and we show that below.

We show below three exhibits that represent typical patterns of increasing months remaining inventory by price range, for Cincinnati, Columbus (OH), and Indianapolis, with additional exhibits for Atlanta and San Diego below. Generally, the higher the price range within a given market, the more time is required to sell and most often, the months remaining inventory will be higher. Stated another way, relatively higher priced homes, within the same market, are usually thinner markets requiring more time to sell. This is further tested across price ranges by CBSA below.

Exhibit 2: Months Remaining Inventory for Three Midwest CBSAs

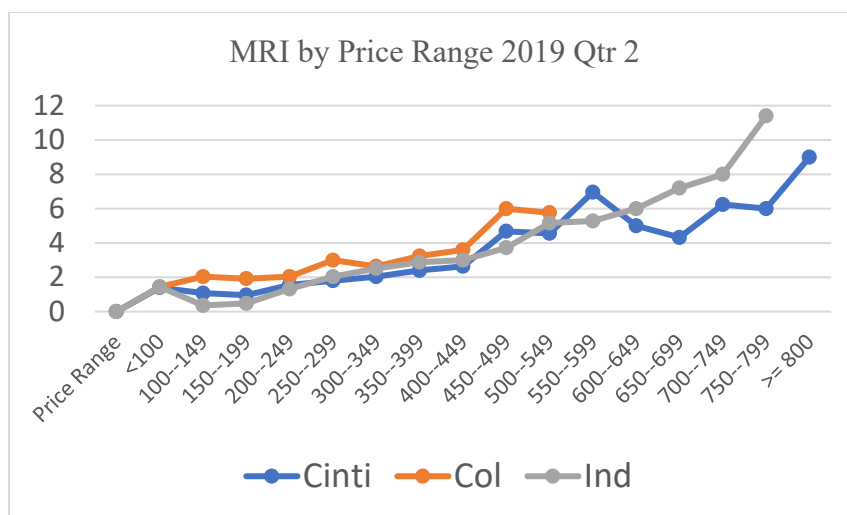


Exhibit 3: Months Remaining Inventory for Atlanta CBSA

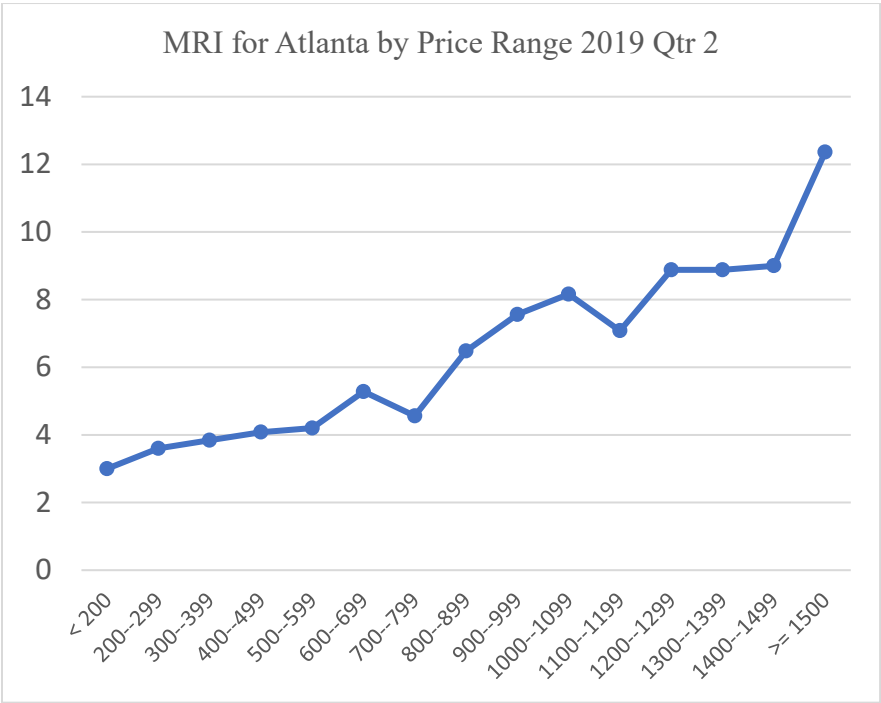
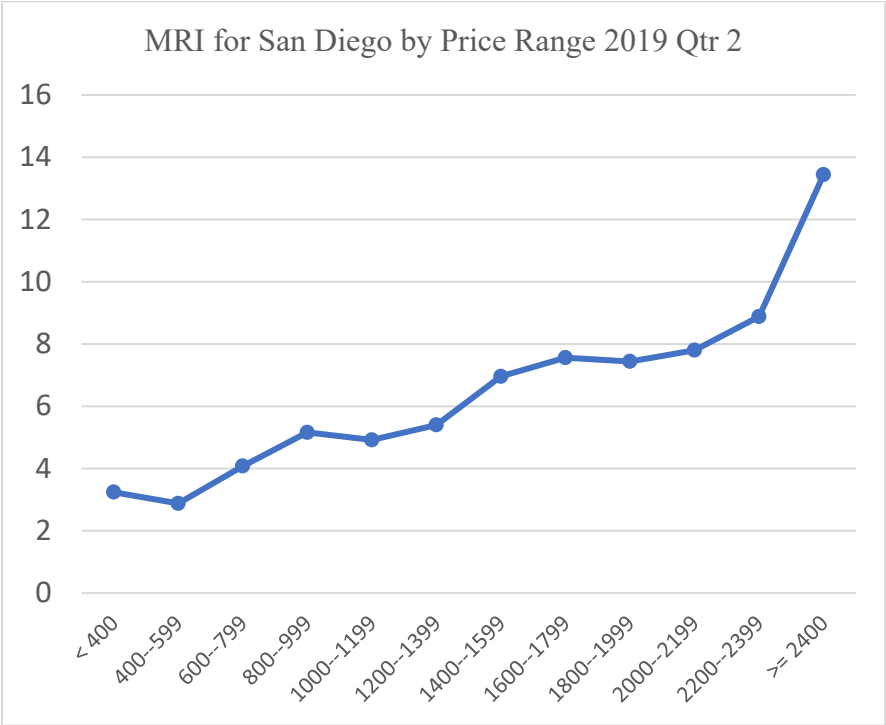


Exhibit 4: Months Remaining Inventory for San Diego CBSA



V Hypotheses

In the following sections we conduct an empirical analysis of the time on the market. The literature discussed above suggest a series of testable hypothesis.

1. Days on market will be lower in stronger markets, defined by lower months remaining inventory or market condition indices.
2. There will be a seasonal pattern to the days on the market.
3. Days on market will be generally higher in relatively higher priced segments of markets, within the same geographic market.
4. When asking prices are close to market values the days on market should be shorter.
5. In active markets, properly priced property should sell on average in less than 60 days.

VI Data and Empirical Analysis

Data comes from Collateral Analytics and covers the period from 2005 through the first quarter of 2019 or 57 quarters. This is panel data that includes 189 major US CBSAs and nearly 27 million residential single-family listings. The data are aggregated for each CBSA quarterly. The following variables are available:

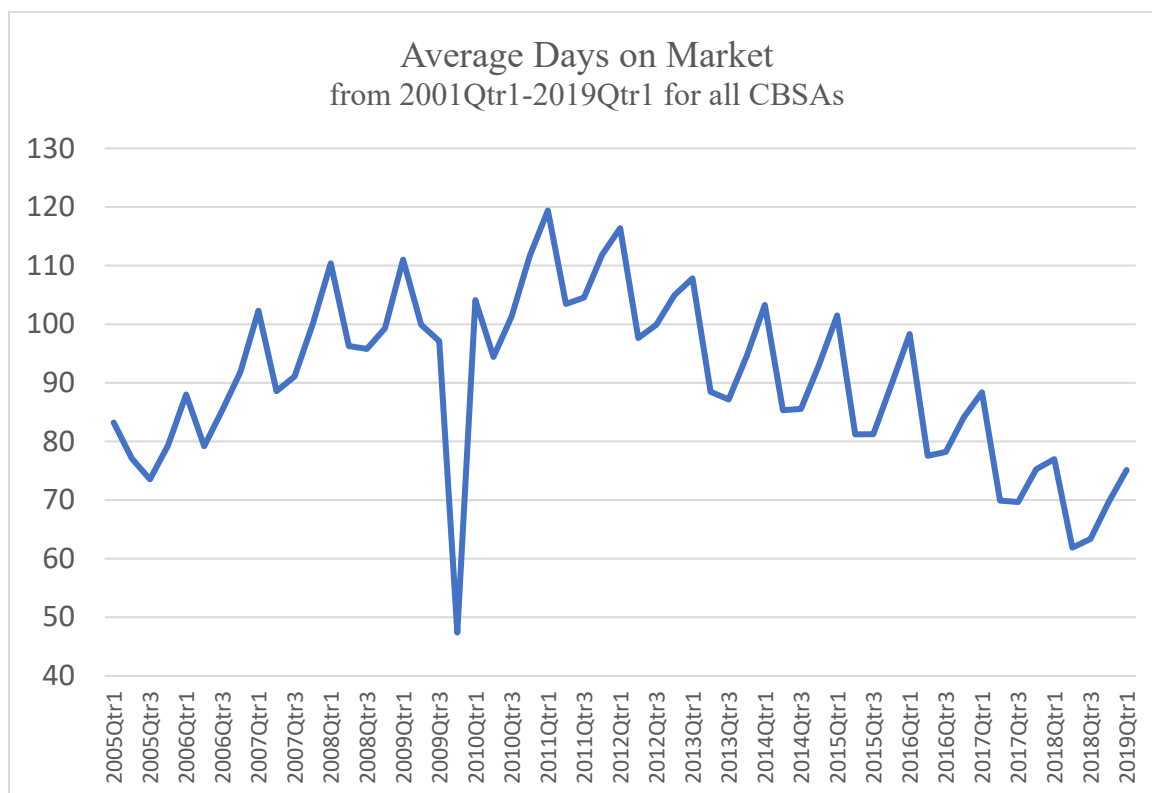
Variable Name	Definition
CBSA	Census bureau defined “core-based statistical areas” tied by socio-economic and commuting patterns and including at least 10,000 people.
Seasonality	Quarterly dummy variables.
Number of Sales	The number of sales in the quarter.
Active Listings	The number of active listing in the quarter.
Date Idx	Quarterly dummy variables.
Foreclosure	Foreclosure sales as percentage of total sales, also tested with a dummy for foreclosures above 5% of sales or not.
Price Tiers	Low, medium and high price tiers with 60% as medium and 20% as high or low.
MRI	The average months remining inventory (MRI) over the quarter based on the prior years sales.
Sold Price Living	Median Sold Price/Per Square Foot of Living Area for homes sold in the quarter.
Sold to List Ratio	Median Sold Price to List Price Ratio for the quarter.

The mean for the sold days on market (DOM) was exactly 90.02 with a standard deviation of 23.10. Note the standard deviation reflects the aggregate calculation for each CBSA. The variation includes changes in time within each CBSA and variation between the CBSAs. The average number of sales per quarter per CBSA was 2,671 and the average number of active listings 6,256. The CBSAs were ranked from shortest average DOM to longest and then entered

into a regression based on rank and as dummy variables. Linear and non-linear models are tested and linear models worked as well as non-linear models.

Seasonality can be observed in Exhibit 5 shown below which shows the average DOM for all quarters over time. We see the consistent pattern of longer DOM for properties put on the market in late fall or winter. In 2009 we see a large number of faster sales as a result of foreclosures and quicker bank REO sales. Generally, we see markets slowing from 2005 through 2011 and then returning to normality and evening quickening over time. Whether this decline in average days on market will continue is difficult to say, but a general lack of inventory and slightly lower volumes is consistent with this faster sales trend. Reasonably priced homes generally sell within 90 days, with the current typical range of 60 to 80.

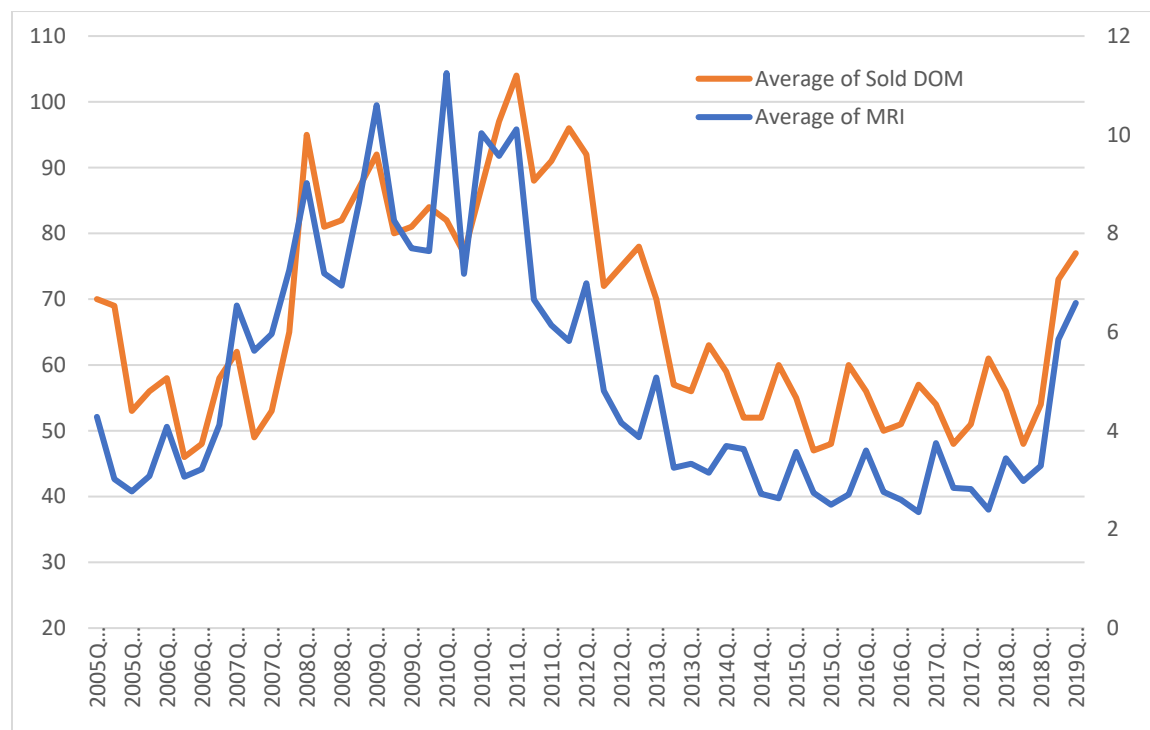
Exhibit 5: DOM Over Time for all CBSAs



Months remaining inventory, like days on market, has also been generally declining since 2011. For the bottom half or so of the price tiers within most markets the months remaining inventory has been extremely low, while in the upper price ranges inventories are much higher as we saw in Exhibits 2, 3 and 4. This is unquestionably the result of a lack of affordable housing units being produced, while new housing has added to the stock of high end product in many markets.

Before showing any empirical analysis, it is helpful to show some descriptive graphs for a few sample CBSAs, that compare MRI to DOM. We see both the seasonality of both variables and the slight but declining lead of MRI relative to DOM. In Exhibits 6 and 7, days on market are on the left Y1 axis and months of remaining are on the right vertical axis or Y2.

Exhibit 6: Dallas CBSA Days on Market Versus Months Remaining Inventory by Quarter

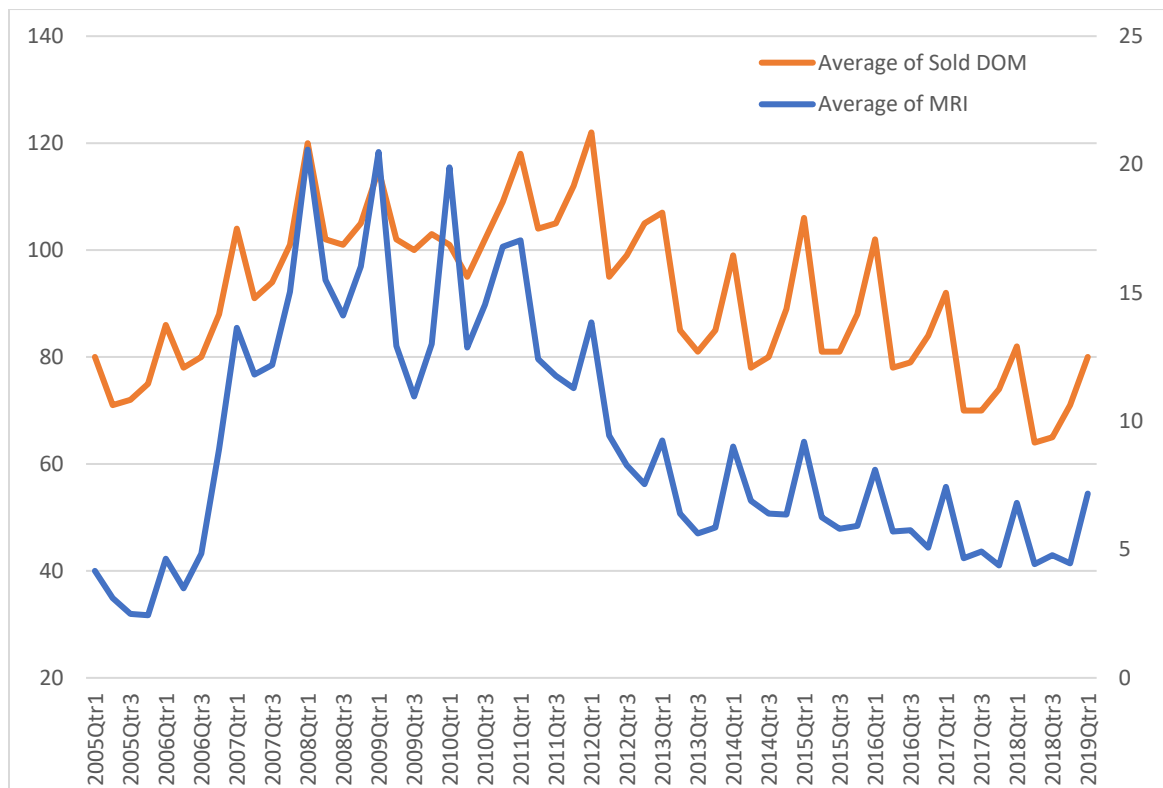


Using only the MRI to explain DOM for Dallas, we get an adjusted R-squared of .6743. Adding in quarterly dummies to control for seasonality this rises to .6891, as shown below:

Sold DOM	Coef	Std Err.	t	P> t	95% Conf Interval Range
Q1	-5.559	3.398	-1.64	.108	-12.377 to 1.259
Q2	-7.416	3.402	-2.18	.034	-14.243 to -.589
Q3	-6.195	3.401	-1.82	.074	-13.021 to .631
MRI	5.349	.503	10.62	.000	4.334 to 6.360
Cons	44.671	3.457	12.92	.000	37.734 to 51.609

The results are very significant and show that MRI and seasonality explain a great deal of the variation in DOM.

Exhibit 7: Chicago CBSA Days on Market Versus Months Remaining Inventory by Quarter

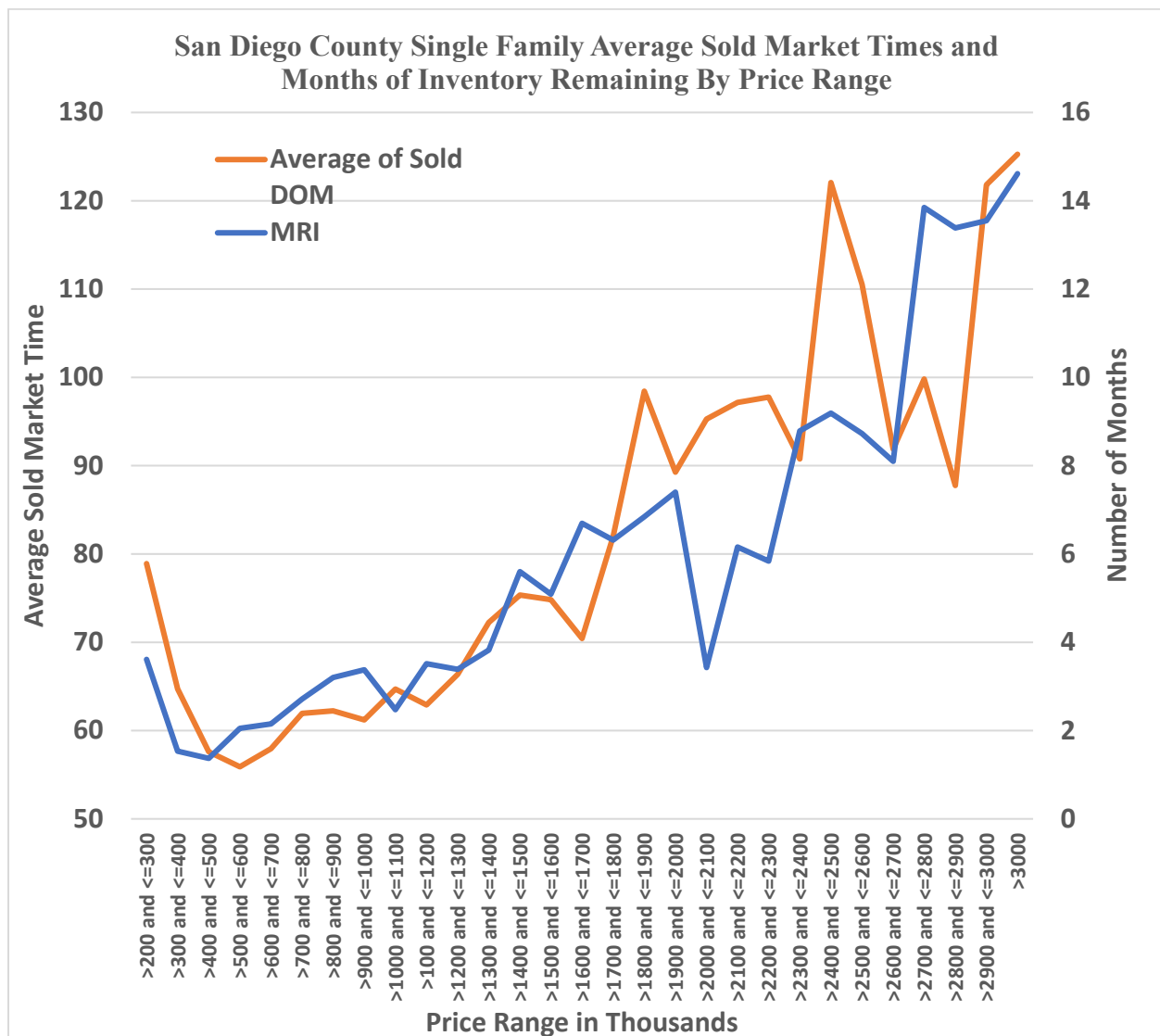


Using only the MRI to explain DOM for Chicago, we get an adjusted R-squared of .7077. Adding in quarterly dummies to control for seasonality this rises to .7387, as shown below:

Sold DOM	Coef	Std Err.	t	P> t	95% Conf Interval Range
Q1	2.479	2.854	0.87	.389	-3.248 to 8.208
Q2	-5.538	2.845	-1.95	.057	-11.248 to .172
Q3	-3.868	2.848	-1.36	.180	-9.584 to 1.848
MRI	2.429	.219	11.07	.000	1.989 to 2.869
Cons	70.707	2.787	25.37	.000	65.114 to 76.299

To improve any modeling of months remaining inventory and its impact on days on market, recall the fact that generally higher priced markets within the same CBSA require more time to sell. Here in Exhibit 8, we show this relationship over the entire 57 quarters from 2005 through the first quarter of 2019, broken into price ranges for San Diego. This is a typical graph, where the very lowest price tiers (bottom 3%) generally take longer to sell. Examining the types of listings in this bottom price range and you will find “mobile” homes on leased land sites, and properties with various title defects. Generally, we observe higher MRI and longer time required to sell a home as the price tier increases, the market thins and the properties become more unique.

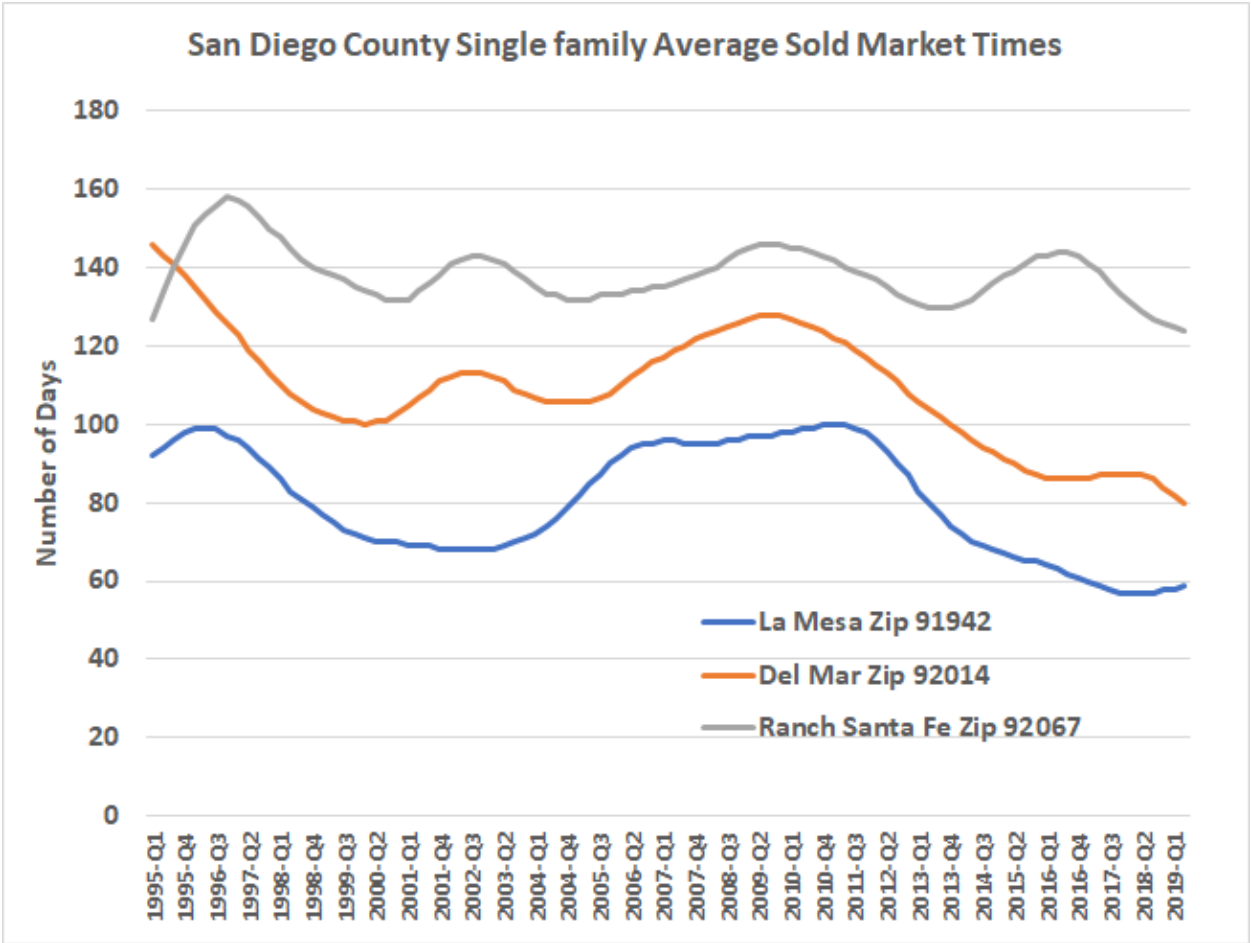
Exhibit 8: MRI and DOM for Price Tiers Over 2005, Qtr through Qtr 1, 2019



Next we examine three different markets, at the zip code level, over time and within the same CBSA. Note that while the days on market are roughly correlated, there is a consistently longer average time required to sell the higher priced markets. Here, in Exhibit 9, we show La Mesa,

more typical of San Diego, with an average price of \$532,000 as of first quarter 2019, Del Mar, with an average price of \$2.4 million, and Rancho Sante Fe where the average price is just over \$3 million. Again, market times show some seasonality, move roughly up and down with general economic conditions and consistently take less time to sell in the more typical and less expensive price tiers.

Exhibit 9: Three Sub-markets Days on Market Over Time



In Exhibit 10 below we show the results of modeling days on market for all CBSAs both with nominal variables and dummies as appropriate. All the variables shown are significant. There was very little time trend as reflected by the date or quarter variable. Overall the R squared results are significant.

From these results and individual market tests, not shown, we can surmise the following:

Seasonality matters a great deal in terms of DOM estimates, as expected.

MRI matters and a higher MRI will imply higher DOM although at a decreasing rate. We should point out that unobserved data distorts the estimate in that listings which do not sell in high MRI markets, will not be reflected as a longer DOM although that is essentially the reality.

The lower the asking price relative to size or value the faster will be the sale. Bidding war effects are not picked up here and seem to work only in strong or hot markets.

The CBSA in which a home is sold matters as there is a systematic difference from one CBSA to another not picked up by market conditions. Overall models work best when applied at the local CBSA level with only that data.

Higher priced markets do not require more time on the market. The effects observed for individual markets, where higher priced listings take longer to sell on average, do not hold for inter-CBSA comparisons. That is, it is the relative price of the home that matters and the highest price tiers within a given CBSA take longer to sell, but this does not hold using absolute prices for higher priced CBSAs. Higher average priced CBSA do not take longer to sell, but the highest priced units within the CBSA will take longer to sell, possibly and among other reasons, because that is where the new inventory is inserted into the market.

Market conditions matter a great deal and homes sell slower in weak and soft markets and fast in strong or hot markets, but this result is similar to the one we get with using MRI alone.

A linear regression seemed to work as well or better as the non-linear form, only the linear form shown below in Exhibit 10 although squaring MRI worked slightly better than using only MRI.

Exhibit 10: Linear Regression Results with the dependent variable: Sold DOM

Model	Coefficients		t	Sig.
	Beta	Std. Error		
(Constant)	110.517	11.410	9.686	.001
Seasonality Qtr1	-2.912	2.641	2.642	.005
Seasonality Qtr 2	-1.567	2.888	2.144	.005
Seasonality Qtr 3	-12.743	4.945	3.888	.001
Number of Sales	-.006	.000	-58.736	.000
Active Listings	.006	.000	52.139	.000
Date Idx (Annual dummies not shown)	-.099	.019	-5.166	.001
Foreclosure (1 for >5%, 0 otherwise)	-.015	.026	-3.162	.001
Price Tiers (Low) Bottom 5%	1.044	2.249	3.668	.001
Price Tier (Normal)				
Price Tier (High) top 5%	5.399	7.376	3.921	.001
MRI	-31.006	13.544	2.669	.008
MRI Squared	3.497	.794	3.764	.001
Sold Price Living	-.003	.000	-17.523	.000
Sold to List Ratio	-8.474	.336	-25.247	.000

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	.725	.526	.525	15.9011	1.596

VI Conclusions

Reasonably priced homes will, at least in 2019, typically sell in 60 to 80 days, with many selling faster, especially if listed in spring and early summer months. It is not unusual to see a home sell within 30 days today as many markets simply lack inventory, especially for any home in the bottom half of the price tiers. As of 2019, home owners are sitting on low mortgage rates and reluctant to upgrade during an uncertain economic outlook. In markets like California, Proposition 13, also reduces the turnover of property and impacts the lack of supply of existing resale homes on the market.

Generally, relatively higher priced homes within any given CBSA, take longer to sell, sometimes by a significant margin as these markets tends to be thinner and this is also where new housing production is often inserted. However, the average priced homes in higher priced CBSAs do not take longer to sell than in lower priced CBSAs, so this slower market effect is based on relative tiers within a market and not absolute by price tier and not across markets.

Asking price relative to market value matters a great deal, but is beyond the scope of the empirical analysis above. Our past research suggests that typical list price to selling price ratios run 96% to 98% and so being within 5% of true market value is necessary to not deter potential buyers. It is also known that buyers typically search within rounded off price ranges, so staying at or below typical thresholds is advisable.⁵ For example, someone may search within a range of \$250,000 to \$300,000 or \$750,000 to \$800,000. Getting into the most common search brackets is helpful but varies by metro market. Bidding wars may occur on some underpriced homes, resulting in selling prices above asking prices, but only in good to strong markets.

Seasonality matters a great deal as do market conditions reflected by months remaining inventory. These are observable and days on market is somewhat predictable. Sellers that wish the shortest days on market will put homes on the market in the spring and generally try and avoid weak, soft or distressed markets to the extent possible. This can be monitored by watching market conditions over time, especially the months or remaining inventory.

⁵ See Beracha and Seiler in references, where they suggest staying just under rounded off list prices.

References

- Anglin, P., Rutherford, R., & Springer, T. 2003. The Trade-off between the Selling Price of Residential Properties and Time-on-the-Market: The Impact of Price Setting. *Journal of Real Estate Finance and Economics* 26(1), 95-111.
- Arnold, M. A. 1999. Search, Bargaining and Optimal Asking Prices. *Real Estate Economics* 27 (3), 453-481.
- Beracha, E. and M. Seiler, 2014, "The Effect of Listing Price Strategy on Transaction Selling Prices" *Journal of Real Estate Finance and Economics*, 49:2.
- Case, K. and R. Shiller 1988, The Behavior of Buyers in Boom and Post-boom Markets, NBER Working paper no. 2748, Oct. 1988.
- Chen, Y., & Rosenthal, R. W. 1996. On the Use of Ceiling-Price Commitments by Monopolists. *The RAND Journal of Economics* 27 (2), 207-220. 23
- Haurin, D. The Duration of Marketing Time of Residential Housing, *Real Estate Economics*, (December 1988) Volume 16:4, 396-410.
- Follain, James R., "A Look at Seller Behavior during Uncertain Times", <http://collateralanalytics.com/15/>.
- Geltner, D., B.D. Kluger and N.G. Miller 1991. Optimal Price and Selling Effort from the Perspectives of the Broker and the Seller. *Real Estate Economics* 19, 1-24.
- Genesove, D. and C. Mayer. "Loss Aversion And Seller Behavior: Evidence from The Housing Market," *Quarterly Journal of Economics*, 2001, v116 (4, Nov), 1233-1260.
- Glomer, M., Haurin, D., & Hendershott, P. 1998. Selling Time and Selling Price: The Influence of Seller Motivation. *Real Estate Economics* 26 (4), 719-740.
- Green, Richard K. & Kerry D. Vandell, 1998. "Optimal Asking Price and Bid Acceptance Strategies for Residential Sales (Revised)," Wisconsin-Madison CULER working papers 98-08, University of Wisconsin Center for Urban Land Economic Research.
- Han, Lu and W. Strange, "Bidding Wars for Housing" *Real Estate Economics*, 42(1) 2014.
- Han, Lu and W. Strange, "What is the Role of Asking Price for a Home?" Working paper, University of Toronto, Oct. 21, 2013.
- Haurin, D. 1988. The Duration of Marketing Time of Residential Housing. *Real Estate Economics* 16 (4), 396-410.
- Haurin, D. R., Haurin, J. L., Nadauld, T., & Sanders, A. B. 2010. List Prices, Sale Prices, and Marketing Time: An Application to U.S. Housing Markets. *Real Estate Economics* 38(4), 659-685.
- Hui, Eddie C.M., J.T.Y. Wong, and K.T. Wong "Marketing Time and Pricing Strategies" *Journal of Real Estate Research*, 34:3, 2012, 375-391.

- J. Cubin. Price Quality, and Selling Time in the Housing Market. *Applied Economics* 6 (1974), 171- 87.
- Knight, J. R. 2002. Listing Price, Time on Market, and Ultimate Selling Price: Causes and Effects of Listing Price Changes. *Real Estate Economics* 30 (2), 213-237.
- Merlo, A., & Ortalo-Magne, F. 2004. Bargaining over residential real estate: evidence from England. *Journal of Urban Economics* 56, 192-216.
- Merlo, A. F. Ortalo-Magne, & J. Rust, "The Home Selling Problem: Theory and Evidence", PIER Working Paper 13-006, <http://ssrn.com/abstract=2209103>, Jan. 2013.
- Miller, N. G. Time on the Market and Selling Price. *American Real Estate and Urban Economics Association Journal (Real Estate Economics)* 6 (Summer 1978), 64-73.
- Miller, N.G. and Rice, P. "A Note on the Differentiation of Market Participants by Search Costs," *Journal of Economic Letters*, Fall, 1981.
- Miller, N.G., V. Sah, M. Sklarz, and S. Pampulov "Is there Seasonality in Home Prices – Evidence from CBSAs", *Journal of Housing Research*, Vol. 22, No. 1, pp 1-17, 2012.
- Miller, N. G. and M. Sklarz "Pricing Strategies and Residential Property Selling Prices," with Michael A. Sklarz, *The Journal of Real Estate Research*. Vol. 2, No. 1, Fall, 1987.
- Miller, N. G. and M. Sklarz "Leading Indicators of Housing Market Price Trends," *The Journal of Real Estate Research*, Vol. 1 No. 1 Fall, 1986.
- Novy-Marx, R. 2009. Hot and Cold Markets of Homes. *Real Estate Economics* 37(1), 1-22.
- P. Anglin, R. Rutherford and T. Springer, "The Trade-Off between the Selling Price of Residential Properties and Time-on-the-Market: The Impact of Price Setting", *Journal of Real Estate Finance and Economics*, 26:1, 95-111.
- Sass, T. R. 1988. A note on optimal price cutting behavior under demand uncertainty. *The Review of Economics and Statistics* 70(2), 336-339.
- Sklarz, M. J. Follain and N. Miller "A New Way to Define Real Estate Market Condition" 2015. See <https://www.collateralanalytics.com/blog/2015/09/01/a-new-way-to-define-real-estate-market-condition/>
- Wong, J.T.Y., C.M. Hui, W. Seabrooke and J. Rafferty. A Study of the Hong Kong Property Market: Housing Price Expectations, *Construction Management and Economics*, 23, 2005, 757-795.
- Yavas, A., & Yang, S. 1995. The Strategic Role of Listing Price in Marketing Real Estate: Theory and Evidence. *Real Estate Economics* 23(3), 347-368. 25
- Yinger, J. 1981. A Search Model of Real Estate Broker Behavior. *American Economic Review* 71, 591-605.