Abstract

Home co-investments represent a new low-cost method to invest in residential real estate with a focus on the underlying appreciation of single-family homes. Using a leveraged equity investment akin to a traditional option, home co-investments offer greater exposure to upside appreciation relative to a direct equity investment.

While home co-investments provide the first equity-based rather than debt-based option for homeowners to tap into their accumulated home equity, in practice their structure is still somewhat inflexible. This paper describes methods to improve the flexibility and adaptability of home co-investments in their current form by introducing customized pricing ratios for an individual property, and the ability to model a dynamic pricing ratio dependent on the customer's desired valuation.

There are several firms that offer these home co-investments, each with their own customized set of rules and parameters. However, they lack two primary features which inhibit the accuracy and customization of the product: unique pricing and leverage based on the home's location and features, and the ability for the homeowner to set the initial starting valuation of the agreement.

By introducing modifications to the Black-Scholes Equation, both factors can be accounted for, resulting in more accurate pricing and leverage for the investment across multiple valuation points benefiting both the homeowner and the investor. In addition, using the same types of modifications to the Black-Scholes equation, further refinements can be introduced considering additional factors.

Pioneered by Unison in the years leading up to the Financial Crisis, home co-investments have emerged as a leading provider of alternative home equity financing for existing and prospective homeowners. Home co-investments offer a means for homeowners to tap low-cost home equity and reduce their financial risk using methods not available through traditional debt products such as a mortgage or line of credit.

A home co-investment provides a homeowner an upfront portion of the home's value from an investor in exchange for the investor receiving a right to the future change in value of the home. For the homeowner, a home co-investment provides an immediate source of financing with no monthly payments, with the investor receiving exposure to a maintenance-free vehicle for future residential real estate appreciation.

Home co-investments are financial instruments structured similarly to an option contract. Unlike a traditional equity investment in which 1% of the home's value would be exchanged for a 1% stake in the future outcome of the home value, home co-investments add a leveraged return on the future value of the home based on the initial payment provided to the homeowner. This represents a structure more akin to a call option as the upside remains largely uncapped, while the downside is capped at the total amount of initial investment. Under this dynamic, the home's value represents the initial strike price of the option, with the payment to the homeowner representing the premium paid for the option, and the leverage represents the ratio between the premium and the delta of the option. The leverage, or pricing ratio, can be thought of as the ratio between the investor's share in change of value of the home relative to the amount given to the homeowner. Due to the added leverage, home co-investments can be thought of as an option trade built on the belief that home prices will continue to appreciate into the future while ensuring a limited downside capped at the value of the investment made to the homeowner.

> *Example: A 10% investment into a property with a resulting 25% share in the change in value would imply a pricing ratio of 2.5x.*

While a close approximation of an option, home co-investments differ in the fact that the agreement still has value if terminated below the strike price, more akin to a feature of a traditional equity investment. The home co-investment would only result in a total loss if the agreement were to be terminated when the value of the home is less than the starting value multiplied by the product of the change in underlying value of the home and the leverage of the home co-investment.

> *Example: Using the same investment terms as above, a $10,000 co-investment into a home valued at $100,000 would only become worthless if the value at termination is less than $60,000.*

This difference allows for the agreement to still have residual value even when the current value is beneath the strike price due to the time value remaining in the agreement and from the equity-like feature of having intrinsic value even when the agreement is terminated below the original strike price.

Unison, Point, and Noah (formerly Patch) are three of the major players in the home co-investment space based on the value of the assets they have generated. Each of these firms largely follow the same core structure whereby an initial investment is provided upfront (option value) at a set valuation (strike price) in exchange for a leveraged share of the home's future change in value at a predetermined pricing ratio (ratio between the value and delta of the option). However, a notable difference from a traditional option is that while the investor controls the origination point of the agreement (both in time and value), the homeowner can decide the termination point. To counter this aspect, each of the three investors named above have mechanisms in place to prevent a loss on the principal invested for an initial period of the agreement.

The Black-Scholes Model, a standardized measure of approximating the fair value of options, can also be used to approximate the value of home co-investments under a wide range of scenarios. This model can help to illustrate why the pricing ratio across the three firms ranges between 2.0x and 4.0x. Using Noah's model as an example along with public information from their website, one can note that a pricing ratio of 3.3x is used, and the maximum time length of the agreement is 10 years. A simplified form of the Black-Scholes Model for home co-investments is listed below along with the resulting calculation for the pricing ratio.

$$Option\,Value = Current\,Price \times N(d_1) - Strike\,Price \times e^{-(risk-free\,rate \times time\,to\,expiration)} \times N(d_2)$$

Where:

$$d_1 = \frac{ln(\frac{Current\,Price}{Strike\,Price}) + (Risk-Free\,Rate + \frac{Implied\,Volatility^2}{2}) \times Time\,to\,Expiration}{Implied\,Volatility \times \sqrt{Time\,to\,Expiration}}$$

$$d_2 = \frac{(ln(\frac{Current\,Price}{Strike\,Price}) + (Risk-Free\,Rate - \frac{Implied\,Volatility^2}{2}) \times Time\,to\,Expiration)}{Implied\,Volatility \times \sqrt{Time\,to\,Expiration}} = d_1 - Implied\,Volatility \times \sqrt{Time\,to\,Expiration}$$

$N()$ *is the cumulative standard normal distribution function*

$$Delta = N(d_1)$$

$$Pricing\,Ratio = \frac{Delta}{Option\,Value} \div \frac{100}{Current\,Price} \times 100$$

Using assumptions that closely models the characteristics used by Noah, an equal strike price and current price of the asset, a time horizon of 10 years, an implied volatility of 12.8%[1], and a risk-free rate of 2.0%, one can approximate that the resulting pricing ratio equivalent would be 3.01x vs 3.30x for Noah.

The pricing ratio can be calculated by dividing the delta of the option by the premium value of the option multiplied by the strike price. The resulting value represents the percentage change in value of the option for every 1% change in value of the underlying asset.

In most cases, the derived pricing ratio using the Black-Scholes Model can be approximated as the floor of the potential pricing ratio for the home co-investment, primarily due to two key factors:

- While the Black-Scholes Model approximates the fair value of the option, given the pace of growth by the home co-investors, demand for the product by homeowners likely outstrips the supply of dollars provided, allowing for the home co-investors to charge a higher pricing ratio
- The homeowner controls the termination date of the investment, resulting in a greater risk that the investment may be terminated at an unfavorable point in time for the investor, warranting a higher pricing.

In addition, discounts to the initial valuation can further inflate the real pricing ratio as is the case for both Point and Noah, while Unison typically does not apply a discount to the appraised value of the home.

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[1] Home Price, Return and Volatility Indices, p. 45, The volatility of 12.8% applies to the Seattle metropolitan statistical areas (MSA), however, due to the calculation and relevance of the study with concerns to the investment properties of home co-investments, this study represents the best approximation for the volatility exhibited by a portfolio of single-family homes. As such, despite its MSA-specific focus, using an equivalent volatility level at the national level provides the best comparison for real-world application.

Point, for example, applies a 15% discount to the appraised valuation. If that discount were to be applied in the form of a lower strike price for the option, the resultant pricing ratio would lower from 2.98x to 2.59x, implying that the premium between the Black-Scholes Model pricing ratio and that currently used by home co-investors could represent an opportunity for further competition as the industry and asset class mature.

To achieve a desired return, home co-investors can resort to adjusting the pricing ratio, apply a customized discount factor, and modify the origination fees paid. Across all three home co-investors, the pricing ratios applied are uniform regardless of location of the property or the amount taken by the homeowner, representing an opportunity to further improve and tailor the product. Unfortunately, the rigidity in pricing and terms results in two primary issues in regard to the flexibility of home co-investments in their current state, namely:

- A uniform pricing ratio ignores the underlying housing dynamics within both the market and at the property characteristic level. A homeowner in California and Florida would have equal pricing terms under the current model of home co-investments, even though their respective housing markets may differ significantly. A uniform pricing structure ensures that every applicant receives the same pricing at the cost of disadvantaging homeowners in stronger performing markets while subsidizing those in weaker performing markets.
- A fixed valuation and pricing reduces the flexibility for homeowners to customize the investment to their needs. Under its current structure, it would not be possible for a homeowner to offer a lower valuation in exchange for a lower pricing ratio or for a higher valuation with a corresponding rise in the pricing ratio.

A Geographic Dynamic Pricing Ratio

Current pricing ratios across all three home co-investors are decided at a national level, allowing for increased standardization of the home co-investment, but at the cost of potentially discouraging customers who feel that their property should warrant a lower pricing ratio than what is held at the national level. With that tenet in mind, any attempt to localize the pricing ratio to increasingly smaller levels of geography serves to provide more accurate pricing for potential homeowners. Similar to a customized interest rate in mortgage origination, there is potential for a future scenario where based on a set of qualifying criteria and characteristics, any individual homeowner may have a unique pricing ratio that is different from even that of their neighbor.

To approximate these qualifying criteria, three key considerations must be kept in mind:

- Pricing ratios should be dependent on the ability for the home to generate positive return for the home co-investment, resulting in a lower pricing ratio for those areas that are higher-performing and a higher pricing ratio for those that are lower-performing.
- Returns differ by the level of urbanization, with average return increasing with the level of urbanization.
- Each geography has a unique volatility profile that must be incorporated into a property’s pricing ratio.

To create a data sample population, the twenty largest metropolitan statistical areas (MSAs) ranked by population can be used. Aggregating data at the MSA level ensures that there is a base level of urbanization, allowing for a more homogenous performance profile, and ensuring that higher performing areas are chosen as home price performance tends to increase with urbanization[2]. The largest 20 MSAs provide a wide geographic spread across the United States, while ensuring that the population scale is large enough that the resulting property data is robust enough for the required analysis.

- *New York, NY*
- *Los Angeles, CA*
- *Chicago, IL*
- *Dallas, TX*
- *Houston, TX*
- *Washington, DC*
- *Miami, FL*
- *Philadelphia, PA*
- *Atlanta, GA*
- *Phoenix, AZ*
- *Boston, MA*
- *San Francisco, CA*
- *Riverside, CA*
- *Detroit, MI*
- *Seattle, WA*
- *Minneapolis, MN*
- *San Diego, CA*
- *Tampa, FL*
- *Denver, CO*
- *St. Louis, MO*

The first objective is to create a measurement that can reasonably assess historical performance and offer insight into the future performance of each MSA. While a myriad of factors can play a role in the performance of each property and the MSA that it belongs to, historical home prices can offer a reliable indicator of future performance. This is due to the presence of autocorrelation or momentum within the housing market as noted by Case and Shiller (1989). Even though it may appear to be succumbing to recency bias rather than the strength of the underlying fundamental factors, the presence of momentum implies that home prices are driven not just by the underlying fundamental factors, but also by their own previous housing prices. By creating an inference for potential future property performance, the pricing ratios for properties located in their respective MSAs can be adjusted to better suit their projected performance.

Given that the Black-Scholes Model provides a reasonable method of assessing the value and pricing ratios of home co-investments, any inference and resulting action due to differences in return will need to affect an input of the Black-Scholes Model for the changes to be reflected. Historical performance can be incorporated into the model by manipulating implied volatility.

To make the manipulation, Upside and Downside Capture Ratios were calculated for each of the 20 MSAs relative to the national average using the FHFA (Federal Housing Finance Agency) All-Transaction Home Price indices. Capture Ratios refer to the amount of price movement exhibited by the underlying asset relative to a one-unit change in price of the index or comparison, and provide a way to segment price movement by upside and downside deviation rather than as a combined metric. These ratios were calculated using quarterly year-over-year returns during the period from 1980-2019, and for the purpose of this demonstration, localized factors such as the political and tax environment are ignored. To minimize the amount of excess distortion caused by extreme ratios, the ratios were then normalized by the second equation below.

$$Capture\ Ratio = \frac{\sum_{1\to n}\frac{MSA\ Return}{National\ Return}}{n}$$

$$Normalized\ MSA\ Capture\ Ratio = \frac{\sqrt{Upside\ Capture\ Ratio}}{\sqrt{Downside\ Capture\ Ratio}}$$

The resulting ratios and normalized ratio for each MSA are listed below.

[2] Rockin' the Suburbs: Home Values and Rents in Urban, Suburban and Rural Areas

MSA	*Upside Capture Ratio*	*Downside Capture Ratio*	*Normalized Capture Ratio*
New York, NY	1.478	0.935	1.26
Los Angeles, CA	1.627	2.103	0.88
Chicago, IL	1.030	1.536	0.82
Dallas, TX	0.955	0.084	3.37
Houston, TX	0.874	0.151	2.40
Washington, DC	1.319	1.338	0.99
Miami, FL	1.604	2.927	0.74
Philadelphia, PA	1.207	0.465	1.61
Atlanta, GA	1.038	1.387	0.86
Phoenix, AZ	1.439	3.126	0.68
Boston, MA	1.570	0.744	1.45
San Francisco, CA	1.815	1.229	1.22
Riverside, CA	1.523	3.267	0.68
Detroit, MI	1.039	2.093	0.70
Seattle, WA	1.453	1.389	1.02
Minneapolis, MN	1.056	1.372	0.88
San Diego, CA	1.509	1.870	0.90
Tampa, FL	1.316	2.515	0.72
Denver, CO	1.262	0.328	1.96
St. Louis, MO	0.827	0.613	1.16

Based on the results exhibited, a wide dispersion in capture ratios can be seen, with the normalized ratios ranging from 0.68 (Phoenix, AZ; Riverside, CA) to 3.37 (Dallas, TX). This dispersion represents a measurement of the estimated differences in performance return profiles by each MSA relative to the national home price index over the period from 1980-2019. A ratio under one indicates that the MSA's magnitude of performance was less than that of the national home price index. Conversely, a higher capture ratio is indicative of a stronger-performing MSA.

Creating a combined metric that incorporates both the Upside and Downside Capture Ratios was critical for assessing the risk-adjusted performance of each MSA. This effect can be denoted by the strong performance in Dallas, TX and Houston, TX on a risk-adjusted basis due to the low Downside Capture Ratio despite having the second and third lowest Upside Capture Ratios respectively.

Traditionally, implied volatility rises from both upside and downside movement, implying that an average, such as a root square mean, may have been the preferred method for normalizing the capture ratios. However, dividing the square root of the Upside Capture Ratio by the square root of the Downside Capture Ratio was needed to accommodate for home co-investments acting as a call option and due to the homeowner controlling the termination period. In addition, using a divisor allows for segmentation between upside and downside outperformance, whereas an average would not be able to distinguish whether the outperformance was to the upside or the downside.

To introduce these findings into the Black-Scholes Model listed above, a new variable (Capture Ratio Modifier) can be created that acts as a modifier to the implied volatility. In this sense, a higher implied volatility leads to a lower pricing ratio, and under the premise that better-performing MSAs should have a lower required pricing ratio, the modifier must act as a positive multiplier to the current implied volatility. The implied volatility used above can be thought of as a proxy for the national average, with the Capture Ratio Modifier acting as a multiplier to either raise or lower the MSA-specific implied volatility. Having performed a normalization to the capture ratios allows for a direct substitute into the Capture Ratio Modifier, and further directly affecting implied volatility.

$$Implied\ Volatility.New = Implied\ Volatility.Old \times Capture\ Ratio\ Modifier$$

Where:

$$Capture\ Ratio\ Modifier = Normalized\ Capture\ Ratio(MSA)$$

Using the reference implied volatility from above of 12.8%, new implied volatility measurements and the resulting pricing ratios have been provided. To reiterate, a lower pricing ratio implies a lower cost of financing to the homeowner and correspondingly more expensive investment to the investor than a higher pricing ratio. More importantly, a higher pricing ratio can apply to MSAs that both outperform to the upside and the downside. While a lower pricing ratio may be thought of as more favorable in a downside scenario as it provides lower leverage to falling home prices, a higher pricing ratio is more advantageous. A higher pricing ratio ensures that at a portfolio level the home co-investment has the highest expected return, and by extension the chance of reaching and exceeding the strike price, while also lowering the potential maximum amount of capital that can be committed to the home co-investment.

MSA	*Modified Implied Volatility*	*Original Pricing Ratio*	*Modified Pricing Ratio*
New York, NY	16.10%	2.98x	2.58x
Los Angeles, CA	11.26%	2.98x	3.23x
Chicago, IL	10.48%	2.98x	3.37x
Dallas, TX	43.14%	2.98x	1.44x
Houston, TX	30.78%	2.98x	1.73x
Washington, DC	12.71%	2.98x	3.00x
Miami, FL	9.48%	2.98x	3.57x
Philadelphia, PA	20.61%	2.98x	2.21x
Atlanta, GA	11.07%	2.98x	3.26x
Phoenix, AZ	8.68%	2.98x	3.75x
Boston, MA	18.59%	2.98x	2.36x
San Francisco, CA	15.55%	2.98x	2.64x
Riverside, CA	8.74%	2.98x	3.74x

Detroit, MI	9.02%	2.98x	3.67x
Seattle, WA	13.09%	2.98x	2.94x
Minneapolis, MN	11.23%	2.98x	3.23x
San Diego, CA	11.50%	2.98x	3.19x
Tampa, FL	9.26%	2.98x	3.62x
Denver, CO	25.11%	2.98x	1.95x
St. Louis, MO	14.87%	2.98x	2.72x

Original Pricing Ratio Assumptions: Current Price $100, Strike Price $100, Implied Volatility 12.8%, Risk- Free Rate 2%, Time to Expiration 10 Years

By adjusting the implied volatility, each MSA's pricing ratio can be modified without affecting any of the other initial assumptions. More importantly, the behavior in the relationship between implied volatility and the resulting pricing ratio is more akin to a logarithmic rather than linear relationship as can be seen by a doubling in implied volatility not leading to a halving of the pricing ratio. This is critical as it allows for further adjustment of implied volatility through additional factors without resulting in extreme pricing such as a zero or negative pricing ratio.

One potential further modification would be to incorporate liquidity into the capture ratios, and by extension implied volatility. Since the termination of a home co-investment is controlled by the homeowner rather than the investor, it is in the investor's best interest to have as much information as possible about when the termination is most likely to occur. The most common scenarios for a termination event would likely be through a home sale or refinance, or through foreclosure if the homeowner becomes financially distressed. The risk of a negative pricing outcome is the highest when the homeowner may be financially distressed, which happens to usually coincide with falling home prices, such as during an economic contraction. When home prices are falling, an investor could be affected by not just a normal market sale, but also by the increased risk of the homeowner becoming financially distressed.

A simple way to estimate the increased risk is by looking at home turnover. In its most basic form, home turnover can be thought of as the ratio of homes that will turn over, via market sale or distressed transaction, in any given year. While reliable foreclosure data has not been available for a significant period, a home turnover rate consisting of only new and existing home sales can serve as an acceptable proxy.

The turnover by year can be segmented between positive home price index return years and negative performing years. This helps to illustrate any turnover, and by extension liquidity, differences that may impact the likelihood of a home co-investment being terminated in different environments. The turnover comparison can be calculated by taking the average annual turnover in a negative performing year and dividing by the average annual turnover of a positive performing year. Due to the low percentage of negative performing years for real estate over the life of the sample, the results may not be actionable. However, during years in which negative performance occurred, home turnover averaged 85% of the rate as occurred in positive performing years.

While informative, this data is sourced from the national level, resulting in no difference in effects at the MSA level. For example, if the Downside Capture Ratios were to be multiplied by 0.85 to account for the reduced turnover during negative performing years, this would only serve to depress the Downside Capture Ratios uniformly, leading to an increase in pricing ratios, but would not help to further separate the performance characteristics of one MSA from another. If MSA level turnover data was accessible, it would be possible to incorporate the turnover dynamic at an MSA level, thereby increasing the accuracy of the pricing ratios.

Introducing MSA specific home price returns allows for an increase in the tailoring of pricing ratios to better reflect the geography that a homeowner resides in rather than uniform pricing exhibited at the national level. This demonstration shows that it is possible to significantly differentiate the potential pricing ratios of each MSA purely by introducing home price returns because of implied volatility. As further studies can be refined, it becomes possible for dynamic pricing to become increasingly granular as not only home price returns can be factored in but potentially down to the individual characteristics of a home, such that any one household may have an entirely unique pricing ratio from that of their neighbors.

Introducing a Flexible Valuation

Typically, when a homeowner enters the home co-investment process, their property will be appraised for the current value, at which point a further discount may be applied depending on the home co-investor. If the homeowner feels that the valuation is unfair, they may request an additional appraisal for their property. The resulting valuation is then used as the reference, or starting value, of the home co-investment.

Although an acceptable solution for solving the required starting value of the home co-investment, it proves to be inflexible to further tailoring that is available with many alternative financial products. Assuming that the homeowner viewed the first appraisal as an acceptable reference point with a corresponding pricing ratio based on the geography and product type, it would not be possible for the homeowner to receive a different pricing if they wished to adjust the valuation. This is a subtle difference from the homeowner believing the value to be unfair. In this case, the homeowner believes the value to be fair, but wishes to alter the starting value of the home co-investment in reference to the fair valuation. To do so would require a change in pricing ratio at a minimum, however, this optionality is currently lacking in the present practice of home co-investments.

While discounting by home co-investors already occurs, there is no readily available method for the homeowner to adjust the valuation to their desired value. Referencing the Black-Scholes Model from above, discounting or overvaluing the property's valuation can be illustrated by changing the strike price (initial valuation) of the agreement while holding all other variables unchanged.

For example, if a homeowner's property were appraised at $1mm, but they were only interested in a home co-investment at an initial valuation of $1.2mm, a new customized pricing ratio would be required. If the original fixed pricing ratio were to be applied at this new higher starting valuation, the home co-investor would be taking on additional risk without additional compensation in the form of a higher pricing ratio.

Introducing a floating valuation or strike price referenced to a set valuation would require abandoning the notion of fixed pricing ratios for a property. The fixed pricing ratio currently used by home co-investors, or a variable geographic pricing ratio as shown above, provides only one pricing ratio for a given home. This fixed pricing ratio can be inadequate when the home co-investment's starting valuation can fluctuate, as it is unable to dynamically change across a range of valuations to ensure that the home co-investor's desired return is still met. While adding a variable starting valuation could create adverse incentives between the homeowner and investor, however, there are methods mentioned below that the investor can undertake to lower this risk.

Ironically, the ability to introduce a floating starting valuation already exists within the current Black-Scholes Model. Recall the earlier examples provided, whereby the introduction of a discount to the strike price lowered the theoretical floor of the pricing ratio. This method could be applied both to discounts, but also to valuations greater than the current value. A starting valuation above the appraised valuation would require a higher pricing ratio, but the Black-Scholes Model provides a way to measure how much of an increase in pricing would be required.

For example, the graphic below shows the curve of the indexed pricing ratio as the strike price changes relative to the current price[3].

[3] *Pricing Ratio Assumptions: Current Price $100, Strike Price $100, Implied Volatility 12.8%, Risk-Free Rate 2%, Time to Expiration 10 Years, Values indexed to Current Price of $100, Pricing Ratio of 2.98x*

As the ratio between the strike price and the current price move to extremes, the resulting curve of the pricing ratios begin to approximate a sigmoid curve. The magnitude of the wave is inverse to the change in implied volatility, although the overall pattern remains consistent.

In the context of home co-investments, however, the pricing ratio curve seen above is not ideal. Ideally, as the strike price of the agreement increases, the required pricing ratio that the investor would receive should increase more quickly. While the pricing ratio for strike prices beneath the current price may approximate an ideal pricing structure, whereby the indexed pricing ratio exhibits an exponential behavior, this behavior does not continue once the strike price exceeds the current price. Instead, the curve begins to taper off, the opposite of what would be desired by a potential home co-investor.

An increasing curve of pricing ratios would be ideal for home co-investments as it can more accurately reflect the risk presented to the investor who does not control the termination point. The risk that the homeowner terminates the investment at an unfavorable point for the home co-investor likely quickly increases as the strike price of the agreement increases relative to the appraised value of the home. This is due to the homeowner likely having a greater incentive to terminate the agreement sooner at the current market value of the property, resulting in a significant loss for the home co-investor as the property did not have enough time to appreciate to the initial strike price. To help compensate for the risk of an early termination, an increasing pricing ratio curve is preferred as it allows for a way in which the homeowner can obtain a home co-investment at a valuation above the appraised value, while also providing a more attractive pricing profile for a potential investor.

The Black-Scholes Model used above will need to be modified further to reflect the desired change. A new term can be added to introduce an exponential pricing ratio curve (the relationship between Delta and the Option Value). Referenced as Variable Pricing, this new term can be added to the existing model as a multiplier, such that Delta increases exponentially relative to the Option Value as the strike price exceeds the current price.

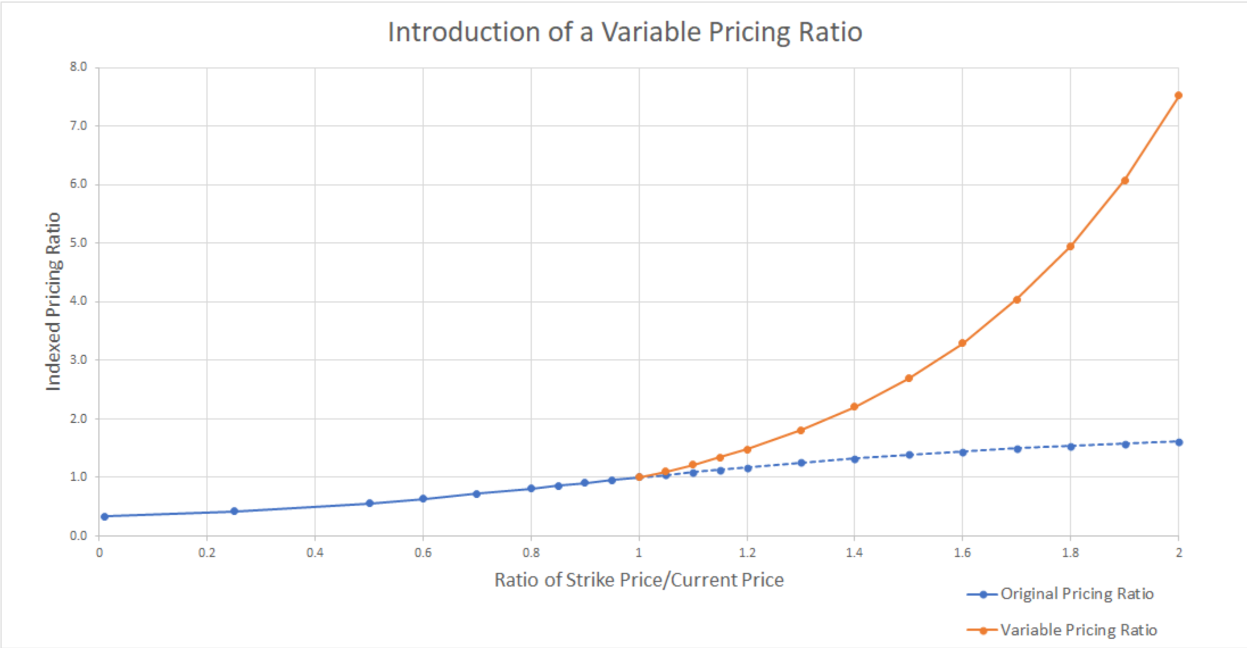
The resulting Variable Pricing term and resulting model can be seen below, followed by the adjusted pricing ratio curve overlaid onto the existing pricing ratio curve.

$$Option\ Value = Current\ Price \times N(d_1) - Strike\ Price \times e^{-(risk-free\ rate \times time\ to\ expiration)} \times N(d_2) \times k(Variable\ Pricing)$$

Where:

$k = constant$

$$Variable\ Pricing = \frac{Current\ Price^{\left(\frac{Strike\ Price}{Current\ Price}\right)}}{Strike\ Price}\ if\ \frac{Strike\ Price}{Current\ Price} > 1$$



Example: A home is appraised at a valuation of $1mm. If the agreement were to be executed with a strike price of $1mm, the resulting indexed pricing ratio would be 1.0x. However, if the homeowner wished to set the strike price at $1.8mm, the resulting indexed pricing would be approximately 5.0x. Conversely, if the homeowner wished to set the strike price at $0.5mm, the pricing ratio would be 0.5x.

Practically speaking, a home co-investor who is interested in introducing an option for a variable valuation for their customers may still wish to restrict the range of options available. Even though a theoretical pricing ratio could be determined for a valuation that is set at twice the current appraised value, there may be too many extenuating circumstances that make the home co-investor too uncomfortable to invest despite the exorbitant pricing ratio. A home co-investor could add some protection by increasing the pricing ratio further by modifying the constant k, however, a higher pricing ratio would likely only serve to further incentivize a homeowner to exit the agreement as soon as is feasible. Alternatively, some homeowners may prefer a higher pricing ratio in exchange for a higher starting valuation as a means to preserve a greater interest in the change in value of their home, or to act as a form of insurance that would only need to be repaid if their home appreciates significantly.

A second factor that could be introduced is to implement a minimum period in which the home co-investor could not take a loss on the investment if the homeowner were to terminate the agreement, otherwise known as a floor. The length of the floor could be correlated to the ratio between the strike price to current price, with a high ratio lasting potentially several years while a ratio under one may have no floor. A floor would help to solidify the investment thesis behind offering a home co-investment that may be set at a valuation significantly higher than the current market value of the property by ensuring that the agreement provides enough time for the underlying property to appreciate close to initial valuation.

Ensuring that the customer has the widest amount of flexibility when considering a home co-investment not only helps to increase the attraction of the asset class to homeowners, but also increases the breadth of the marketplace for new operators to enter into, helping to increase the legitimacy and maturity of home co-investments. Introducing a variable valuation allows for more precise customization by the customer to best fit a home co-investment to their needs. Despite increasing the potential risk for home co-investors, measures can be undertaken to mitigate the added risk while maintaining the home co-investor's return profile.

The Big Picture

Home co-investments are a relatively new concept to residential real estate. In a world traditionally dominated by debt products, whether they be a mortgage or line of credit, home co-investments are the first real estate product to focus on the equity of a home. Over the past decade, multiple new operators have entered the industry, increasing the legitimacy of this type of investment while also introducing competition into the marketplace.

These developments have necessitated the need to continue to expand the horizons of what home co-investments can become by creating both a more precise and more flexible product. The two primary ways this can be accomplished from a customer's viewpoint is by creating a more precise pricing ratio that incorporates factors at a local geographic level rather than at the national level, and by allowing a flexible starting valuation that can be appropriately priced rather than requiring a fixed valuation.

By introducing modifications to the Black-Scholes Model, the model that best approximates the attributes of home co-investments, this paper has offered methods to address both of those issues. Altering the implied volatility is the primary factor in which increasingly granular data can be applied to affect the pricing ratio, while adding a new variable is required to adequately compensate a home co-investor for the added risk of providing a variable valuation.

As home co-investments as an asset class and consumer product become increasingly mainstream, focus will need to turn towards increasing consumer education and the accessibility of these investments. While the solution to tailor pricing mentioned above can help to better approach the consumer's preferred investment style, it will be difficult to implement and may in fact only serve to further confuse the consumer if the proper supporting education is not in place. In addition, further democratization to the class of available investors is required to help broaden the awareness of this new asset class. Conceivably, there could be a future point in time where a homeowner in California may take a home co-investment on their personal property only to redeploy those funds into a home co-investment on an unknown homeowner's property in New York.

Further improvement and innovation to all aspects of home co-investments will be required for the asset class to continue to thrive into the future.

Full Disclosure: Harrison Tateosian is a former employee of Unison Investment Management. The views presented here are his own and he receives no compensation from any company mentioned within. Prior to joining Unison, Harrison worked with WCM Investment Management's equity research team and co-founded a hydroponics startup. Harrison is a graduate of University of California, Irvine in Business Economics.