Market clearing mechanism with time on market, sale price and list price of housing market

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Term Paper

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HOUSING MARKET CLEARING MECHANISM

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Abstract

This article examined the relationships between time on the market (TOM), sale price, and list price of residential properties of Greater Toronto Area (GTA) in the mid-nineties to achieve market clearing mechanism. Multiple plots and two regression models were built to predict the time it takes for a property to sell in the market and sale price to list price ratio (SPTLP) with certain given characteristics of the property. This research considered 11 significant municipalities in GTA to see whether there would be an impact between urban and suburban municipalities. The results indicated that distance from downtown Toronto and whether the property had fireplaces were both significant important to TOM and SPTLP. Other important determinants for TOM were detached house structure type and SPTLP. Houses sold more than listed price had brick exterior and centralized air conditioning. In addition, overpriced houses had more days on the market, and as days on the market increased, the final sale price also dropped below list price. The finding of this study can be used to help home sellers to predict the time it will take for their listed properties to sell and the expected final sale price relative to the listed price.

Introduction

During the past few years, there had been unusually phenomenon in the GTA real estate market, many houses were sold with much higher price than listed price. A detached house fully furnished in uptown Toronto sold \$650k more than listed price in early 2018 (Flack, 2018). Another detached house with its original owner lived there for 30 years and recently renovated the property with laminate floor, and walk in closet in western Toronto listed for \$1,079,900, and sold for \$1,185,000 in 2016 (Yu, 2017). While some other houses were unsold after three month or longer. A two-storey, semi-detached house directly across from a Walmart in York had been

on the market for 10 months although its listed priced decreased from \$755,000 to \$650,000. Another property with three bedrooms, four bathrooms, and a finished basement with an asking price of \$799,800 in Scarborough was listed for five months (Mahoney, 2017). This unusual phenomenon created surplus and inefficiency on the market. As real estate and its related industries accounted for 20% of Canada's GDP in 2017 (Connolly, 2018), more investments and strategies need to be developed to sustain its growth and achieve market clearing. Market clearing "occurs in those market situations in which the amount demanded by consumers equals the amount supplied by firms" (Policonomics, n.d.). In order to find the market equilibrium price, many factors have to be considered. There is one factor that is not being strongly verified which is the time it takes for a residential property to sell on the market. Home sellers want to sell the house with the highest price offered, however there might be trade-offs while waiting for the desired price, for example, interest rate changes. During the past one year period, Canada's overnight rate increased from 0.5% to 1.25% (Bank of Canada, 2018). Features of the property may change rapidly during the wait time. Smart home technologies have become a popular trend for newer residential houses, therefore traditional houses with outdated features will have a disadvantage when compared with newer homes, all else being equal.

Literature Review

There had been numerous studies on relationships between TOM, sale price and list price of residential properties in the past. The research by Asabere & Huffman (1993) studied the impact of overpriced listings on final sale price, and TOM. The data set contained 337 residential sales over the time period of December 1986 to June 1990 from cities of Philadelphia, Montgomery, and Chester. The variables included list price, selling price, TOM, rates of 30-year mortgage rate, unemployment rate, rural location, median household income and median gross

rent. Although the number of observations was small and outdated, but this research still provided historical studies and useful variables such as rural locations which helped us to determine the influence of different municipalities in our models. A regression model was created by setting log of deflated sales price as the dependent variable and other relevant housing characteristics as explanatory variables. The result of the paper was that homes located both in urban and suburban sold at a discounted price due to unpopular city policies and oversupply. Lastly, the research concluded with the finding of if the house was overpriced, the TOM was increased. As the time increased, the property lost its opportunity to buyer exposures therefore the seller had to lower the price to attract new buyers.

For a more recent study done by Cirman, Pahor, & Verbic (2015), the authors collected and analyzed data of 371 transactions for residential property transactions in the illiquid market of Ljubljana from year 2000 to 2010. The dataset included information of the property characteristics, list price, selling price, TOM, location area, interest rate and degree of overpricing which provided insights for sale price to listing price ratio. The authors developed two regression models to estimate the list price and TOM with the given explanatory variables. They found that the most important determinants of the variable TOM in Ljubljana were the cost, availability of housing finance, and housing price index. Furthermore, "higher house prices (at the national level) and the average interest rate on housing loans both extend a property's TOM while better availability of housing loans, in contrast, shortens the TOM" (Cirman, Pahor, &Verbic 2015).

Besides housing structure and locational characteristics, the financing structure of the property was also conducted in a research done by Genesove & Mayer (1997). The authors examined the relationships between list price, sale price, TOM and loan to value ratio. Log of the

number of weeks the property listed, sale price, and list price were set as dependent variables, whereas loan to value ratio, time dummy variables, property attributes, assessed value, occupancy were considered as explanatory variables of the regression models. The data used in this research contained 2,381 observations of condominium transactions in Boston from May 1, 1990 to December 31, 1992. The paper concluded that condo units with higher loan to value ratio took a longer time to sale, particularly, "A unit with an outstanding mortgage balance equal to its market value has a 15% longer time to sale than a unit with an LTV of 80%" (Genesove & Mayer, 1997).

.Methodology and Data

Methods

This study first created an explanatory variable for sale price to list ratio in order to help explaining the relationship between days on the market, sale price and list price.

Then I generated a descriptive analysis for all the available variables in the dataset to find out the number of records, mean, minimum and maximum of each variable. Some of the variables considered as important determinants of TOM from previous studies were analyzed first. Two bar plots were created to determine the relationship between average days on the market and sale price with detached houses. Three scatter plots were created to illustrate the impact of other important housing characteristics on the SPTLP. One scatter plot was created to determine the relationship between days on the market and SPTLP. Lastly, I developed two regression models to explain dependent variables of number of days on the market and SPTLP. The final regression models will be able to predict days on the market for a newly listed residential property in GTA with the most

important determinants of TOM, and also explain why some homes sold more than listed price.

Data

This study observed 2,166 residential property sales data of GTA in the midnineties. The dataset contains house transaction variables of days on the market, list price, and sale price; house characteristics variables of number of rooms, bedrooms, and washrooms, pool, detached house, three storey house, brick exterior, multiple fireplaces, no fireplaces, centralized air conditioning, and finished basement; locational variables of within 1km of a highway, subway and waterfront, and within 2.5km of a large mall.

Major Findings

Statistic	N	Mean	St. Dev.	Min	Мах
id	2,166	14,549.770	7,816.425	264	27,494
dayson	2,166	53.256	38.526	2	185
lstprc	2,166	239,963.500	138,387.100	44,900	1,950,000
sldprice	2,166	227,613.100	127,833.900	40,000	1,550,000
rooms	2,166	6.908	1.459	1	15
beds	2,166	3.309	0.747	1	7
no_wash	2,166	2.496	0.988	1	7
d_cbd	2,166	21.408	13.330	0.208	70.844
hway_1	2,166	0.188	0.391	0	1
sway_1	2,166	0.168	0.374	0	1
mall_25	2,166	0.107	0.309	0	1
beach_1	2,166	0.056	0.230	0	1
pool_ug	2,166	0.065	0.247	0	1
detach	2,166	0.724	0.447	0	1
three_st	2,166	0.044	0.205	0	1
brick	2,166	0.924	0.265	0	1
fire_mlt	2,166	0.093	0.291	0	1
fire_no	2,166	0.355	0.479	0	1
air_con	2,166	0.594	0.491	0	1
bsmt_fin	2,166	0.528	0.499	0	1
sale.to.list	2,166	0.951	0.032	0.711	1.179

Table 1: Descriptive Statistics of Variables

By looking at the descriptive statistics of each variable I found that the average days of houses on the market was 53 days, the average list price was \$239,964, the average sold price was \$227,613, the average number of total rooms, bedrooms, and bathrooms were seven, three, and two respectively. The average distance from downtown Toronto was 21 km, there were 18%

of houses located within 1km of a highway, 17% of houses located within 1km of a subway, 11% of houses located within 25km of a mall, 5% of houses located within 1km of a waterfront, 6% of houses had pool, 72% of houses were detached houses, only 4% of houses had three stories, 92% of houses had brick exterior, 9% of houses had multiple fireplaces, 35% of houses had no fireplaces, 60% of houses had centralized air conditioning, 53% of houses had finished basement. The average SPTLP was 0.951.

Average Days on the Market versus Detached House

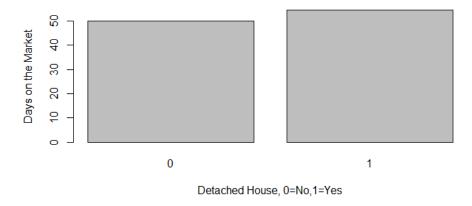


Figure 1: Bar plot of Average Days on the Market versus Detached House

The bar plot of average days on the market versus detached house showed that houses with detached structure type sold for 54 days, comparing to houses with other structure type's 50 days which indicated that it could be a determinant for TOM.

Average Sale Price versus Detached House

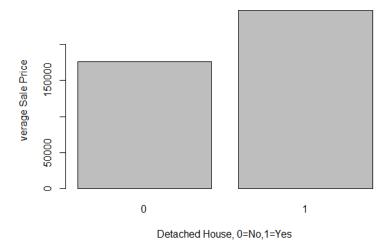


Figure 2: Bar plot of Average Sale Price versus Detached House

The bar plot in figure 2 demonstrated that detached houses sold \$71,202 more than other housing structure types.

Days on the Market versus Sale Price to List Price Ratio



Figure 3: Scatter plot of Days on the Market versus SPTLP

The scatter plot above presented houses sold less than 0.8 SPTLP had less than average TOM. Houses with most days on the market had SPTLP between 0.9 and 1.



Figure 4: Scatter plot of Average SPTLP versus Number of Rooms

The scatter plot in figure 4 showed that houses with less or equal than two rooms, and more than 14 rooms sold with higher SPTLP. Houses with the lowest SPTLP had 13 and 14 rooms. Houses with three, four, eleven and twelve rooms also sold below than average SPTLP. By looking at the graph, as the number of rooms increased, the average SPTLP decreased.

Sale Price to List Price Ratio versus Distance from Downtown Toronto

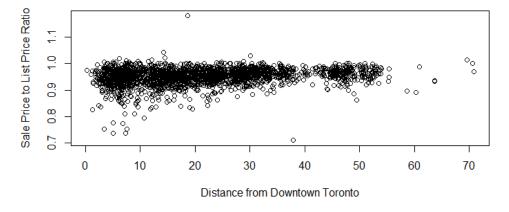


Figure 5: Scatter plot of SPTLP versus Distance from Downtown Toronto

The scatter plot in figure 5 showed that only houses within 10km from Downtown Toronto had SPTLP of less than 0.8. Since there was no strong evidence of houses closer to downtown Toronto sold more than list price, the variable was added to the regression model for further analysis.

List Price versus Distance from Downtown Toronto

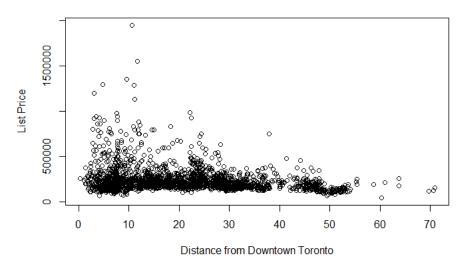


Figure 6: Scatter plot of List Price versus Distance from Downtown Toronto

The scatter plot in figure 6 showed that houses closer to downtown Toronto had higher list price, and as the distance from downtown Toronto increased, list price decreased.

Sale Price to List Price Ratio versus Brick Exterior

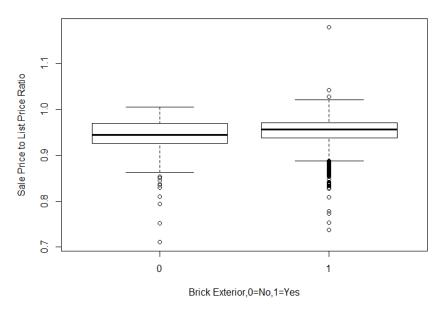


Figure 7: Box plot of SPTLP versus Brick Exterior

The above boxplot showed houses with brick exterior had higher SPTLP, therefore brick exterior was considered as an explanatory variable in the regression models.

The categorical variable municipality was added to the final regression models of days on the market and list price to sale price ratio along with the explanatory variables had more than 1.96 absolute t-values.

```
lm(formula = dayson ~ municipa + d_cbd + detach + fire_no + sale.to.list)
Residuals:
   Min
             10 Median
                             30
                                     Max
-72.344 -29.198 -9.177 19.813 134.235
Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)
                    214.94424 27.69708
                                           7.761 1.30e-14
municipaBRAMPTON 11 15660
                                 9.49620
                                           1.259 0.20804
                                 6.62482 1.684 0.09231
                     11.15668
municipaBURLINGTON -30.31286 27.47329 -1.103 0.27000
municipaCALEDON
                    -0.86897 13.73207 -0.063 0.94955
municipaE GWILL
                    -78.49186
                               38.86613 -2.020 0.04356
municipaEAST YORK 28.36260
municipaETOBICOKE 18.75045
                     28.36260
                                11.07824
                                           2.560 0.01053
                                 8.89401
                                            2.108 0.03513
municipaKING
                     -8.73077
                                38.21429 -0.228 0.81930
municipaMARKHAM
                    14.43111
                                7.73605
                                          1.865 0.06226
municipaMISS
                    20.88433
                                 6.90735
                                           3.023 0.00253 **
municipaNEWCASTLE 13.54197
municipaNEWMARKET 0.61580
                                24.40245
                                           0.555
                                                   0.57899
                     0.61580
                                 8.13083
                                           0.076 0.93964
municipaNORTH YORK 20.24265
                                           2.281 0.02266 *
                                 8.87534
municipaOAKVILLE 14.62343
                                 7.58301 1.928 0.05393 .
                    0.03654
                                 7.84284 0.005 0.99628
municipaOSHAWA
municipaPICKERING
                     9.45248
                                 7.62545
                                           1.240 0.21526
/ .62545
municipaR HILL 33.82898 8.14423
municipaSCARBORO 18.02490 8.05430
municipaTORONTO 24.52270 10.36541
municipaVAUGHAN 22.41966 8 70700
                                           4.154 3.40e-05
                                           2.238 0.02533 *
                                           2.366 0.01808 *
                                8.78706 2.551 0.01080 *
municipaWHIT/STOUF -36.72494
                                22.66590 -1.620 0.10532
municipaWHITBY
                                 7.99943 0.302 0.76287
10.39904 2.011 0.04441 *
                      2.41382
                               10.39904
municipaYORK
                     20.91646
d_cbd
                                            2.600 0.00940 **
                       0.71609
                                  0.27547
detach
                       4.69082
                                  1.97025
                                            2.381 0.01736 *
                       4.30374
                                  1.82339
                                           2.360 0.01835 *
fire_no
sale.to.list
                   -209.45932
                                 26.83346 -7.806 9.17e-15 ***
Signif. codes: 0 ?**?0.001 ?*?0.01 ??0.05 ??0.1 ??1
Residual standard error: 37.76 on 2138 degrees of freedom
                                Adjusted R-squared: 0.0393
Multiple R-squared: 0.05128,
F-statistic: 4.28 on 27 and 2138 DF, p-value: 1.591e-12
```

Figure 8: Final regression model for Days on the Market

The final regression model for number of days on the market suggested that for houses with identical distance from downtown Toronto and SPTLP, non-detached structure type, and have fireplaces, the number of days on the market in East Gwillimbury was 78 days less than in

Ajax; for houses in Scarborough and Etobicoke, the number of days on the market was 18 days more than in Ajax; for houses in Mississauga, North York and York, the number of days on the market was 20 days more than in Ajax; for houses in Vaughan, the number of days on the market was 22 days more than in Ajax; for houses in Toronto, the number of days on the market was 24 days more than in Ajax; for houses in East York, the number of days on the market was 28 days more than in Ajax; for houses in Richmond Hill, the number of days on the market was 33 days more than in Ajax. Houses with identical municipality and SPTLP, non-detached structure type, and have fireplaces, for each kilometer away from downtown Toronto, the number of days on the market increased by 0.7 days. For detached houses, and houses with no fireplaces, the number of days on the market was 4 days more than non-detached house structure type with identical distance from downtown Toronto, municipality and SPTLP. When house's SPTLP increased by 0.01, the number of days on the market increased by 209 days with identical distance from downtown Toronto and municipality, non-detached house structure type, fireplaces. With an adjusted r-squared of 0.0393, the final regression model suggested that the model explained 3.93% of the variance in dependent variable.

```
call:
lm(formula = sale.to.list ~ dayson + municipa + rooms + d_cbd +
    brick + fire_no + air_con)
Residuals:
                1Q
                      Median
                                   3Q
     Min
                                            Max
-0.212625 -0.012794 0.002733 0.017611 0.225436
Coefficients:
                     Estimate Std. Error t value
                                                             Pr(>|t|)
                  0.94735990 0.00984664 96.212 < 0.0000000000000000 ***
(Intercept)
                  -0.00012679 0.00001682 -7.539 0.000000000000696 ***
dayson
municipaAURORA
                 -0.00513105 0.00748814 -0.685
                                                             0.493277
municipaBRAMPTON 0.00111151 0.00523428 0.212
                                                             0.831853
                                          -1.521
municipaBURLINGTON -0.03293383 0.02164857
                                                            0.128334
                                                            0.000765 ***
municipaCALEDON -0.03649730 0.01082991
                                          -3.370
                  -0.09316644 0.03071725
                                          -3.033
                                                            0.002450 **
municipaE GWILL
municipaEAST YORK -0.00009726 0.00876936 -0.011
                                                            0.991152
municipaETOBICOKE -0.00038562 0.00704544 -0.055
                                                            0.956356
              -0.01542482 0.03023465 -0.510
municipaKING
                                                            0.609985
municipaMARKHAM
                  0.00108448 0.00612074
                                           0.177
                                                            0.859383
                  -0.00164096 0.00548224 -0.299
municipaMISS
                                                            0.764722
municipaNEWCASTLE 0.00231801 0.01926117
                                           0.120
                                                            0.904220
municipaNEWMARKET -0.01217041 0.00641294 -1.898
                                                            0.057858 .
municipaNORTH YORK -0.00278544 0.00703916 -0.396
                                                            0.692361
municipaOAKVILLE -0.00680266 0.00599492
                                          -1.135
                                                            0.256613
                  -0.01290991 0.00621657
municipaOSHAWA
                                          -2.077
                                                            0.037949
municipaPICKERING 0.00114958 0.00601906
                                          0.191
                                                            0.848552
municipaR HILL -0.00553765 0.00647294 -0.856
                                                            0.392366
municipaSCARBORO 0.00217417 0.00638373
                                          0.341
                                                            0.733453
municipatoronto 0.00911689 0.00815882
municipavaughan -0.00293890 0.00698432
                                           1.117
                                                             0.263937
                                          -0.421
                                                             0.673954
                                                   0.0000445179071418 ***
municipaWHIT/STOUF -0.07292906 0.01782607 -4.091
municipaWHITBY -0.00658801 0.00630379 -1.045
                                                             0.296101
municipaYORK
                 -0.00563019 0.00820926 -0.686
                                                             0.492893
                 -0.00231828 0.00050755 -4.568
                                                  0.0000052150785539 ***
rooms
d_cbd
                  0.00086277 0.00021780
                                           3.961
                                                   0.0000770209607680 ***
                                                            0.001534 **
                  0.00790787 0.00249276
brick
                                           3.172
fire_no
                  -0.00347282 0.00150669
                                          -2.305
                                                            0.021265 *
                                                            0.003689 **
air_con
                   0.00420936 0.00144811
                                           2.907
Signif. codes: 0 ?**?0.001 ?*?0.01 ??0.05 ??0.1 ??1
Residual standard error: 0.02976 on 2136 degrees of freedom
Multiple R-squared: 0.1222,
                              Adjusted R-squared: 0.1103
F-statistic: 10.26 on 29 and 2136 DF, p-value: < 0.00000000000000022
```

Figure 9: Final regression model for SPTLP

The final regression model for SPTLP suggested that houses with identical number of days on market, number of rooms, distance from downtown Toronto, brick exterior, fireplaces, no centralized air conditioning, and locate in Caledon, the SPTLP dropped by 0.03650 than in Ajax; for houses locate in East Gwillimbury, the SPTLP dropped by 0.09317 than in Ajax; for houses locate in Oshawa, the SPTLP dropped by 0.01291 than in Ajax; for houses locate in

Whit/Stouf, the SPTLP dropped by 0.07292 than in Ajax. For houses listed one more day on the market, the SPTLP dropped by 0.00013, with identical municipality, number of rooms, distance from downtown Toronto, brick exterior, fireplaces, no centralized air conditioning. For one additional room of the house, the SPTLP dropped by 0.00231 with identical municipal, number of days on market, distance from downtown Toronto, brick exterior, fireplaces, no centralized air conditioning. For one additional kilometer distance from downtown Toronto, the SPTLP increased by 0.00086 with identical municipal, number of days on market, number of rooms, brick exterior, fireplaces, no centralized air conditioning. For houses had brick exterior, the SPTLP increased by 0.00791 with identical municipal, number of days on market, distance from downtown Toronto, number of rooms, fireplaces, no centralized air conditioning. For houses had no fireplaces, the SPTLP dropped by 0.00347 with identical municipal, number of days on market, distance from downtown Toronto, number of rooms, brick exterior, no centralized air conditioning. For houses had centralized air conditioning, the SPTLP increased by 0.00421 with identical municipal, number of days on market, distance from downtown Toronto, number of rooms, brick exterior, fireplaces. With an adjusted r-squared of 0.1103, the final regression model suggested that the model explained 11.03% of the variance in dependent variable.

Discussion of Results

By looking at the graphs and regression models created in this study, I found that the determinants of days on the market for a listed residential property were distance from downtown Toronto, detached house structure type, whether the property had fireplaces or not, and SPTLP. Some of the municipalities were also significantly important to days on the market, they were Ajax, East Gwillimbury, East York, Etobicoke, Mississauga, North York, Richmond Hill, Scarborough, Toronto, Vaughan, and York. Detached houses appeared to be listed more

days on the market, this was because detached homes generally had larger lot square footages and more rooms than other structure types. The market recognized this feature, therefore all else being equal, detached homes sold for \$71,202 more than other house structure types. Out of all the significant explanatory variables, SPTLP had the largest absolute t-value of 7.8 which indicated that when buyers were considering buying a house, price was the largest factor. However the adjusted r squared of this model suggested that only 3.9% of the dependent variable was explained, therefore further research with more variables will be needed.

The next problem this paper tried to solve was why did some houses sell for more than list price? The finding was that properties closer to downtown Toronto listed and sold more, however the SPTLP increased as distance away from downtown Toronto, this showed properties closer to downtown Toronto was overpriced, even though it had location advantages however the seller had too much confidence on the price therefore caused the property to be overpriced. This research obtained similar results with previous studies around the world, which proved that overpriced houses would have more days on the market, and for houses that have commonly accepted characteristics such as closer distance to downtown Toronto, more rooms usually sell for less than listed price because of being overpriced, whereas houses with unique features such as brick exterior, and centralized air conditioning sold for more than list price houses. Although some rural municipality had lower sale to price ratio, there was no strong evidence that urban municipality sold with higher SPTLP. As more days the property listed on the market, the final sale price will also drop below list price.

Conclusion

As the residential market in GTA becomes more volatile in 2018 (RENX, 2018), it is important to look at the significant factors contribute to the real estate market changes to achieve

market equilibrium. The purpose of this study is to find out what are the determinants of the time it takes for a residential property to sell in GTA, and why some houses sold with higher price than listed price. This study analyzed 2,166 residential transaction records of GTA in the midnineties and found that the most important determinants of days on the market for a listed residential property were distance from downtown Toronto, detached house structure type, whether the property has fireplaces or not, and SPTLP. Some of municipalities were also significant important to days on the market if the property was in Ajax, East Gwillimbury, East York, Etobicoke, Mississauga, North York, Richmond Hill, Scarborough, Toronto, Vaughan, and York. Overpriced houses had more days on the market, and as days on the market increased, the final sale price dropped below listed price. Nevertheless there were some limitations in this study. I would like to add median household income for the next study, because I believe there should be a significant relationship between household income and sale to price ratio, as higher income families would have stronger purchase power. Another limitation is that the data used in this study was outdated compare to the current market in GTA. Also, economic variables including interest rate changes were not included in this study. They are important because when interest rates drop significantly after the financial crisis in 2008 many first time buyers were able to borrow money from banks and obtain homeownership, and attracted more investors to convert a living home into an investment property (Castaldo, 2017).

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