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A study of numerological superstitions in the apartments market

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Abstract

In this paper we study the influence of superstitions related to numbers 13 and 7 on people's buying behavior in the apartment market. A unique feature of our methodology is that we use real sales data instead of survey or pricing data. Based on the dataset from Saint-Petersburg primary real estate market we compare the share of sold apartments on floor 7 with that of on floors 6 and 8, whereas floor 13 is benchmarked to floors 12 and 14. As floors are comprised by exactly the same apartments we manage to isolate the effects of the “lucky” and “unlucky” numbers. We have found a significantly negative effect of the 13th (“unlucky”) floor on demand for apartments in new apartment houses, but no significant positive effect of the 7th (“lucky”) floor. Possible implications of this result and directions for future research are discussed.

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1. Introduction

Our preliminary research contributes to a relatively new area of empirical economics that deals with the role of superstitions in consumer behavior and the functioning of various markets. Bennett and Barth (Bennett & Barth, 1973) gave birth to so-called Astronomics by studying whether people born under the signs of the wargod Mars were more likely to pursue military careers. Joohnson and Nye (Johnson & Nye, 2011) demonstrated that belief in the greater superiority of dragon-year children among Asians is self-fulfilling. Kramer and Block (Kramer & Block, 2008) have shown that individuals tend to be more risk-averse on Friday, 13. Research related to Asian astronomy and astrology showed that superstitious influence the decisions related to marriage and child birth (Akabayashi, 2008; Bruckner, Subbaraman, & Catalano, 2011; Wong & Yung, 2005). Tufan and Hamarat (Tufan & Hamarat, 1997) studied stock market activity on different dates, but found no jinx numbers effect for stock markets in Romania and Turkey.

Some researchers detected the influence of numerological superstitions on real estate price (Bourassa & Peng, 1999; Fortin, Hill, & Huang, 2014; Shum, Sun, & Ye, 2014). However, all these papers related to real estate were inspired mainly by Chinese superstitions. Superstitions common in Russia are, on the contrary, closer to those widespread in western countries than to Asian beliefs: number 7 is considered lucky, whereas number 13 is associated with bad luck. We have found no research on the role of these numbers in real estate markets. In Russia it is not accepted to miss "13" in the numbering of floors or buildings as it is done in some western countries. This gives us an opportunity to identify the role of numerological superstitions in the marketplace. In addition, our identification strategy differs from that used in any other study. First, whereas most researchers analyzed the influence of certain indicators of good or bad luck on real estate prices, we analyze consumer choice in the primary market for apartments. Second, we manage to isolate the effect of numbers 7 and 13 from the effects of other features (price, view from the window, etc.) by comparing identically planned and prices floors: floor 13 is compared to floors 12 and 14, while floor 7 is benchmarked to floors 6 and 8. Due to active residential development in Saint-Petersburg, the second largest city in Russia, it became possible to collect a sufficient number of apartment houses that are being constructed and look at how successfully apartments located on different floors are sold.

In Section 2 we describe our dataset and identification strategy. In section 3 we present empirical results. Sections 4 and 5 conclude and describe how the research design is going to be improved.

2. Data and empirical strategy

As we would like to isolate the effect of the floor on the demand for apartments, the following criteria were used to select appropriate apartment houses:

- Have no fewer than 15 floors (if a building has 14 floors than for many people 14th floor would be preferable, because there are no neighbors upstairs).
- The price of an apartment is independent of the floor on which it is located.
- Plans of floors 6-8 and 12-14 are identical so that floors 6 and 8 can be used as counterfactuals for floor 7, while floors 12 and 14 – for floor 13.
- The house is under construction and will be finished within 1-2 years from the date of data collection. If apartments in a certain object have been on the market for a long time they are usually eventually bought by someone. That is why as time goes by different floors converge to the 100% share of sold apartments. Therefore, the differences among the floors are likely to be negligible if residential real estate objects whose sales started long time ago prevail in the sample.

- There are no fewer than 10 apartments on each floor (the aggregate number of apartments across all entrances of the building).

The dataset collected in October, 2014 consists of 108 observations and contains data on the share of apartments sold on floors 6-8 (54 observations) and 12-14 (54 observations) for each of the 18 residential buildings being constructed in Saint-Petersburg for which plans were available online. The fragment of the dataset is presented in Table 1.

Table 1. A fragment of the dataset used for regression analysis

object	floor	share_sold	share_sold_12_14	floor12	floor13	floor14
…	…	…	…	…	…	…
6	12	45.8	36.1	1	0	0
6	13	25.0	36.1	0	1	0
6	14	37.5	36.1	0	0	1
7	12	85.2	80.2	1	0	0
7	13	74.1	80.2	0	1	0
7	14	81.5	80.2	0	0	1
8	12	40.0	32.5	1	0	0
8	13	25.0	32.5	0	1	0
8	14	32.5	32.5	0	0	1
9	12	95.5	89.4	1	0	0
9	13	86.4	89.4	0	1	0
9	14	86.4	89.4	0	0	1
10	12	18.8	20.8	1	0	0
10	13	18.8	20.8	0	1	0
10	14	25.0	20.8	0	0	1
11	12	70.0	65.0	1	0	0
11	13	55.0	65.0	0	1	0
11	14	70.0	65.0	0	0	1
12	12	10.0	11.7	1	0	0
12	13	10.0	11.7	0	1	0
12	14	15.0	11.7	0	0	1
13	12	100.0	98.7	1	0	0
13	13	96.2	98.7	0	1	0
13	14	100.0	98.7	0	0	1
14	12	40.0	31.7	1	0	0
14	13	27.5	31.7	0	1	0
14	14	27.5	31.7	0	0	1
15	12	53.8	38.5	1	0	0
15	13	30.8	38.5	0	1	0
15	14	30.8	38.5	0	0	1
…	…	…	…	…	…	…

To control for the differences in time when sales of apartments in a residential community started and some other unobserved characteristics of objects we use the log-transformed share of sold apartments on the 12^{th}-14^{th} floors in the i^{th} object.

We estimate the following specification using OLS with robust standard errors:

$$\ln share\_sold_{ij} = \beta_0 + \beta_1 floor12_{ij} + \beta_2 floor14_{ij} + \beta_3 \ln share\_sold_{i,12-14} + \varepsilon_{ij} \quad (1)$$

In equation 1 $share\_sold_{ij}$ is the share (%) of sold apartments in object i situated on floor j, $share\_sold_{i,12\text{-}14}$ is the share (%) of sold apartments on floors 12, 13 and 14 of the i^{th} object. The latter variable serves as a proxy for the unobserved characteristics of the i^{th} object such as when its sales started and how expensive it is. $Floor12_{ij}$ and $floor14_{ij}$ are dummy variables equal to 1, when j=12 and j=14, respectively. Taking into account that the number of apartments within one house is the same on floors 12-14, β_1 and β_2 are equal to percentage premiums of floors 12 and 14, respectively, over floor 13.

The same type of equation is estimated for the case of floors 6-8 ($share_{i,12\text{-}14}$ is substituted by $share_{i,6\text{-}8}$, $floor12_{ij}$ – by $floor6_{ij}$ and $floor14_{ij}$ – by $floor8_{ij}$):

$$\ln share\_sold_{ij} = \alpha_0 + \alpha_1 floor6_{ij} + \alpha_2 floor8_{ij} + \alpha_3 \ln share\_sold_{i,6-8} + u_{ij} \quad (2)$$

Since we are interested in the significance of coefficients at floor-specific dummy variables, omitted variables bias is not an issue as floor is exogenous (as long as we consider only 3 consecutive floors), i.e. not correlated neither with any unobserved characteristics of a building, nor with the dependent variable.

In addition to running regressions described above, we tested the differences between the floors (based on the percentage of sold apartments) using nonparametric test for related samples (Wilcoxon signed ranks test). In order to do the test we reshape the data so that each building is represented by one line of data and the share of sold apartments on 12, 13 and 14 floors are contained in variables share12, share13 and share14, correspondingly (Table 2).

Table 2. A fragment of the dataset used for Wilcoxon signed ranks test

object	share12	share13	share14
…	…	…	…
6	45.8	25.0	37.5
8	85.2	74.1	81.5
8	40.0	25.0	32.5
9	95.5	86.4	86.4
10	18.8	18.8	25.0
11	70.0	55.0	70.0
12	10.0	10.0	15.0
13	100.0	96.2	100.0
14	40.0	27.5	27.5
…	…	…	…

3. Empirical results

First, we estimated equation 1 in order to test the 13^{th} floor effect. The results are presented in Table 3. Controlling for the overall share of sold apartments on floors 12-14, the demand for the 12^{th} floor is on average $(\exp(0.199)-1)\cdot 100\%=22\%$ higher and the demand for the 14^{th} floor is $(\exp(0.156)-1)\cdot 100\%=16{,}9\%$ higher than that for the 13^{th} floor.

Table 3. Parameter estimates of equation 1 (dependent variable: ln(share_sold$_{ij}$))

	Coef.	Robust Std. error
floor12$_i$	0.199***	(0.0389)
floor14$_i$	0.156***	(0.0389)
ln(share_sold$_{i,12\text{-}14}$)	1.010***	(0.0267)
Constant	-0.170	(0.110)
Observations	54	
R^2	0.967	
Adjusted R^2	0.965	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Parameter estimates of equation 2 are presented in Table 4. Based on our sample, floor 7 slightly outperforms floors 6 and 8, but the differences are statistically insignificant. The joint test of significance has not revealed the influence of the floor number (H_0: $\alpha_1 = \alpha_2 = 0$, F=0.00, p-value=0.954).

Table 4. Parameter estimates of equation 2 (dependent variable: ln(share_sold$_{ij}$))

	Coef.	Robust Std. error
floor6	-0.0132	(0.0797)
floor8	-0.00960	(0.0832)
ln(share_sold$_{6\text{-}8}$)	0.877***	(0.124)
Constant	0.521	(0.564)
Observations	52	
R^2	0.858	
Adjusted R^2	0.849	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Wilcoxon signed ranks test supports the conclusion that the share of sold apartments on the 13th floor tends to be significantly lower than on the 2 neighboring floors (Table 5), while sales on floors 6-8 are indistinguishable (Table 6).

Table 5. Wilcoxon Signed Ranks Test (*share_sold$_{i,13}$* vs. *share_sold$_{i,12}$* and *share_sold$_{i,14}$*)

	Rank of *share_sold$_{i,13}$* -Rank of *share_sold$_{i,12}$*	Rank of *share_sold$_{i,13}$* -Rank of *share_sold$_{i,14}$*
Negative rank difference	14	13
Positive rank difference	0	0
Ties	4	5
Z	-3.297	-3.180
Asymp.Sig. (2-tailed)	0.001	0.001

Table 6. Wilcoxon Signed Ranks Test (*share_sold$_{i,7}$* vs. *share_sold$_{i,6}$* and *share_sold$_{i,8}$*)

	Rank of *share_sold$_{i,7}$* -Rank of *share_sold$_{i,6}$*	Rank of *share_sold$_{i,7}$* -Rank of *share_sold$_{i,8}$*
Negative rank difference	7	4
Positive rank difference	8	12
Ties	3	2
Z	-0.426	-1.399
Asymp.Sig. (2-tailed)	0.670	0.162

4. Conclusion

This is the first study that addresses the influence of superstitions related to numbers 13 and 7 on people's buying behavior. A unique feature of our methodology is that we use real sales data instead of a survey or a conjoint study that may seem to be appropriate tools. Therefore, we study the actual consumer behavior in natural market conditions. Despite the fact that we use non-experimental data, our explanatory factor, the floor number, is exogenous since we consider only floors 12, 13 and 14 which are almost indistinguishable objectively. Based on the dataset from primary real estate market we have found a negative effect of the 13th ("unlucky") floor on demand for apartments in new apartment houses. More specifically, the demand for the 14th floor is on average 17% higher and for the 12th floor – 22% higher than for the 13th floor. This implies that in Russia numerological superstitions are likely to influence the choice of residential real estate. However, no significant positive effect of the 7th ("lucky") floor was found. There is a chance that this effect would become significant if the sample size is increased, but we still expect the effect size to be much smaller than that of the 13th floor effect. Based on the difference between the effects of the 7th and the 13th floor we suppose that Russians are likely to believe in superstitions associated with bad luck rather than in good luck. However this more general proposition needs to be empirically tested.

5. Directions for future research

Even though our study controls for the stage of each object's construction, a more detailed study could be conducted using apartments rather than floors as observations. Each apartment situated on the 13th floor has 2 counterfactuals (exactly the same apartments) on the 12th and 14th floor in the same object. We suppose that floor difference is negligible and the apartments can be considered to have identical characteristics except for the floor number (this seems to be a realistic assumption since whereas people would feel the difference between the 1st and the 2nd floors, the higher the floor the less significant a one-floor difference becomes). By monitoring each triad of apartments from the start of the sales we plan to work out the time each of them was on sale before being bought by someone. Then parametric and nonparametric tests can be applied to figure out whether apartments located on the 13th floor are perceived as inferior.

Such natural experiment has several advantages to what has been proposed in this paper. In particular, the study will be conducted at a disaggregated level, i.e. individual apartments will be monitored from the time the sales are started. Therefore the number of observations will be larger. This, in turn, will allow studying whether floor 13 has the same effect on the apartments of different size or not. If there are such differences, this may imply that different social groups are not equally superstitious (the size of an apartment depends on buyer's family status, income, etc.). We also suppose that buyers of large apartments are more sensitive to the floor number, because they are more likely to stay there for a long time, while studios and 1-room apartments are often bought as a temporary home or as an asset.

An interesting feature of our study is that we used publicly available data that has not been used in this fashion previously. We believe such freely available data has great potential in real estate research (e.g. for research related to identifying the features of apartments that determine how quickly they are bought).

Besides real estate market it would be interesting to see if effects of lucky and unlucky numbers are present in the markets for durables as well as in the market for theatrical and cinema tickets.

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