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## Housing market of Almaty

Kairat T. Mynbaev<sup>1</sup> and Saniya Ibrayeva<sup>2</sup>

**Abstract.** The housing market is special in that houses are immobile, costly and durable. In this paper we look at the determinants of prices of the housing market of Almaty. What affects the prices of houses and apartments? How was the housing market developing during the economic boom and after the financial crisis started?

The paper starts with a review of the existing models. The theory indicates the size, quality and location as the main determinants. To apply the hedonic model, we collected a random sample of about 2,500 observations on housing units in seven districts of Almaty from newspaper advertisements. Those units were categorized by the number of rooms, quality, district, floor, etc. Some of those characteristics are non-numerical and require dummy variables. With the data collected, we ran several regressions in Eviews.

We have obtained valuation figures for different characteristics of housing units. The data clearly show existence of a bubble during 2006-2007. The regression results revealed the differences between different districts, dependence on the quality and floor. Among unexpected results are the facts that corner apartments and floor level have negative coefficients, perhaps because first-floor apartments are considered as potential commercial property or perhaps lower stories are preferred in general but the first storey is the least preferred. Some questions, such as valuation of luxury apartments or those in the north of the city remain unanswered because of lack of data. It would be also interesting to correlate housing prices with the interest rate on mortgages.

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## INTRODUCTION

A house is defined as a bundle of characteristics such as size, quality and location. For a number of reasons, valuing a house is difficult and differs in approach in comparison to other heterogeneous goods valuations. As reported by Harsman and Quigley (1991) it is possible to depict three distinctive characteristics of urban housing as a good. These are:

- 1) *Housing complexity*, i.e. ability of housing to meet various household's needs and be interrelated with household members' activities like life, work, entertainment, etc.
- 2) *Immobility of housing*. Housing is tied to a certain location. This fact makes, for example, commuting very expensive, both in terms of physical and opportunity costs, as well as inconvenient. Therefore, undoubtedly choice of housing involves consideration of the neighborhood, job proximity, and nearby infrastructure, including general public facilities like schools, hospitals, etc.
- 3) *Durability*. This attribute of housing can affect new and existing stock housing markets. Consumers of real property are free to choose the building type, community environment, and other characteristics that would maximize their utility.

Looking at these three characteristics, it is clear that housing price is not easily determined. A variety of statistical techniques have been proposed in the literature to model housing prices which are generally called hedonic regression models. The main advantage of a hedonic regres-

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sion model is that it provides an opportunity to account for the unique housing characteristics mentioned above.

In this work we study the movements of house prices in Almaty, Kazakhstan, during a six year span (2004-2009) using the hedonic regression approach. Residential real estate market of Almaty is the object of research. Specifically, our objectives are to make an overview of Almaty real estate boom and to compute relative contributions of individual determinants of house price. To this end, we first analyze the real estate bubble in Almaty providing possible explanations of its causes and evaluation of consequences. Then we apply hedonic regression analysis as a method of property valuation.

The Almaty housing market presents a particular interest for a researcher, owing to the facts that over the past several years real estate experienced a pricing bubble, Almaty is the largest city in the republic and the income differentials within the city are large. As reported by the Agency of Statistics of the Republic of Kazakhstan (The Agency of Statistics of the Republic of Kazakhstan, 2009), the average city price at the height of the recent boom (first quarter of 2007) was at \$3,700 per square meter, which is more than ten times higher than 2003 levels. As housing is a substantial part of any economy, the aftermath of the bubble is characterized by a negative shock to financial and construction sectors and macroeconomic stability at large. Recognizing these adverse effects, potential house buyers, sellers and developers of new houses are all interested in answers to the questions about the riskiness of the investments in residential real estate, and the constituents of housing value. The banks want to know more about the price risks of real estate because they use houses as collateral for bank loans. The analysis of real estate prices was developed in this paper in an attempt to answer some of these questions.

The paper is organized as follows. In Part 1, a theoretical foundation and the existing empirical studies of the real estate bubble and the hedonic model are discussed.

In Part 2, the case study of Almaty housing market is presented, in which the market is overviewed over the period from 2004 till 2009. This part also contains the description of data employed in the study, with the explanations on how it was obtained. Based on the produced database, the further analyses of Almaty real estate market dynamics are made.

Part 3 discusses the model specification and our findings. For the hedonic research in this section multiple regression is applied to estimate the implicit prices of specific housing characteristics. General advantages of multiple regression analysis in the context of estimation of the market value of residential housing, as indicated by Bruce and Sundell (1977), are its objectivity and time considerations.

Concluding remarks and recommendations are offered in the final section of the paper.

## **Part 1. OVERVIEW OF THE LITERATURE**

The following literature review is a necessary step in understanding current theory and models concerning the real estate bubble and the hedonic model of housing prices.

### **1.1 Real estate bubble**

In the real estate economics literature J. Stiglitz' definition of a bubble is usually presented, which states that "if the reason that the price is high today is only because investors believe that the selling price will be high tomorrow – when "fundamental" factors do not seem to justify such a price – then a bubble exists" (Stiglitz, 1990). Another commonly stated definition is the one by Charles Kindleberger, which is needed for further operationalization of the concept of bubble:

“A sharp rise in price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers – generally speculators are interested in profits from trading rather than in its use or earning capacity. The rise is then followed by a reversal of expectations and a sharp decline in price, often resulting in severe financial crisis – in short, the bubble bursts” (Kindleberger, 2008).

The now classical description of a real estate bubble includes six stages:

- 1) *Foundation phase*, when the increased investors’ expectations about assured long-term returns on their assets are supported by positive macroeconomic developments, when, for instance, a clear GDP increase is complemented by a moderate or negligible inflation.
- 2) *Expansion*. The overall increase in demand for new storehouses, spaces for production and offices is accompanied by an increasing demand of wealthier households to improve their living conditions. These two factors provide a stimulus for a rapid growth in the construction sector. The inflow of banking investment and leverages offered to this sector further intensify the growth of real estate development. The successes in construction fuel other related sectors. The developers earn supernormal profits, which makes investments in construction even more attractive. The real estate price has a tendency for a spiraling uncontrollable growth.
- 3) *Overheating*. At some point in time payable needs in objects of real estate become satisfied. The demand for housing starts increasing at a slower rate than the accompanying supply increase. While real estate prices continue to grow, the second derivative of a price function becomes negative at some point.
- 4) *Burst*. The burst of a bubble is caused by an excess supply of housing. Those who bought real property for speculative activities become concerned and try to sell it as quickly as possible. Such leap in the supply leads to a sharp decline of all real estate prices.
- 5) *Downturn*. The recognition of total overproduction of real estate shrinks the demand for it. Buyers are waiting for a further price fall, in order to purchase property at the minimum price. The amount of cash inflow into construction quickly reduces. Banks suddenly realize that houses that served as construction loan collaterals quickly become cheaper. Credit lines cross, sale of real property is paused, and loans have to be paid back. This causes a wave of bankruptcy, which quickly expands through the economy, from developers to banks and to the rest of the economy. As a result of bankruptcies some new real estate objects appear on the market and lower price even further. There is another positive feedback loop relationship, not of growth, however, but decline.
- 6) *Recession*. At last, lower housing prices attract buyers to the market. At the same time construction and banking sectors go through reconstruction. The sequence of bankruptcies and acquisitions stops, and the survived banks and construction companies start changing their business strategies. GDP rises very slowly (if rises at all), capital flows out of the country, and stock market falls.

As property prices are correlated with macro factors, the housing boom could get an additional impetus from lower interest rates, longer mortgage durations and changing demographics, as has been the case in Almaty. Hwang, Park, and Lee (2009) illustrate the process of housing price determination, in which it is seen that the housing supply consists of existing housing for sale and newly-built housing, while the demand for housing includes both actual demand and investment demand. Investment demand, which means the demand for accumulation of property, is assumed to play the leading role in the demand derivation, rather than actual demand, which refers to means of living, because it is the usual way of consumers to perceive housing as investment.

In case of speculation, property is purchased for the sole purpose of realizing a profit upon resale and no additional capital is invested in the property following the acquisition. Recent economic

changes support the view of Malpezzi and Wachter (1989) that the distinction between speculation and investment opportunities is blurred. Capozza (1976) argues that the aim of speculation is basically an optimal timing of development.

Therefore, there exist opposing views with regard to the reasons of the real estate bubble. Whether the price increases could be justified by fundamentals, or were they stimulated by expectation of prices appreciation in the future and speculation is subject to research.

## 1.2 Hedonic model

In order to make an actual estimation and use of the hedonic model for the housing market of Almaty, some of the theoretical constructs which are at the foundation of this approach are reviewed here.

We have mentioned in the introduction the distinctive characteristics of housing as a good (complexity, immobility, and durability). It is then predictable that the market for housing itself differs from the markets for other heterogeneous durable goods, for instance, from the automobile market. According to the work of Sheppard (1999) the most relevant differing aspects of housing market are the following:

1) *Housing markets involve search* – collection of information regarding the features of a particular structure is a costly time-consuming process. Consequently, there arises uncertainty about the true nature of the hedonic function. A purchase-sale transaction in the market for real estate can only happen after a consumer examines a sequence of structures, eventually beginning the process of making offers on properties (possibly continuing to sample) and continuing until the expected increase in utility from continued search is less than the cost. In this sense the housing market is similar to other “matching” type markets such as the labor market.

2) *Housing markets are inherently spatial* – houses involve varying quantities of land, and possess particular locations. There exists a special nature of location characteristic, which arises when all (or most) relevant local amenities have been accounted for, so that the only factor which distinguishes one location from another is the transport costs. In this case the bid rent curve for locations with greater accessibility is determined by the transport cost function.

3) *Housing markets involve both new and existing homes* – perhaps the most significant difference between housing and other heterogeneous goods markets is the importance of the sale of existing (previously produced) goods. The share of house sales accounted for by new construction is relatively small in almost all housing markets. Consumers can substitute between them, and seek out the type, whether new or old, which maximizes utility. This poses no problem for the consumer side of the market.

These differences are considered to be crucial in the formulation of any hedonic model of housing markets. The hedonic model starts with the assumption that on average the observed price can be explained by some function, which generally takes this form:

$$\text{Price} = \text{Function}(\text{Physical Characteristics}, \text{Other Factors}) \quad (1)$$

Among the physical characteristics are square footage, bathrooms, age, location, various amenities and other factors such as environmental and external factors. The regression estimates give the implicit price of each variable or characteristic. Typically, hedonic pricing equations are estimated using linear, semi-logarithmic, and logarithmic models.

For the hedonic analysis validity, it is important to understand not only the effects of housing attributes on house prices, but also that the analysis of such effects must be preceded by careful examination of the separate influences of various attributes. House prices are determined not only by the demand for the attributes of the housing units themselves, but also by the region in

which the units are located. The effect of different attributes tends to vary across geographical locations. If each neighborhood has its own effect, the hedonic model would ideally need a separate indicator variable for each neighborhood. However, identifying all relevant neighborhood characteristics within metropolitan areas is difficult.

In general, the hedonic approach has been used for several purposes, such as environmental impact assessment (Garod and Willis, 1992), examination of the impact of the planning system on house prices (Cheshire and Sheppard, 1989), assessment of the effect of transport infrastructure on property values (Forrest, Glen and Ward, 1996), as a complementary test for the estimation of the primary demand for housing (Cheshire and Sheppard, 1998), and in indirect analysis of the impact of accessibility on house prices (Ball and Kirwan, 1977). The important works of Griliches (1961, 1971) did much to introduce hedonic analysis and techniques for dealing with commodity heterogeneity to a wider audience of economists. Griliches and many others have rightly referred to the work of Court (1939) as an early pioneer in application of these techniques, as well as the first to apply the term “hedonic” to analysis of prices and demand for the individual sources of pleasure – the attributes which combine to characterize heterogeneous commodities.

Malpezzi, Ozanne and Thibodeau (1987) applied the hedonic method to the housing market. They compared housing to a bundle of groceries in a way that some bundles are bigger than others and contain different items. Housing, then, can be thought of as a bundle of rooms, bathrooms, and other amenities and the particular bundle of a house distinguishes it from other houses. However, unlike groceries, the price of individual features cannot be directly observed. The usefulness of hedonic modeling is to price these individual features by using multiple regression analysis on a pooled sample of many houses.

Other important studies to be mentioned here use the application of the hedonic pricing technique, developed by Rosen (1974), to the estimation of consumer valuations of avoiding or incurring the risk of losses from natural disasters. These studies are interesting because they apply the hedonic approach to consumer behavior under conditions of risk and uncertainty where the source of risk is from nonmarket hazards occurring in the natural environment.

Overall, the comparison of the studies that use hedonic models is complicated due to the fact that studies define and measure variables differently. For example, one study may measure structural characteristics as continuous whereas another study may use binary variables (dummies). The comparability of previous hedonic pricing studies is also complicated and/or limited because of different empirical specifications.

The hedonic modeling can be useful in addressing a number of issues in housing valuation. It has been used in valuing not only the obvious components such as square footage, bathrooms, etc. but has also been useful in measuring the effect of other issues such as school quality, proximity to a landfill or high voltage lines, and the effect of non-market financing. A vast literature has developed in the USA promoting the use of the technique (Mark and Goldberg, 1988, Schuler 1990). This application has also attracted the attention of UK academics and practitioners (Greaves, 1984, Antwi, 1995).

## **Part 2. A STUDY ON HOUSE PRICE FLUCTUATIONS OF ALMATY**

### **2.1 Analysis of residential real estate market in the period 2004-2009**

Almaty is the largest city in Kazakhstan, with a population of 1,411,553 as of April 1, 2010 (Department of statistics of Almaty city, 2010). It was the capital of Kazakhstan during the period from 1929 to 1997, and despite the loss of that status the city has remained the foremost commercial center of the country. It is a regional financial and business center. The market for residential real estate makes a significant component of the stock of property in Almaty. The city is also experiencing large investments in residential construction in comparison to other parts of the country, although starting from 2008 the amount of investments has shrunk. During the period from 2004 till 2009, of the total investment in construction of residential property over the republic, the average share has been 32% in Astana and 23% in Almaty (The Agency of Statistics of the Republic of Kazakhstan, 2010).

Almaty consists of seven administrative districts as illustrated by Figure 1 below.



**Figure 1. Districts of Almaty. Source: Department of statistics of Almaty city, 2010**

In order to gain understanding of the distribution of real property around the city, brief information about each of the administrative districts is further provided. The factual data on population was collected from the department of statistics of Almaty and is presented as of April 1, 2010 (Department of statistics of Almaty city, 2010), while comparative evaluation of districts in terms of property is based on the reports issued by one of the largest real estate agencies operating in the city – Scot Holland CBRE (2009).

*Alatau* - a new administrative district of Almaty, which was formerly the western outskirts of the city; its population is still to be assessed to obtain reliable figures; it represents a mix of low quality individual houses, industrial facilities etc.

*Almaty* - comprises the central part of Almaty; population 187,813; mostly residential properties, both prestigious and less so, condominiums and houses; both more sophisticated and basic retail facilities; also some office space and light industrial facilities.

*Auezov* – comprises the western part of Almaty; population 372,324; mostly residential, not very prestigious properties, multi - family at south - eastern part of the district, individual houses in the other parts; generally basic - level retail; no contemporary office space.

*Bostandyk* – comprises the southern part of Almaty; population 308,743; mostly business class residential multi - family properties plus a few prestigious residential developments; expanding retail facilities; business centers at the eastern end of the district.

*Medeu* – comprises the south - eastern part of Almaty; population 165,703; the most prestigious residential part with condominiums along Dostyk Avenue and individual houses in outlying parts; both more sophisticated and basic retail facilities; the business core of Almaty.

*Turksib* – comprises the outlying north - eastern part of Almaty; population 196,387; not prestigious individual houses; generally basic - level retail; no contemporary office space and some industrial facilities.

*Zhetysu* – comprises the northern part of Almaty; population 180,583; a mix of industrial facilities, trade centers and less prestigious residential properties – condominiums at the southern end and individual houses at the eastern and western parts.

According to the official data from the Government program of development of housing construction in Republic of Kazakhstan (Government of the Republic of Kazakhstan, 2007), in 2007 the average sale price of new housing was 1.9 times the cost of its construction. The reasons of price increase outlined in the program are the purchase of apartments for subsequent resale, necessity of pulling down old houses to build commercial property, propensity of the population to invest resources in the real estate, monopoly of separate developers, etc.

The substantial increase in property prices was partially caused by a rapid development of the mortgage market and the banking system as a whole, which was borrowing on international markets to increase lending domestically. This made loans available to a larger number of borrowers, and families with average incomes started to buy houses on credit, even at relatively high, by international standards, interest rates.

Mortgages have been available since 1998 in the republic; at first the rates were about 20% per annum, and the downpayment was as high as 40-50%. The crediting term was very short – not more than 5-10 years. After the state started providing various mortgage programs, including a program for supporting low-income households, the mortgage market started to develop rapidly. During each of the years 2004, 2005 and 2006, the volume of mortgages more than doubled. By the end of 2005 the interest rates fell to 10-13% per annum, the downpayment decreased to 10-15%, the average credit term was 10 years, and the share of apartments purchased on credit exceeded 80% of transactions made through real estate agencies.

Kazakhstan was the first among all CIS countries to issue long-term mortgage bonds. In 2001 the government established a state-owned mortgage company which effectively deals with refinancing mortgages. Moreover, mortgage-backed securities were introduced, which allowed the banks to lower the annual cost of resources by 1-2% (and in case of dollar loans and eurobonds – by 4% annually). To improve availability of housing for low-income population, the authorities also have founded Zhilstroysberbank, which accepts special deposits to save for the downpayment and borrow the rest of money at the annual rate of 3.5-6.5%. These measures opened the door for speculators who bought apartments on credit and then resold them at higher prices.

International loans, as opposed to domestic deposits, were the basis of the increased lending in Kazakhstan. According to the prime minister of the country, their volume has exceeded country's gross national product (Wikipedia). Therefore Kazakhstan was the first among the CIS countries to feel the consequences of the world financial crisis. First of all, the domestic stock market crashed: in a matter of two weeks banks' shares fell by 10-15%. Secondly, share prices of Kazakhstani banks on the London stock exchange dropped. For example, stock quotes of the Alliance Bank fell by 28%. The average interbank rate started growing, and the rate of inflation increased. The National Bank of Kazakhstan stepped in to limit the amount of international borrowing, to reduce the growth of credit portfolios of banks and to overcome inflation by introducing higher interest rates and minimum reserve requirements but it was too late.



In the meantime, a \$40 billion external debt had to be paid out (\$3 billion quarterly, by estimates of Standards and Poor's, see Wikipedia), the cost of international loans became very high, and it actually became impossible to get them. In the summer of 2007 the Kazakhstani banks felt an acute shortage of liquidity and were compelled to toughen conditions on the delivery of mortgages and to increase interest rates from 15% to 24% per annum; the downpayment grew to 60%. For the purposes of estimating the credit status of borrowers, banks stopped considering unofficial sources of income and introduced a loan sponsor requirement. Besides, many institutions raised the interest rates on previously issued loans and/or have reduced the terms of loan repayment. Fearing low demand and lacking loans, the construction companies suspended construction projects. Finally, banks started selling collaterals to get some cash. According to some multimedia estimates, there were about 100,000 problematic mortgages at the time. All of the above factors led to a fall in apartment prices, in some cases up to 50%.

Practically simultaneously with the collapse of the real estate market, rumors about bank bankruptcies and imminent devaluation of the national currency started to spread. People rushed to take out deposits and buy up dollars. The dollar rose by 20%. The National Bank had to intervene by selling \$6 billion from its reserves. In February 2009 the tenge was devalued. Besides, the government injected an estimated \$18 billion in commercial banks (Xinhuanet, 2009).

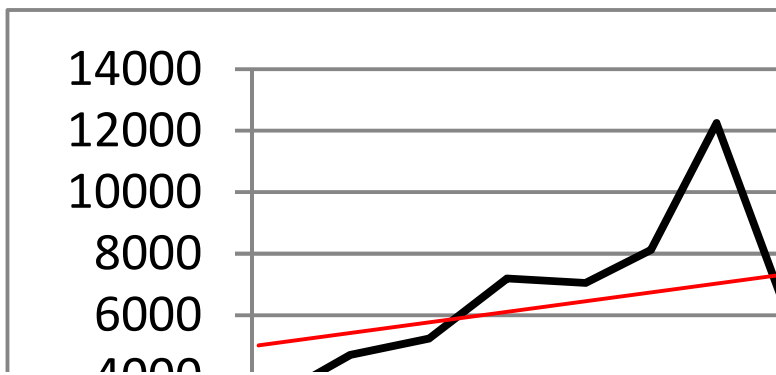
## **2.2 Data set preparation and further analyses of the market**

Unfortunately, there are no publicly available good databases on prices and housing attributes of real estate in Kazakhstan. We contacted some local real estate companies but they were unwilling to share their databases with us. The data on apartments for sale have been taken from the advertisements published in the newspaper "Krysha". As we had to use asking prices, rather than actual transactions prices, all our estimates are biased upward.

"Krysha" is the only newspaper purely consisting of real estate advertisements that is on archive in the national library. It has been publishing weekly since September 1997. For lack of time, we sampled just two newspapers per year. It is a usual practice that an advertisement in a newspaper is given for the duration of two to six months, and the newspapers even make discounts in such cases. A stratified random sample of about 2,500 ads has been chosen from twelve newspapers (two newspapers in each year from 2004 though 2009, see Krysha, 2004-2009).

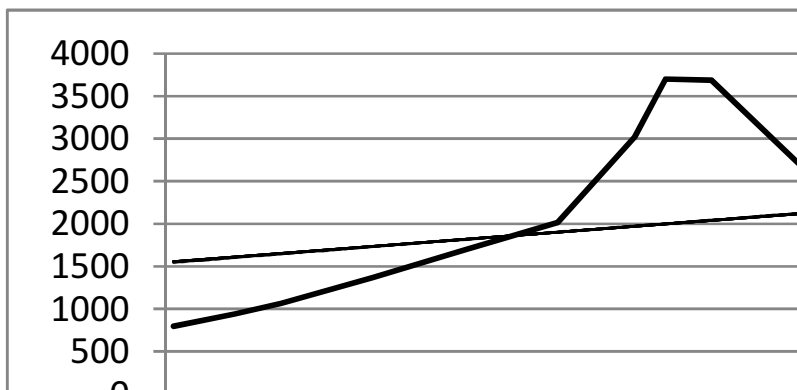
In the newspaper there is a division of ads by the number of rooms (from one to five rooms), with a further subdivision by administrative districts. Before July 2, 2008 the Alatau district was not an administrative unit of Almaty, but a collection of fourteen villages to the north of the city (The official site of Almaty city, 2008). Due to its small territory, low number of real estate listings, and impossibility to trace the development of prices before July 2008, the Alatau district has been excluded from the sample. As a sampling strategy proportionate allocation was chosen, in which the sampling fraction in each district is proportional to that district's population.

The majority of advertisements offer two- and three-room apartments that are located mainly in Bostandyk, Almaly, Auezov and Medeu districts, while much fewer offerings come from Zhety-su and Turksib districts. In Figure 2 we graph a residential property supply curve during 2004-2009. It is obvious that there is an overall tendency of ads to increase from year to year and there is a relationship breakdown in 2007, presenting anomalously high level of ads. Exactly in that period there was a sharp increase in the price of a square meter of housing, which can explain the jump in supply.



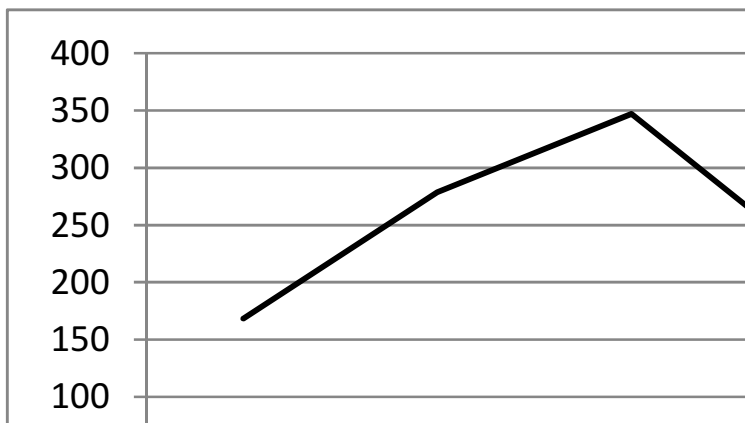
**Figure 2. Dynamics of residential property offerings (number of advertisements)**

Sample figures per newspaper were generated as a proportion of total number of observations in a year that can be attributed to one newspaper. Overall, the data set includes 2,465 ads. Some observations were excluded from the sample (ads about privatized hostels, apartments in unfinished houses, with preparatory trimming, collaterals, and those that contained incomplete information). Figure 3 shows the average price of a square meter in US dollars for the period 2004-2009.



**Figure 3. Average price per square meter**

In less than three years the index grew from \$780 to \$3,700. The latter price was certainly unrealistic and in no way was corresponding to the level of solvent demand. The data on the actual value of transactions in residential real estate are shown in Figure 4 below. Although our sample data represent only the supply side, in terms of showing the bump in prices they are a good representation of reality. The supply level has returned to reasonable limits, and the index has fallen to an adequate level by the end of 2009.



**Figure 4. Average transaction price (in thousands of tenge). Source: The Agency of Statistics of the Republic of Kazakhstan**

The bubble in construction is clearly seen but other evidence suggests that it was a local phenomenon that did not extend to many other national economy sectors.

## **Part 3. HEDONIC PRICE MODEL**

### **3.1 Methodology**

The categories for hedonic analysis were chosen based on their availability and presence in almost all observations. The variables are generally self-explanatory. The asking price is measured in dollars, apartment's area in square meters, building's age in years; the number of rooms takes values 1 to 5; also included are the floor of an apartment and the total number of stories in the building. Buildings are categorized as panel, brick and monolithic.

Two groups of variables can be distinguished in the data set: those describing own characteristics of the apartment (area, number of rooms, age of building, apartment floor, total number of floors, building material, corner or non-corner apartment, reformed/not reformed, design/layout) and those concerned with its location and time (district, year of offer).

Two types of functional models are used in the present study: linear model and semi-logarithmic model (with the log of price as the dependent variable). The semi-logarithmic form is widely reported in hedonic model applications. Some examples are Clapp, Kim, and Gelfand (2002); Goodman and Thibodeau (2003); Rush and Bruggink (2000); and Wolverton and Bottemiller (2003).

The average price of the apartments in the sample is \$118,754. The average area is 61.569 m<sup>2</sup>, and the average age of the building is about 22.5 years. 40.6% of the buildings are made of brick, 9.5% are monolith and 49.9% (100%-40.6%-9.5%) are made of panels. More than half of apartments have been reformed (52.8%) and 41.2% are improved apartments.

### **3. 2 Interpretation of hedonic regression results**

Several regressions were run. The next table gives the regression results for two best models. In both of them the log of the apartment price was regressed on other available variables. The difference between them is that in the first model the log of area was used among the regressors, to see if there are decreasing returns to scale with respect to area; in the second regression area itself was used. The differences in the coefficients of other variables are not very large (except for

the number of rooms) and all coefficients have expected signs, excluding, perhaps, the effect of the floor level. All measures of goodness of fit are better for the first model.

**Table 1. Regression results (high p-values are shown in bold)**

Variable	LOG_SQFT as one of regressors		SQFT as one of regressors	
	Coefficient	P-value	Coefficient	P-value
INTERCEPT	6.404	0.000	9.301	0.000
LOG_SQFT or SQFT	0.915	0.000	0.009	0.000
BRICK	0.137	0.000	0.140	0.000
MONOLITHIC	0.032	<b>0.128</b>	0.023	<b>0.295</b>
ROOM	0.057	0.000	0.153	0.000
REPAIR	0.073	0.000	0.082	0.000
AGE	-0.002	0.001	-0.003	0.000
IMPROVED	0.012	<b>0.281</b>	0.015	<b>0.202</b>
NON_CORNER	-0.021	0.044	-0.027	0.009
FLOOR_LEVEL	-0.004	0.088	-0.006	0.024
NUM_OF_STORIES	0.019	0.000	0.026	0.000
BOSTANDYK	0.446	0.000	0.424	0.000
ALMALY	0.437	0.000	0.431	0.000
ZHETYSU	0.319	0.000	0.312	0.000
AUEZOV	0.275	0.000	0.269	0.000
MEDEU	0.597	0.000	0.584	0.000
2005	0.310	0.000	0.318	0.000
2006	0.752	0.000	0.785	0.000
2007	1.374	0.000	1.385	0.000
2008	0.890	0.000	0.896	0.000
2009	0.614	0.000	0.628	0.000
Adjusted R-squared	0.884		0.876	
S.E. of regression	0.234		0.242	
Sum squared resid	134.022		143.454	
Log likelihood	91.285		7.462	
F-statistic	941.795		871.839	
Durbin-Watson stat	1.275		1.232	

The explanatory power of both models is very good, judging by the adjusted R square. The Durbin-Watson statistic of 1.2 indicates a minor positive serial correlation.

Variance inflation factors are a measure of multicollinearity in a regression design matrix. Among VIF values of all variables, the minimum was 1.089 and the maximum was 4.723, both far smaller than 10, which indicated that the multicollinearity problem was not serious.

One possible explanation for the negative effect of the floor level could be that first-floor apartments are considered potential commercial property. To see if there are other plausible explana-

tions, we ran two more regressions. One included a dummy for first-floor apartments. The contribution of the first floor (-0.073545) was higher in absolute value than that of the higher floors (-0.011591). The second regression included a quadratic dependence on the floor level. The senior coefficient of the quadratic function is so small that the graph of the parabola looks like a straight line in the range of floor levels in the sample (from 1 to 25 floors), with a very small negative slope. These facts provide an alternative explanation of the negative sign of the coefficient of FLOOR\_LEVEL: the first storey is least preferred and in general there is preference for lower floors. However, the fit of the last two models was slightly worse than that of the first model in Table 1.

The coefficients of administrative districts are highly significant in both models, and Medeu stands out as the most valued district. The effects of brick and area are also remarkable. As expected, properties tend to be cheaper with increasing age. Another interesting finding is the negative sign of the coefficient of the dummy variable representing apartments location in the building – non-corner. Usually corner apartments are colder than non-corner ones; however the advantages of corner apartments might be different views from windows and more windows overall, and less noise from the neighbors.

The remaining coefficients all fall within expected bounds. Another important detail to mention in the semi-logarithmic model is the year 2007. Its coefficient is very large in comparison to all others, which is evidence of a bubble in the real estate market.

We also used pooled regression analysis to track the changes in valuation of housing characteristics over years. The model specification for all regressions was semi-logarithmic, as it had better goodness of fit and fewer statistically insignificant variables. Some of the coefficients were significant in one year and statistically zero in another year but in general the results of cross-section regressions were similar to the panel regression results. The panel regression approach has revealed one more interesting detail: the housing prices in the wealthiest district, Medeu, were affected the least by the recession and those in the poorest districts (in the north of the city) were affected the most. As the share of newly constructed buildings increased, the relative importance of improved and reformed apartments decreased and the coefficient of monolith became positive.

It should be realized that there are a number of well known limitations associated with the hedonic technique.

Since all hedonic relationships are to some extent misspecified, researchers should be sensitive to the possibility that specification bias has affected their results. In our case a number of variables have not been accounted for: proximity to schools, kindergartens, and supermarkets; apartments considered as potential commercial property; availability of playgrounds, parking and security, etc. On the other hand, there is empirical evidence that the practical impact of these biases is small (Butler, 1982). Even the severely restricted specifications tested there appeared to suffer only limited coefficient biases, with a negligible impact on the explanatory and predictive powers of the equation.

Whilst acknowledging the limitation of the technique as outlined above, the results broadly confirm the opinions of real estate professionals and give an invaluable guide as to the validity of their estimates. The area, presence of improvements, number of storeys, the quality of the apartment are found to positively impact the selling value of apartments in Almaty. These features are of secondary importance, however, compared with the number of rooms, building material, and the location of an apartment. Most of the explanatory power of the regression variables results from these components.

# CONCLUSIONS

We performed a hedonic analysis of the residential real estate market of Almaty during 2004-2009. Our interest in this topic was caused by the recent real estate bubble that led to a number of negative consequences, affecting mainly the financial and construction sectors of the country's economy. We have discussed the real estate bubble in Almaty. The combined effects of lower mortgage rates and higher volumes, inappropriate lending criteria by banks, and expectations of future price rises led to an inadequately high market value of housing capital.

Further, we used the hedonic method to quantify the individual influence of various housing characteristics on the determination of housing prices. We introduced 20 housing characteristics as independent variables, including dummies, and used several model specifications with the log of the price as the dependent variable. 18 out of 20 coefficients of housing attributes were proved to be significant. The signs of coefficients were found to be as expected, with two exceptions – coefficients for floor level and non-corner apartments. Our results support the view that 2007 was the height of the housing boom, when a substantial part of the property price was determined by a speculative component.

Overall, the performance of the model was economically appealing and fitted the predictions of real estate practitioners. The coefficients of administrative districts are highly significant in both models, and Medeu stands out as the most valued district. The effects of brick and area are also remarkable. As expected, properties tend to be cheaper with increasing age. The most striking feature of the results is that the coefficient of the floor level is negative and statistically significant. Two contradicting explanations are possible: the first-floor apartments are valued higher because they are considered a potential commercial property or people in general prefer lower stories, with the first storey being least preferred. The pooled regression approach has revealed one more interesting detail: the housing prices in the wealthiest district, Medeu, were affected the least by the recession and those in the poorest districts (in the north of the city) were affected the most.

Some of the limitations of our results stem from the lack of data and some – from our modeling techniques. Our time series were short, represented only the supply side and sampled only two newspaper issues per year. On the modeling side, it would be interesting to correlate the ask prices with the rental prices, because the rental market is more dynamic and stronger depends on incomes. It would be also useful to explicitly introduce the interest rate on mortgages as one of determinants of price.

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