

# ***COMPARATIVE ANALYSIS OF THE EVALUATION OF THE MARKET BORDERS*** \*

Issues dealing with the formation of unified markets and the overcoming of the sellers' geographical dispersion are very important for public welfare. The wider the market, the more intense the competition among the sellers and the higher the gains (provided the other terms being equal) of both sellers and buyers. The level of costs needed to overcome the geographical dispersion of markets (including transportation costs) has, therefore, a major impact on the market borders and, consequently, on public welfare.

It's a matter of principle for Russia whether the markets are regional, or they are shaped within wider boundaries. It's important to answer the question: If the markets are confined to narrow boundaries, is this caused by high transport tariffs or by any other restrictions of interregional trade?

Therefore, this paper aims to:

- Analyze the trends for shaping a unified Russian market;
- Define the major obstacles to forming a unified Russian market and find out if these obstacles are created by transport tariffs or by any other trading barriers.

To solve these tasks, we have chosen the grain market, or, more exactly, the food-wheat market, as an object of study of interregional trade. It is also of some interest to apply the conclusions about the regional boundaries to the corresponding market of finished products - the market of top-grade wheat flour in our case.

Our choice is not accidental. Grain is one of the most representative traded goods; it has the advantage of comparatively high liquidity if compared to other real assets. Besides, the Russian grain market is rather capacious: its volume is 55-80 million tons. Finally, the grain market is of interest because it is potentially one of the most competitive in the Russian economy. Grain is produced in different Russian regions, including those situated far apart from one another. There are some 40,000 grain producers in Russia (half of them are agricultural organizations created from transformed collective and Soviet farms, the others are individual farms). So, the development of competition on the grain market must have a strong positive influence on the market's efficiency.

The interregional trade in grain and the barriers on its way are of great interest to many analysts of agricultural production. One of the few works devoted to interregional trade and the convergence of agricultural prices on the Russian markets belongs to Michael Kopsidis<sup>1</sup>. The author analyzed the Russian grain market and the integration processes on the interregional grain markets during the period of 1992 to 1995. The results obtained were regarded as evidence of the progressive disintegration of the Russian grain markets. A considerable reduction in regional price differences was found only in barter trade. Evaluating the latter result, there is no ignoring the fact that "the

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<sup>1</sup> Michael Kopsidis "The Effect of Disintegration: Regional Grain Market in Russia (1992-1995), collected articles "Russia's Agro-Food Sector: Towards Truly Functioning Markets", edited by P. Wehrheim, E. Serova, K. Frohberg, J. von Braun. IPP Analytical Center for Agro-Food Economy, Moscow, 2001.

barter trade prices” are absolutely fictitious: actual relative prices are defined by the proportion of the exchange of one commodity for another [S. Guriev and B. Ikes, 1999; A. Yakovlev, 1999]. Therefore, the results obtained by Kopsidis regarding the barter prices cannot be interpreted seriously.

Besides, M. Kopsidis examined the interrelation of different sales channels within one specific region, using balanced coefficients of variation. Once again, the author shows that the period under examination produced neither a functioning internal grain market, nor an increased integration of the regional grain markets.

Speaking of conditions, which, when observed, help to develop a unified and effective domestic market, Michael Kopsidis singles out the need for a healthy macro economical policy, especially in monetary issues, as well as the creation of an institutional structural framework that would meet the demands of a free market.

Of great importance in this context is an economic analysis of obstacles to free trade, including regional trade, their causes and impact on the efficiency of the market.

### ***1.1. Differences in prices for wheat in Russian regions: a general description***

It seems inevitable that a certain level of interregional differences in prices for grain and wheat in Russia will be preserved. One of the factors that determine the basic (minimal) level of price dispersion is the level of transport tariffs. This is due to the fact that a considerable part of agricultural produce transported from one Russian region to another is carried by rail. A large share in rail transportation of grain belongs to interregional transportation. The transport component in the price for grain influences the formation of regional markets, where consumers traditionally choose certain producing regions in order to reduce their transport costs. Therefore, an increase in tariffs on the transportation of this or that grain can change not only the cost of the commodity itself but that of all bread products and other goods. Table 1-1 shows the data on the increase in tariffs for grain transportation. It’s evident that from mid-2001 to mid-2005, the tariff for cargo transportation by rail increased nominally by 2.2 times. Over the same period, the general level of prices (measured by the consumer prices index) grew by less than 1.7 times. Thus, during four years, the real growth in tariffs for cargo transportation amounted to about 30%. However, we must point out that this growth is partly a compensation for the maintenance of a stable level of tariffs for rail transportation (along with other regulated tariffs) during the years of 1998 to 2000. As is known, the stable tariffs helped in a large degree to restore production quickly and bring about economic growth during this period. But, as a result, the compensatory rise in railway tariffs could not help affecting interregional trade and the unity of the Russian grain market.

According to expert evaluation<sup>2</sup>, in the past few years, the regional grain producers have formed separate sub-markets within the national grain market. Such areas of the West Siberian economic region as Omsk Oblast, Novosibirsk Oblast and Altai Krai have been localized as separate entities. Within the borders of these economic zones, we find an active interregional trade in grain and the “single price” principle in operation.

Table 1-1. Changes in rail transportation tariffs from 2001 to 2005 (%).<sup>3</sup>

|  | June 3, 2001 | July 21, 2001 | Febr. 1, 2002 | June 1, 2002 | Jan. 1, 2003 | Jan. 1, 2005 | August 1, 2005 |
|--|--------------|---------------|---------------|--------------|--------------|--------------|----------------|
| Changes in rail transportation tariffs | +17,5%       | + 5%          | + 16%         | + 9%         | +18,9%       | + 12%        | +5,4%          |

<sup>2</sup> From conversation with a **WJ Interagro** representative, <http://www.wjinteragro.ru>

<sup>3</sup> Resolution of the RF Federal Economic Commission No.12-T/2, 30.12.2003, “On indexation of the level of operating tariffs, payments and levies on the Price List as of ‘O’ o’clock, August 11, 2004.”

If we are right in our assumption that a low grain yield puts restrictions on the potential of interregional competition, we must get evidence proving that during the years of the low wheat yield the price dispersion in the Russian regions increases.

Indeed, one of the ways to evaluate the intensity of interregional competition is to define the balanced coefficient of regional price variation. To calculate the variation coefficient we use the annual regional prices for wheat.

Figures 1-1 and 1-2 present the balanced coefficients of the variations of regional prices for grain and wheat during the years of 1992 to 2005.

The balanced variation coefficient is calculated according to the following formula<sup>4</sup>:

- a) *We define the region's share in the total sales of grain in Russia, and estimate the regional prices according to the share of the regional sales in the total grain sales in Russia:*

$$\alpha_i = \frac{x_i}{\sum x_i}; \quad \bar{p} = \sum_i p_i \cdot \alpha_i$$

- b) *We find the standard deviation in the product's price from the Russian average as estimated according to the region's corresponding share in the total grain sales in Russia:*

$$\sqrt{\sum_{i=1}^n \left( p_i - \bar{p} \right)^2} * \alpha_i,$$

$\alpha_i$  - regional share in the total grain sales in Russia;

$x_i$  - the total volume of grain sold by one region;

$n$  - the number of regions;

$p_i$  - the price of one ton of grain in the region;

$\bar{p}$  - the average Russian price of one ton of grain.

A similar calculation was made for wheat prices during the period of 1992 to 2003.

The use of this particular index modification is due to the need for correcting the data according to the proportions of grain production (sales) in different regions: it matters not only how much the grain price in a region deviates from the average value, but also how great the region's share is in the total grain production.

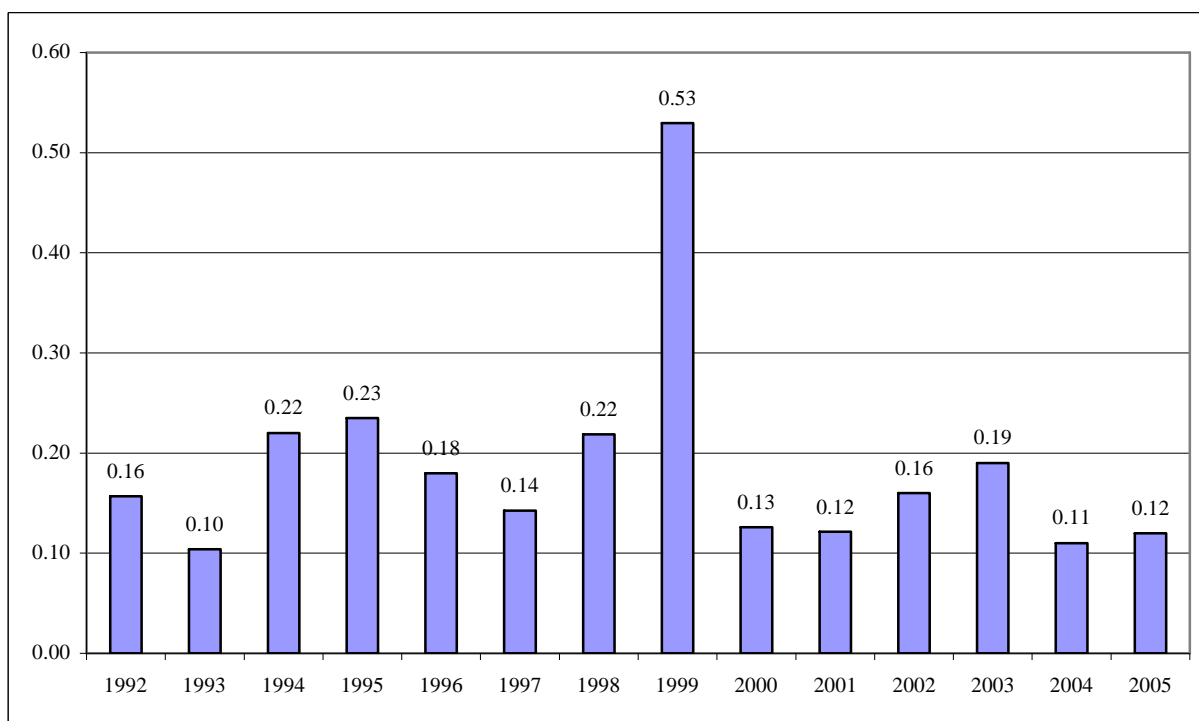
The growth of the price deviation from the average in the regions, major producers, must have a greater impact on the index value than the growth of price differences in the regions, minor producers.

This index reflects not only the price dispersion in different regions, but also the tendencies toward the development of interregional trade. Other conditions being equal, the higher the price differences among the regions, the higher barriers of admission to the local markets and the lower interregional competition on this market. Lesser

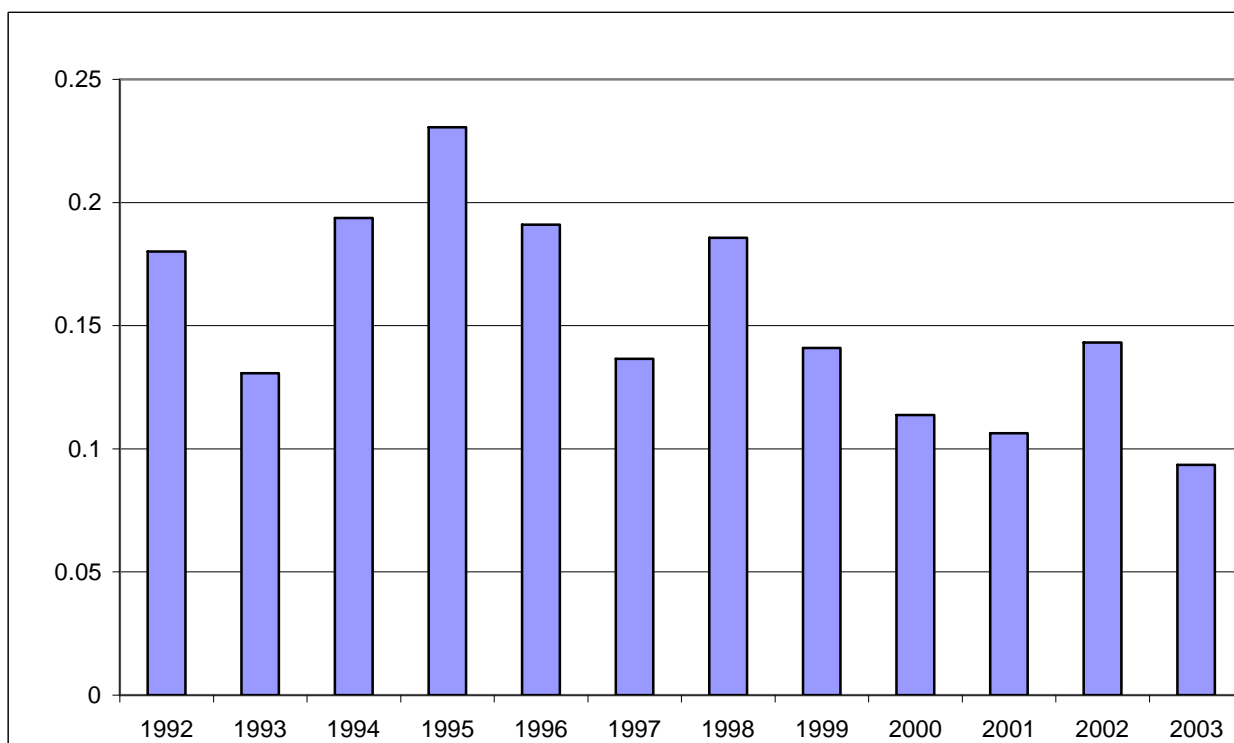
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<sup>4</sup> Michael Kopsidis "The Effect of Disintegration: Regional Grain Market in Russia (1992-1995), collected articles "Russia's Agro-Food Sector: Towards Truly Functioning Markets", edited by P. Wehrheim, E. Serova, K. Frohberg, J. von Braun. IPP Analytical Center for Agro-Food Economy, Moscow, 2001.

variations of the regional prices would, on the contrary, bear evidence to the equalization of absolute price levels, which would confirm the assumption about the intensified market integration. Though, undoubtedly, this simple indicator cannot be used to analyze neither the reasons for the interconnections of regional prices nor the price arbitrage in the Russian grain markets. At the same time, this indicator has an advantage because it can be used as an integral description.



Graph 1-1. Balanced coefficient of variations in the regional grain prices in Russia: 1992-2005.



Graph 1-2. Balanced coefficient of variations in the regional wheat prices in Russia: 1992-2003.

The data presented shows a continuous increase in the interregional dispersion of grain prices, beginning with the introduction of the liberalization policy in 1992 up to 1995. The subsequent trend for leveling off the interregional prices was cut short by the crisis of 1998. In the years that followed, however, the leveling trend was resumed. The indices of differences in prices for both grain and wheat are today practically twice as low as those we had immediately after the financial crisis of 1998, whose influence on the interregional trade was even more harmful owing to the low grain yield in 1998 (a total of 47.9 million tons as compared to 1997, with its 88.6 million tons). These two factors helped to restore the interregional trade barriers, which were still present in 1999. Besides the economic problems proper, the financial crisis and the low grain yield prompted an unfavorable trend for which there seemed to be no economic basis. The very high variation coefficient in 1999 was but a response to the events of 1998, despite the growth in the overall grain production during this period.

Comparing the data of Graphs 1-1 and 1-2, which feature the balanced variation coefficients for grain and wheat, we must mention the following. The dynamics of the coefficients during the periods under consideration is the same for grain and wheat, with the exclusion of the year 1999. As Graph 1-1 shows, the grain index in 1999 is higher than that in any other year. There is no such rise of the wheat indices in Graph 1-2, where there is a smooth decline in the balanced coefficient after 1998, which shows the trend for leveling the absolute levels of wheat prices. Thus, these data show an increased influence of interregional trade (actual and potential) on the correlation of grain prices in different Russian regions.

### ***1.2. Differences in prices for wheat in the Russian regions: the role of transportation costs and interregional trade***

For a more detailed and accurate analysis of price dispersion in the Russian regions, we can use a statistical and econometric analysis of price dispersion between two separate regions, which, unlike a study of the general data on the price differences, allows us to answer the question to what extent the price differences can be accounted for by transportation costs, and how much the price differences vary under the influence of interregional trade.

Studying the interregional price dispersion, we consider two time periods: from January 1999 to December 2001 and from September 2002 to August 2005. The main criterion for the selection of regions is the availability of the data on prices needed for the analysis. Division into two periods is explained by a complete absence of data concerning the period from January to August 2002.

We have selected only major food-wheat producers, those with stable wheat yields, which amounted, during the period of 1999 to 2005, to over one thousand tons. These are Belgorod, Voronezh, Kursk, Lipetsk and Tambov oblasts in the Central Chernozem (Black Earth) Region; Volgograd and Saratov oblasts in the Volga Region; Rostov-on-Don Oblast, Stavropol Krai and Krasnodar Krai in the North Caucasian Region; Orenburg and Kurgan oblasts in the Ural Region; Novosibirsk Oblast and Altai Krai in the West Siberian Region. These areas combined account for 25 to 30% of the overall wheat production in Russia.

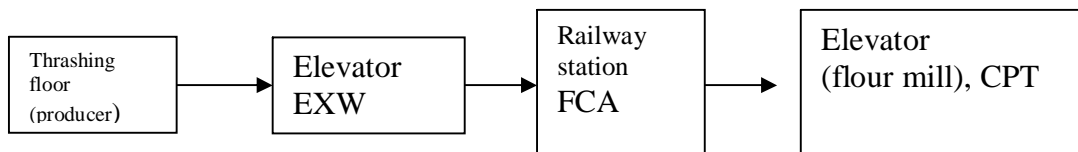
This paper uses the average monthly prices of the regional agricultural producers during the period of 1999 to 2005. The statistical information is based on the data supplied by the Russian Federation Ministry for Agriculture and the WJ Interagro company<sup>5</sup>. The model uses the absolute (nominal) values of the regional monthly prices for one ton in thousands of rubles, EXW, which means “ex works”, or “ex-elevator” in the wheat market. The customs term “ex works” means that the seller is regarded to have fulfilled his delivery commitments when he delivers goods to the buyer at his own place of business or another mentioned place (for example, at a factory, warehouse and the like). The seller bears no responsibility for the loading of goods onto a means of transportation as well as for the

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<sup>5</sup> For more details, visit the website <http://www.wjinteragro.ru>.

customs clearance of goods to be exported. These delivery terms place minimal obligations on the seller, while the buyer must bear all costs and risks involved in the transportation of goods from the seller's place of business to the point of destination<sup>6</sup>.

Below is a scheme (Fig. 1-3) that shows the formation of grain prices with due regard for all the costs of transportation from the producer to the end consumer. On the wheat market, the first stage of price formation takes place between the farm's threshing floor and the elevator. The costs of transportation from the threshing floor to the elevator amount to an average of 100-250 rubles per ton, while at the elevator the price is fixed on EXW terms. The second stage has to do with the transportation of grain from the elevator to the railway station, where the price is formed on FCA (Free Carrier) terms. Transportation costs in this case amount to an average 200-250 rubles per ton. And, finally, FCA → CPT<sup>7</sup> makes up the rail tariff.



Graph 1-3. Scheme of wheat marketing, tariffs and delivery terms

Since the data on the period under examination are incomplete, we have chosen the prices on EXW terms, though we cannot rule out the fact that prices on FCA terms would have suited us better. At the same time, it's at the elevator that wheat is obtained for interregional arbitrage, which means that the related tariff is an adequate reflection of the price at the moment when the wheat is transferred from the producer to the trader.

From the very start, we introduce an axiom about the non-stationarity of the regional prices of agricultural producers: for example, prices may grow every year and have no restrictions from above. The axiom within this model is the starting point for checking the single-price law, which we consider through a certain notion of stationarity. This supposition can also be checked by a special stationarity test<sup>8</sup>. We use the first-order autoregressive model AR(1):

$$\Delta P_t = \mu + \lambda P_{t-1} + \varepsilon_t, \text{ where} \quad (1)$$

$\varepsilon_t$  – white noise;

$\Delta P_t$  – the change of the price in the region in the t period as compared to the previous period;

$P_{t-1}$  - the price in the region in the previous period;

? and  $\lambda$  – parameters.

The AR(1) process is stationary, if  $|\lambda| < 1$ . If  $\lambda = 1$ , the equation defines a random walk, and  $P_t$  is not stationary. Stationarity is tested by the unit-root test developed by D.A. Dickey and W.A. Fuller. The results of the test, provided that the initial prerequisite is correct, show that the price rows are non-stationary.

<sup>6</sup> <http://www.silmarill.ru/cust/inko.htm>

<sup>7</sup> The term “Freight/transportation are paid for up to” means that the seller delivers goods to the carrier he names. Besides, the seller is obliged to pay the costs involved in transportation of goods to the point of destination. This means that the buyer assumes the responsibility for all risks of loss or damage of goods, as well as other expenses after the goods are delivered to the carrier.

<sup>8</sup> In this paper the stationarity of prices and the convergence of prices are equivalent notions. Prices are stationary, if a price deviation that occurs once does not grow systematically. And, vice versa, if a price deviation continues to grow, we speak of the non-stationarity of prices.

Of special interest, in case of non-stationary prices, is the difference between prices in different regions. In conditions when the prices are constantly growing (due to inflation), the single-price law can be observed when (and only then) the difference in prices in any arbitrarily chosen regions does not increase.

In this case, the first-order autoregressive model is as follows:

$$\Delta P_t^* = \mu + \lambda P_{t-1}^* + \varepsilon_t, \text{ where} \quad (2)$$

$\varepsilon_t$  – white noise;

$\Delta P_t^*$  – the second difference in prices between two regions in period ‘t’;

$P_{t-1}^*$  – the difference in prices between the regions in period ‘t-1’;

$\lambda$  – parameter.

In this model parameter ‘?’ reflects the differences among the regions which characterize, for example, the distance.

The above analysis shows that, for an overwhelming majority of the Russian regions, the stationarity (stability or reduction in the price gap) is typical of 55 pairs of regions in both 1999-2001 and 2002-2005. A larger number of regions (26 pairs) show the stationarity of price gaps during the period of 1999 to 2001 as compared to the period of 2002 to 2005. In our opinion, this can be explained by the fact that, following the exogenous shock of 1998, which cut short the period of integration among the regional markets and created price gaps, the trend for leveling off the prices featured more prominently than in the period that followed.

And, finally, this tests the hypothesis that the systematic difference in grain prices in different regions is accounted for by the level of transportation costs.

To test this hypothesis we use the following equation:

$$\Delta P_t^* = \beta + \gamma T + \varepsilon, \quad (3)$$

where  $\Delta P_t^*$  – the second price gap between two regions in period ‘t’;

$T$  – the variable characterizing the transportation tariff;

$\beta$  – the basic (fixed) arbitrage losses that can reflect the costs of

- Delivery to the elevator
- Delivery to the railway station
- Unloading/loading
- Other operations, not connected with transportation
- Including the costs (obvious and non-obvious) needed to overcome the administrative

interregional barriers to trade.

Since it’s impossible to evaluate them adequately, these costs are supposed to be constant.

$\varepsilon$  – an error with normal distribution

The empirical analysis carried out shows that the period from 1999 to 2005 did see the shaping of the unified grain market, though not on the national scale but within individual economic regions. Every year the market’s geographical boundaries expand, which manifests itself in a stronger interaction of prices in an ever growing number of regions.

At the same time, the econometric analysis shows no significant impact on the difference in the prices of the transportation tariff. It’s most likely that the remaining obstacles to interregional trade (simultaneously – the

factors that shape the market's local boundaries) are connected not with transportation costs but with other expenses, including those created by administrative barriers.

Thus, the analysis on a microeconomic level supports the preliminary conclusions about the price differences on the whole: in an overwhelming majority of the Russian regions, differences in nominal prices increase (and consequently, actual price differences decrease).

The analysis of price dispersion on a micro level allows us to make several important conclusions concerning not only the tendencies toward changes in the differences in nominal prices but also the connection of price differences with the level of transportation costs and the scale of interregional trade.

By way of example, Graph 1-4 features the dynamics of the price gap growing in Rostov Oblast, Krasnodar Krai and Stavropol Krai (prices in Rostov Oblast are chosen as an object of comparison). It's evident that the price difference in both cases shows stationarity: the prevalence of the price in region 'i' over the price in region 'j' during period 't' is accompanied by the reduction of the respective price difference during the period 't+1'.



Price difference in Krasnodar Krai and Rostov Oblast

Price difference in Stavropol Krai and Rostov Oblast

Graph 1-4. The tendency toward price convergence in Rostov Oblast, Krasnodar Krai and Stavropol Krai (difference of prices for one ton of wheat, in rubles.)

For each region pairs I calculated «the implied half-life», using the next equation:

$$T_{irs} = \frac{\ln 0.5}{\ln |1 + \lambda_{irs}|}$$

where  $\lambda_{irs}$  - the estimated parameter which shows the convergence speed process, that is the speed, from which market forces return the prices to balance. This coefficient undertakes from model (2).

The parameter  $T_{irs}$  shows, for what time in accepted units (in the given work - in months) a deviation from balance (price difference between regions r and s), caused by separate indignation, decreases twice. Results of calculation of the characteristic - « the implied half-life » in the market of food wheat are presented in Table 1.

Calculation « the implied half-life » in the market of wheat also allows to answer a question: whether inter-regional price distinctions can decrease or their scope to become wider that will strengthen a territorial inequality.

In our case for all region pairs the coefficient “the implied half-life” (T) became lower in the period of 06.2002-08.2005, except. All the pairs with Orenburgskaya obl gave the opposite result.

In the international practice the researches devoted the Law of one price were studied by David C. Parsley, Shang-Jin Wei<sup>9</sup>, and Pinelopi K.Goldberg, Frank Verboven<sup>10</sup>. David C. Parsley, Shang-Jin Wei have thoroughly researched price difference between towns. They used the panel of the 51 final goods and services prices (quarterly) from 48 cities in the United States over the period 1975.1 through 1992.4. The data set includes prices of both tradable and nontradable goods and services. For each group they calculate the implied half-life for the product whose AR(1) coefficient is the median value in the group. The medians are corn flakes (-0.123), fried chicken (-0.157), and beauty salon visit (-0.044), for non-perishables, perishables, and services, respectively. These coefficients estimate imply half-lives for deviations from parity of approximately five quarters for non-perishables, four quarters for perishables, and fifteen quarters for services.

Pinelopi K.Goldberg and Frank Verboven have examined price convergence using a large three dimensional panel. This panel has contained information on approximately 150 vehicle makes per year in five distinct European markets over the period 1970-2000. They were also estimating the basic convergence equation. In general, the half-lives they obtained were always between 1 and 2 years.

**Table № 1. The price convergence between different regions.**

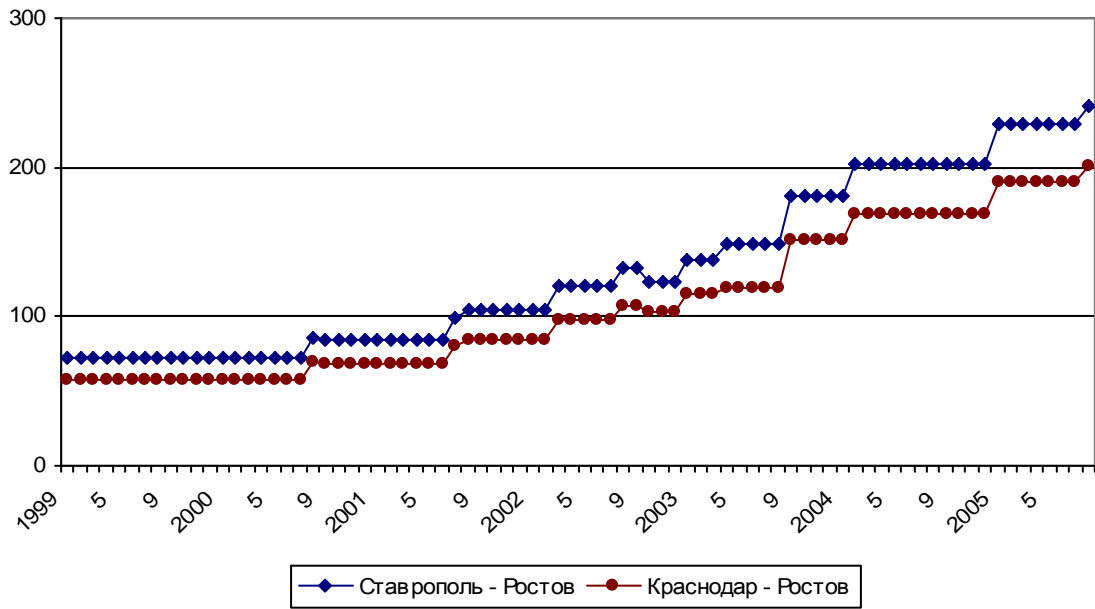
| Pairs regions               | 01.1999 no 12.2001 |                                 | 06.2002 no 08.2005 |                                 |
|-----------------------------|--------------------|---------------------------------|--------------------|---------------------------------|
|                             | $\lambda$          | The implied half-life T, months | $\lambda$          | The implied half-life T, months |
| <i>Belgorodskaya oblast</i> |                    |                                 |                    |                                 |
| Altayskiy krai              | -0.491 (0.152)     | 1.03                            | -0.641 (0.157)     | 0.7                             |
| Krasnodarskiy krai          | -0.591 (0.161)     | 0.8                             | -0.6537 (0.169)    | 0.7                             |
| Kurganskaya oblast          | -0.466 (0.152)     | 1.1                             | -0.537(0.146)      | 0.9                             |
| Lipetskaya oblast           | -0.907 (0.176)     | 0.3                             | -0.8361(0.177)     | 0.4                             |
| Novosibirskaya oblast       | -0.382 (0.139)     | 1.4                             | -0.564 (0.1515)    | 0.8                             |
| Orenburgskaya oblast        | -0.572 (0.162)     | 0.8                             | -0.4592 (0.139)    | 1.13                            |
| Rostovskaya obl             | -0.742 (0.169)     | 0.5                             | -1(0.176)          | 0                               |
| Stavropolskiy krai          | -0.658 (0.165)     | 0.6                             | -0.8671(0.1725)    | 0.3                             |
| <i>Krasnodarskiy krai</i>   |                    |                                 |                    |                                 |
| Altayskiy krai              | -0.813 (0.174)     | 0.4                             | -0.644 (0.158)     | 0.7                             |
| Kurganskaya oblast          | -0.459 (0.153)     | 1.1                             | -0.474 (0.139)     | 1.08                            |
| Novosibirskaya oblast       | -0.678 (0.167)     | 0.6                             | -0.584(0.152)      | 0.8                             |
| Orenburgskaya oblast        | -0.594 (0.165)     | 0.7                             | -0.365(0.126)      | 1.5                             |
| Rostovskaya obl             | -0.605 (0.159)     | 0.7                             | -1.092 (0.173)     | 0.3                             |
| <i>Rostovskaya obl</i>      |                    |                                 |                    |                                 |
| Kurganskaya oblast          | -0.663 (0.168)     | 0.6                             | -0.95 (0.172)      | 0.2                             |
| Orenburgskaya oblast        | -0.796 (0.177)     | 0.4                             | -0.5504 (0.141)    | 0.9                             |
| Altayskiy krai              |                    |                                 | -0.78202 (0.161)   | 0.5                             |

<sup>9</sup> Convergence to the Law of One Price Without Trade Barriers or Currency Fluctuations by David C. Parsley; Shang-Jin Wei. *The Quarterly Journal of Economics*, Vol. 111, No. 4. (Nov., 1996), pp. 1211-1236.

<sup>10</sup> Pinelopi K.Goldberg, Frank Verboven, Market Integration and Convergence to the Law of One Price: Evidence from the European Car Market, *Review of Economic Studies*, October 2001, pp.811-848

|                           |                |     |                 |     |
|---------------------------|----------------|-----|-----------------|-----|
| <i>Stavropolskiy krai</i> |                |     |                 |     |
| Altayskiy krai            | -0.681 (0.169) | 0.6 | -0.751 (0.160)  | 0.5 |
| Rostovskaya obl           | -0.613 (0.157) | 0.7 | -0.865 (0.176)  | 0.3 |
| <i>Saratovskaya obl</i>   |                |     |                 |     |
| Altayskiy kray            | -1.034 (0.176) | 0.2 | -0.775 (0.161)  | 0.5 |
| Novosibirskaya oblast     | -0.709 (0.170) | 0.6 | -0.694 (0.154)  | 0.6 |
| Krasnodarskiy kray        | -0.728 (0.173) | 0.5 | -0.8026 (0.171) | 0.4 |
| <i>Volgogradskaya obl</i> |                |     |                 |     |
| Stavropolskiy krai        | -0.714 (0.169) | 0.6 | -1.0146 (0.175) | 0.2 |
| <i>Tambovskaya obl</i>    |                |     |                 |     |
| Novosibirskaya oblast     | -0.767 (0.179) | 0.5 | -0.688 (0.163)  | 0.6 |
| <i>Lipetskaya oblast</i>  |                |     |                 |     |
| Saratovskaya obl          | -0.745 (0.173) | 0.5 | -1.0388 (0.180) | 0.2 |
| Rostovskaya obl           | -0.971 (0.176) | 0.2 | -0.9238 (0.177) | 0.3 |
| Volgogradskaya obl        | -0.509 (0.155) | 1.0 | -0.7701 (0.179) | 0.5 |
| Krasnodarskiy kray        | -0.672 (0.167) | 0.6 | -0.5307 (0.162) | 0.9 |
| <i>Kurskaya obl</i>       |                |     |                 |     |
| Rostovskaya obl           | -0.867 (0.175) | 0.3 | -0.957 (0.178)  | 0.2 |
| Saratovskaya obl          | -0.721 (0.172) | 0.5 | -0.961(0.181)   | 0.2 |
| Krasnodarskiy kray        | -0.669 (0.166) | 0.6 | 0.9106 (0.177)  | 0.3 |
| <i>Voronezhskaya obl</i>  |                |     |                 |     |
| Rostovskaya obl           | -0.947 (0.177) | 0.2 | -0.9072 (0.181) | 0.3 |

It deserves special note that the stationary price gap was in view despite the remaining trend for growing transportation tariffs. Graph 1-5 provides an example of the absolute value of the transportation tariff (in rubles) for the delivery of one ton of wheat from Rostov Oblast to other Russian regions (or, vice versa, from these regions to Rostov Oblast).



----- Stavropol-Rostov ----- Krasnodar-Rostov

Graph 1-5. The cost of the rail transportation of one ton of wheat (in rubles, January 1999 - August 2005)

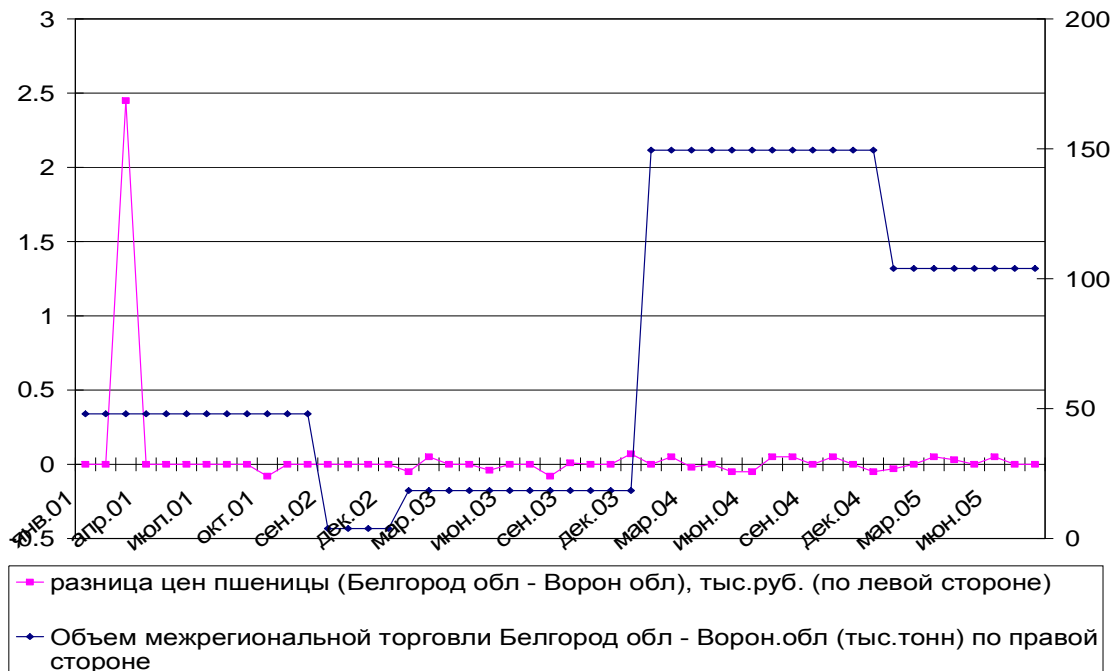
The interaction of prices on the regional markets can be considered in the context of interregional trade by comparing the dynamics of interregional trade and the price gap. In most cases there was the expected ratio between the dynamics of flows of interregional trade and the stationarity of price differences in the regions. Graphs 1-6 and 1-7 present the data on interregional trade (as overall volume of counter flows of wheat), and data on the price differences in Rostov Oblast and Krasnodar Krai, as well as in Belgorod and Voronezh oblasts. The volumes of counter trade were high and were growing rapidly during the period under consideration. Simultaneously, the price fluctuations show the classic picture of the stationarity of price gaps: the greater the price difference in period 't-1', the greater the deviation of the price difference toward the opposite side in period 't', with the fluctuation amplitude declining.



Dispersion of prices for wheat (Rostov Oblast and Krasnodar Krai), in thousands of rubles (left axis)

Volume of interregional trade between Krasnodar Krai and Rostov Oblast, in thousands of tons (right axis)

Graph 1-6. Interregional trade and price dispersion in Rostov Oblast and Krasnodar Krai: 2001-2005. On the left ordinate axis – difference in price for one ton of wheat, in thousands of rubles; on the right axis – the volume of interregional wheat trade, in thousands of tons.



Dispersion of prices for wheat (Belgorod Obl. – Voronezh Obl.), in thousands of rubles (left side)

Volume of interregional trade (Belgorod and Voronezh Obl.), in thousands of tons (right side).

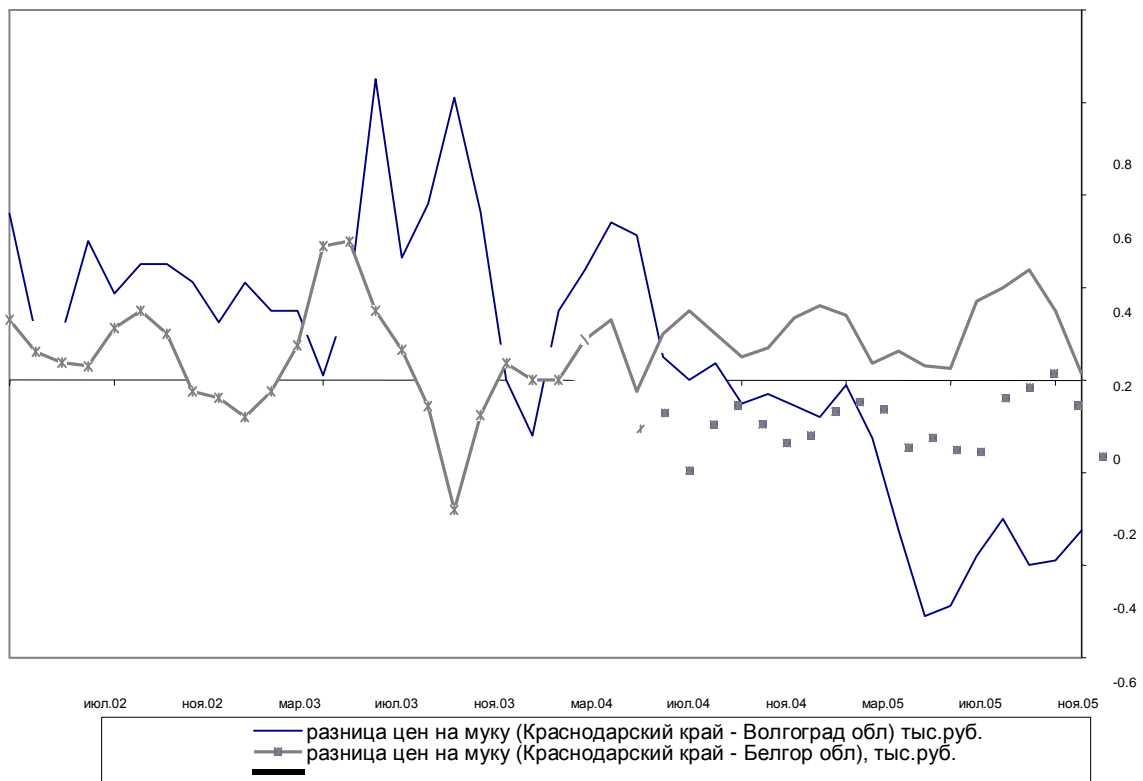
Graph 1-7. Interregional trade and price dispersion in Belgorod Oblast and Voronezh Oblast: 2001-2005. On the left ordinate axis – difference in price for one ton of wheat, in thousands of rubles; on the right axis – the volume of interregional wheat trade, in thousands of tons.

The above graphs allow us to make important conclusions about the mechanism of changing the price differences on the regional wheat markets. It is evident that the interaction of prices is indeed created by the arbitrage mechanism. The degree in which this mechanism operates in the regions with a strong interaction of prices gives us further proof of the basic hypothesis that the expansion of interregional trade and the shaping of wider-than-regional markets lead to a more fierce competition and a higher efficiency of the wheat markets.

We have also shown the possibilities of using the data on the monthly price changes in individual regions, along with the data on transport tariffs and interregional trade, to describe the tendencies of the development of the Russian national markets, as well as the factors that define these tendencies.

If we consider the related market of finished products (that of top-grade wheat flour, in this case), the above analysis of interregional trade and price diversion shows the following results.

The analysis of price differences as seen on Graph 1-8, as well as in the case of the food-wheat market, allows us to make several important conclusions about not only the tendencies toward changes in the differences of nominal prices but also the connection between the price dispersion and the scale of interregional trade. This graph presents the dynamics of the growth of the nominal price gap, using, by way of example, Volgograd Oblast, Krasnodar Krai and Belgorod Oblast (the prices in Krasnodar Krai are chosen as an object of comparison), from November 2002 to November 2005. The analysis uses average monthly interregional prices for one ton of top-grade wheat, including VAT on FCA (free carrier) terms<sup>11</sup>. We can see that on the flour market, the price divergence, in both cases, does not show the stationarity typical of wheat.

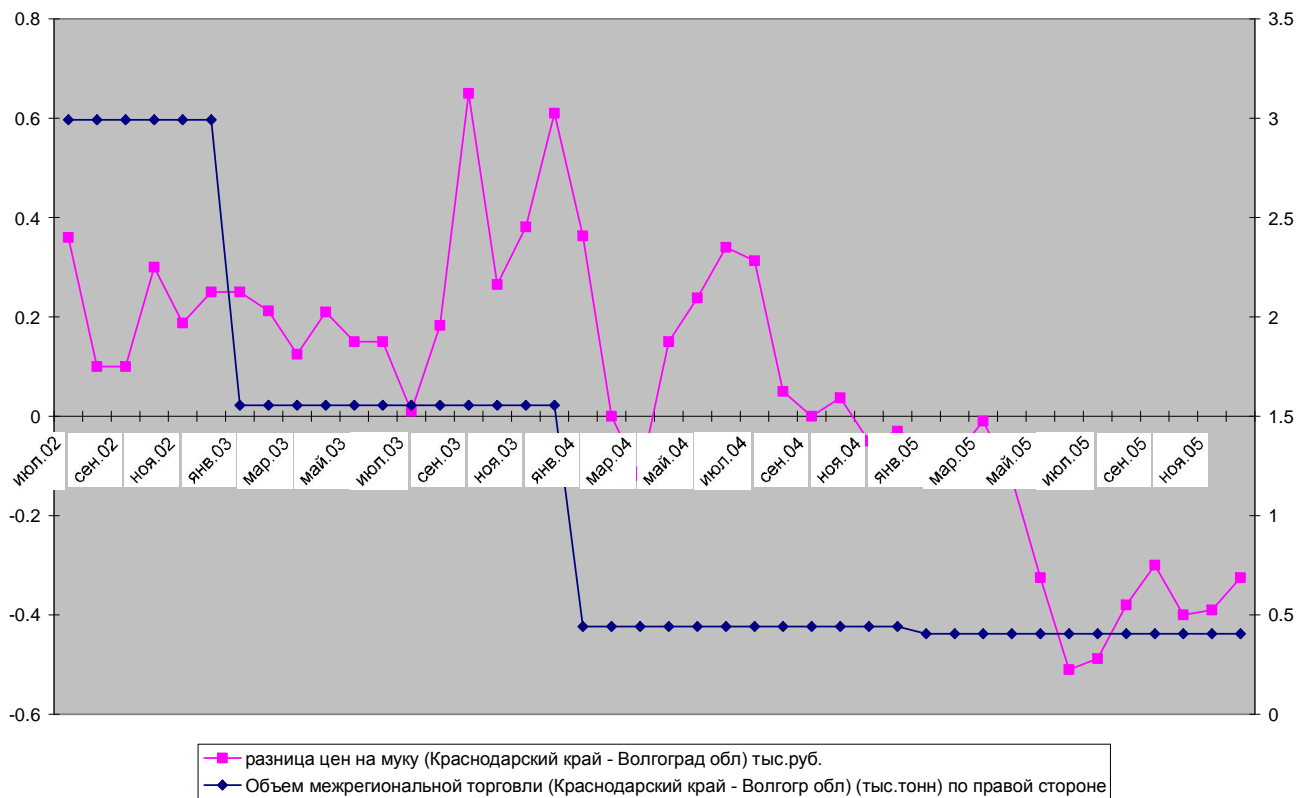


<sup>11</sup> See Graph 2-6. The scheme of wheat marketing, tariffs and delivery terms.

Difference in prices for flour (Krasnodar Krai - Volgograd Obl.) in thousands of rubles.  
 Difference in prices for flour (Krasnodar Krai – Belgorod Obl.), in thousands of rubles.

Graph 1-8. Tendency toward the convergence of prices in Krasnodar Krai, Belgorod Oblast, Volgograd Oblast (difference in prices for one ton of wheat, in thousands of rubles).

The absence of prices interaction on the regional markets of finished produce can also be considered in the context of interregional trade by comparing the dynamics of the development of interregional trade and the price gap. Graph 1-9 presents the data on interregional trade (as the total volume of the counter flows of wheat flour), and the data on the differences in regional prices in Krasnodar Krai and Volgograd Oblast, taken as an example. As the graph shows, the volumes of counter trade drop rapidly during the period under consideration. At the same time, the prices fluctuations testify to the non-stationarity of price gaps. A similar situation can be found in other regions.



Difference in prices for flour (Krasnodar Krai – Volgograd Obl.), in thousands of rubles.

The volume of interregional trade (Krasnodar Krai – Volgograd Obl.), in thousands of tons, the right side.

Graph 1-9. Interregional trade and the differences in prices in Krasnodar Krai and Volgograd Oblast: 2002-2005. On the left ordinate axis – the differences in prices for one ton of wheat, in thousands of rubles; on the right axis – the volume of interregional wheat trade, in thousands of tons.

The above analysis shows that there are two different situations: on the regional wheat markets the arbitrage mechanism does create an interaction of prices, while this does not happen on the corresponding markets of finished products. One reason for this might be in the role of the administrative restrictions of interregional arbitrage, another - in the difference of the buyers’ positions and their ability to influence the prices of goods, including the use of the arbitrage mechanism.

