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# Conditions of Stability and Growth of Russian Companies

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## Contents

## Abstract

The author of this report tries to estimate the role of economic stability and financial markets in the growth process of Russian companies. The article contains econometric estimations of the influence of different factors on investments in property, plant and equipment in the Russian economy. Among the regressors there are such indicators as revenues, net income, net cash flow and net tax payments and their variance, and a set of financial indicators. The results show that the greatest influence on investments is caused by the net cash flow from operations. The impact of the net tax payments on the investment policy is insignificant. The econometric analysis demonstrates that the major financial indicators are statistically significant as factors of investments.

The paper continues the research on econometric identification and optimization of economic growth initialized in the book[1].

[1] See, for example, the monograph [4] among the most recent publications.

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# Conditions of Stability and Growth of Russian Companies

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## Instability and Investments

The instability that touches business in post-communist Russia can be divided into two large groups: a) macroeconomic instability and b) legal, administrative and taxation rules instability. The dynamics of these factors can be divided into three periods: a) 1992-94; b) 1995-1999; and c) 2000 till nowadays.

Let us start our discussions on the macroeconomic level. In 1992-1994 the main specific feature of the Russian economy was hurricane-type inflation. The prices doubled each quarter. In such circumstances business transactions were very dangerous for both parties, seller and buyer, because nobody could anticipate the rates of inflation and the changes in monetary policy. Many of companies tried to make transactions in US dollars but it was also rather risky because nobody could forecast the rate of ruble to dollar even for the next month. The hyperinflation depressed the life of business dramatically, and the level of Russian GDP in 1994 was only about 50 % of the level in 1990.

In 1995 the Bank of Russia began to promote more strict and qualified monetary policy, and the inflation declined steadily. The most successful was 1997 when annual inflation was only 12 %. But the problem of this period was that the Bank of Russia suppressed the inflation by means of sharp decline of annual growth rates of money mass and by almost stop to credit commercial banks and companies[2]. In that time the rate of money aggregate M2 to GDP in Russia was about 10 %, much less than in the developed countries (in Japan it is even about 200 %). The result was that companies

[2] The specifics of the policy of the Bank of Russia in the first half of 1990s was that it continued to credit not only banks like in the developed countries but also some companies. It was a consequence of the Soviet-type financial policy.

immediately began to suffer from the lack of liquidity. The non-payments and payment arrears in business transactions became the typical problems.

The reaction of the economy consisted in invasion of middlemen who organized the complex chains of payments between business parties and got very lucrative fees for such activities. The other consequence was an appearance of tremendous amount of "bad" money or "pseudo-money" by means of which companies tried to fulfill the transactions. The result was in increasing time to fulfill transactions and large losses of business that paid fees for middlemen.

The period that began in 2000 mostly solved the problem of non-payment because after ruble devaluation and tremendous increase in Russian export goods prices the Bank of Russia was able to increase the money mass rate to GDP[3] without parallel increase in inflation. The scheme is very simple: the Bank of Russia buys the currency the exporters get from their sales abroad. These transactions increase the ruble mass in economy automatically.

Today in 2005 the macroeconomic situation in Russia is much more stable than 10 years ago. But there other bottlenecks that prevent Russia from the future stable economic growth. At first, there is a weak bank system, and the bank crisis in summer of 2004 justifies this view. There are following heavy problems connected with Russian banks: 1) it is hard to get large-volume loans; 2) it is hard to get loans for small business; 3) it is hard to get long-term credits. All these points prevent Russian banks to become a locomotive of economic growth and thanks to this a lot of Russian companies still suffer from the lack of liquidity and of investment resources.

The other serious "bundle" of problems is continuous changes in legal, administrative and tax rules. Before 2000 every week brought some disorganized news in legislation for business. The latter suffers tremendous losses from such situation, especially the small and medium ones who were not able to spend much money for high-qualified lawyers. After adoption of the Russian Civil Code and especially the Russian Tax Code the situation became better. But the problems were not removed totally. Still, in the polls among Russian and foreign businessmen who work in Russia in the answers about the bottlenecks to business the following complaints are at the first

place: bureaucratism, corruption, complex and hardly-to-be-understand rules of making business, too quick changes in tax laws, too often tax inquiries, weak protection of private property and unsatisfactory work of courts.

All these features of today's situation in Russia lead to lack of trust in the business life. And the trust was for centuries a critical feature of wealthy economy. The implementation of the shortcomings mentioned above was a large capital flow from the country that was estimated at the level of $20 billion annually. In recent years, thanks to stabilization measures this level decreased to estimated $4 billion in 2004. The problem is recognized by the Russian government and the President Message to the Russian Federal Congress on the 25th of April of 2005 indicates the existence of this problem. But it is still a lot of things that should be done to create an atmosphere of trust and wealthy economy in general.

## Financial Markets and Investments

The main sources of companies' investments in property, plant and equipment (PP&E) are: a) net income of the company; b) bank loans; c) stocks and bonds emission[4]. Their relative role is different in different countries. The best market of stocks and bonds in the world are the United States though the main source of investments in non-financial sector is the net income there. In Japan and in Germany the role of bank loans is traditionally high, at least until the end of the 20th century.

For Russia as it has a very small period of the post-communist market economy its financial markets are weaker than in the developed countries (DC). But that does not mean that they do not develop. To estimate the structure of the sources of investments in PP&E in Russian economy we construct an artificial indicator that we name "the investment potential" or simply "potential".

As we have no regular data about stocks and bonds emission by all Russian companies this indicator is calculated according to the following formula:

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[3] To the end of 2004 it was equal to 41 %.

[4] For the subsidiary there is another one important source: the investments of holding or other subsidiaries of the same holding.

**POTENTIAL = GROSS INCOME[5] + RUSSIAN BANKS CREDITS + FOREIGN BANK CREDITS + FOREIGN DIRECT INVESTMENTS[6]**

"Potential" is exactly only *potential*. We can not be sure what part of it and what of its elements is invested in PP&E. But the latter can be well explained by the former by means of econometrics. The following equation is[7]:

$$I = 38.3 + 0.15\ POTENTIAL$$

$$(17.232)$$

$$R^2 = 0.887$$

$$F = 297.0$$

$$DW = 2.167$$

Here

$I$ denotes investments in PP&E in Russian economy;

$R^2$ is the coefficient of determination;

$F$ is Fisher statistics;

$DW$ is Durbin-Watson statistics;

and $t$-statistics is indicated in the brackets.

As we see, "potential" indicator explains rather well the dynamics of investments in PP&E. That is why let us have a look on the development of the structure of the "Potential".

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[5] This indicator is taken from the GOSKOMSTAT of the Russian National Accounts statistics. It is published on the GOSKOMSTAT official site [7]. Gross income is companies' profit as a share of GDP before the corporate tax deduction.

[6] The data about foreign bank loans include Russian companies' debt emission in foreign markets. These data and data about foreign direct investments (FDI) are published on the official site of the Bank of Russia [6] as a part of Russia's balance of payments. The statistics about credits given to companies by Russian banks is also published on the Bank of Russia site.

**Table 1. Share of Different Elements of Investment Potential in Russia, 1995-2004, the Last Quarter of the Year, %[8].**

| Year | GI[9] | FDI[10] | RCR[11] | FCR[12] |
|---|---|---|---|---|
| **1995** | **51,9%** | **1,3%** | **39,3%** | **7,6%** |
| **1996** | **47,8%** | **1,7%** | **48,4%** | **2,1%** |
| **1997** | **41,3%** | **1,8%** | **52,2%** | **4,8%** |
| **1998** | **53,6%** | **4,4%** | **49,9%** | **-7,9%** |
| **1999** | **58,5%** | **3,2%** | **42,0%** | **-3,6%** |
| **2000** | **51,3%** | **1,9%** | **47,9%** | **-1,1%** |
| **2001** | **45,0%** | **0,8%** | **58,5%** | **-4,3%** |
| **2002** | **40,2%** | **0,9%** | **55,3%** | **3,5%** |
| **2003** | **36,3%** | **-0,5%** | **58,2%** | **6,0%** |
| **2004** | **34,4%** | **3,3%** | **57,2%** | **5,0%** |
| **Average for the period** | **46,8%** | **1,5%** | **49,9%** | **1,8%** |

Table 1 shows that the basic elements of the investment potential are companies' profits and credits from Russian banks. The share of two other elements is low, though it is greater in 2004 in comparison with the period average. We see also that the share of companies' gross income declines steadily during the period. At first, it is a sign of strengthening the Russian banking system. The second, it reflects an instability of the share of the gross income in GDP (see Table 2).

[7] Full estimation output, Breusch-Godfrey serial correlation LM test, and unit root tests on variables one can find in Supplement 1. Sources of data: [6], [7] and author's calculations.

[8] Sources: [6], [7] and author's calculations.

[9] GI – Gross income.

[10] FDI – Foreign direct investments.

[11] RCR – Credits from Russian banks.

[12] FCR – Credits from foreign banks and other foreign borrowing.

**Table 2. Dynamics of Gross Wages and Gross Corporate Income as Shares of GDP, 1995-2004, the Last Quarter of the Year[13].**

| Year | Gross wages[14] | Gross corporate income |
|---|---|---|
| 1995 | 0,552 | 0,448 |
| 1996 | 0,643 | 0,357 |
| 1997 | 0,631 | 0,369 |
| 1998 | 0,520 | 0,480 |
| 1999 | 0,491 | 0,509 |
| 2000 | 0,515 | 0,485 |
| 2001 | 0,550 | 0,450 |
| 2002 | 0,549 | 0,451 |
| 2003 | 0,550 | 0,450 |
| 2004 | 0,525 | 0,475 |

Nevertheless, when the elements of "potential" are taken as separate regressors the gross income has the greatest influence on the investments. That proves that companies' profits are still very significant factor of the latter. It is supported lower by the analysis on the company level. Moreover, companies' earnings have a significant influence on the second largest element of the "potential", which are the credits from Russian banks. We can find this dependence when estimate the following regression equation[15]:

$$RCR = 1128.2 + 0.461\ IN + 0.748\ GI + 9.259\ R - 164.5\ V - 71.4\ V_{-1}$$

$$(3.706) \quad (4.255) \quad (3.806) \quad (-3.996) \quad (-2.482)$$

$$R^2 = 0.993$$

[13] Sources: [7] and author's calculations.

[14] To calculate these shares, the indirect taxes are deducted from the GDP. Gross wages include the joint social tax and personal income tax.

[15] Full estimation output, Breusch-Godfrey serial correlation LM test, and unit root tests on variables see in Supplement 2. Sources of data: [6], [7] and author's calculations.

***F = 742.7***

***DW = 1.226***

***t*-**statistics is given in the brackets.

Here

***IN*** is the population incomes;

***GI*** is the gross corporate income;

***R*** is the interest rate;

***V*** is the time velocity of money from the Fisher's formula.

## The Company-Level Analysis

The purpose of the company-level analysis is the estimation of the influence of instability on the performance of Russian companies. Usually, in economic science the "risk", if we use it as a synonym to "instability", is measured by *volatility* of some indicators. Very often, the *variance* and even more, its square root – the *standard deviation*, are used to measure volatility[16].

Another purpose of our work is to test the hypothesis: *do financial markets have an influence on the performance of Russian companies.*

Here we use the investments in PP&P as a dependent variable because we consider it as one of the best indicators of the company's intention and ability for the long-term growth. As independent variables we use, at first, revenues, net income, and net cash flow from operations[17]. Their levels indicate the "prosperity" of the company, and their variance, and also the level and variance of tax payments describe the "stability" of the company. Second, such indicators as net borrowing, share emission, average interest payments and dividends payments test the influence of financial markets on the companies' growth.

The "quality" set of variables is described in Table 3.

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[16] For example, in the Markovitz' theory of the portfolio risk the last is measured by the *variance* of its profitability.

[17] The selection of regressors is based on the financial management theory described in classical handbooks (see, for example, [1], [5]).

**Table 3. Variables of the Company-Level Model.**

| Dependent variable | Independent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Operational variables | | | | | | | |
| Investments in property, plant and equipment | Net revenues | | Net income | | Net cash flow from operations | | Net tax payments | |
| | Level | *Variance* | Level | *Variance* | Level | *Variance* | Level | *Variance* |
| | Financial variables | | | | | | | |
| | Net borrowing | | Net share emission | | Net interest paid | | Dividends paid | |

## The Data

The data for estimation is taken from the 1999-2003 reports of those Russian companies that use International Accounting Standards (IAS) or US GAAP. All data is taken from their Internet sites ([8]-[39]) and recalculated in US dollars.

These companies represent the following sectors of the Russian economy (see Table 4[18]).

**Table 4. Sectors of Economy in the Sample.**

| Sector of economy | Number of companies represented |
|---|---|
| Telecommunications | 10 |
| Machinery | 4 |
| Food & beverages | 5 |
| Oil & gas | 5 |
| Electric energy & heating | 3 |
| Ferrous metallurgy | 1 |
| Nonferrous metallurgy | 2 |
| Transportation | 1 |
| Mineral fertilizers | 1 |
| Total | 32 |

[18] See also the total list of the companies in the sample in Supplement 4.

To eliminate the influence of scale, *all the data (with the exception of interest and dividends payments) are divided by the total assets for each company*. For the same purpose, the interest payments are divided by the obligations, and dividends payments are divided by the total equity capital of a company. Then, the averages for the time period *for all variables*, and the standard deviations, and coefficients of variance *only for non-financial variables* are calculated. To estimate the sector and company specifics, the *dummy variables* are used. Thanks to this, we have *the purely cross-section sample* prepared for the econometric estimation.

The generated variables are displayed in Table 5.

**Table 5. Variables Generated for Econometric Estimation.**

| Variables | Generated indicator | Symbol |
|---|---|---|
| Dependent variable | | |
| Investments in PP&P divided by total assets | Time period mean | EIA |
| Regressors | | |
| Operational | | |
| Revenues divided by total assets | Time period mean | EAU |
| | Time period standard deviation | SFAU |
| | Time period coefficient of variance[19] | CVAU |
| Net income divided by total assets | Time period mean | EROA |
| | Time period standard deviation | SROA |
| | Time period coefficient of variance | CVROA |
| Net cash flow from operations divided by total assets | Time period mean | ECFOA |
| | Time period standard deviation | SCFOA |
| | Time period coefficient of variance | CVCFOA |
| Net tax payments divided by total assets | Time period mean | ETA |
| | Time period standard deviation | STA |
| | Time period coefficient of variance | CVTA |
| Financial | | |
| Net borrowing from banks and bond emission divided by total assets | Time period mean | ECRA |
| Net share emission divided by assets | Time period mean | ESIA |
| Net interest payments divided by company's obligations | Time period mean | I |
| Dividend payments divided by company's equity capital | Time period mean | DIV |
| Dummy variables for sectors | | Di |
| Dummy variables for companies | | Dj |

[19] The standard deviation divided by the mean value.

## The Research Results

The ordinary least squares method (OLS) is used for estimation, and the equation with the best characteristics is demonstrated in Table 6.

**Table 6. Estimation Output by the Regression Equation.**

| Dependent Variable: EIA | | | | |
|---|---|---|---|---|
| Method: Least Squares | | | | |
| Included observations: 32 | | | | |
| Variable | Coefficient | Std. Error | t-statistics | Prob. |
| C | 0.044899 | 0.009454 | 4.749293 | 0.0001 |
| CVROA | 0.002437 | 0.000715 | 3.411214 | 0.0023 |
| DF | 0.072811 | 0.011755 | 6.194220 | 0.0000 |
| DIV | -0.369401 | 0.152540 | -2.421673 | 0.0234 |
| ECFOA | 0.659031 | 0.064719 | 10.18296 | 0.0000 |
| ECRA | 0.476991 | 0.092716 | 5.144648 | 0.0000 |
| I | -0.355119 | 0.086633 | -4.099140 | 0.0004 |
| SCFOA | -0.672545 | 0.182774 | -3.679651 | 0.0012 |
| Equation characteristics | | | | |
| R-squared | 0.903127 | Mean dependent variance | 0.084659 | |
| Adjusted R-squared | 0.874872 | S.D. dependent variance | 0.049072 | |
| S.E. of regression | 0.017358 | Akaike info criterion | -5.057156 | |
| Sum squared residuals | 0.007232 | Schwarz criterion | -4.690722 | |
| Log likelihood | 88.91449 | F-statistics | 31.96385 | |
| Durbin-Watson statistics | 2.128105 | Prob. (F-statistics) | 0.000000 | |

The results can be summarized as follows.

1. The strongest influence on investments in PP&P is determined by *the net cash flow from operations* (ECFOA).

2. *The instability in this flow (SCFOA) has a negative influence* on investments in PP&P.

3. *Financial indicators* (net borrowing, interest and dividends payments) are also statistically significant.

4. *The net tax payments and its volatility are statistically insignificant*.

5. Among the dummy variables only *the dummy for "Food & beverages"* (DF) is statistically significant.

6. The equation as a whole *explains about 90 % of variance* of dependent variable – that is rather good result for the cross-section estimations.

## Evaluation of Research Results

1. Investments in PP&P in Russian companies are determined mostly by the *real flow of money from operations*[20]. The variables calculated by the *accrual method* of accounting have small statistical significance[21].

2. The *net tax payments have no separate influence on investments*[22].

3. *The "instability"* expressed by standard deviation of the net cash flow from operations *have significant and negative influence on investments*[23].

4. *The cost of capital, the access to financial markets, and the dividend policy are significant for the companies in the sample*.

5. *The significant and positive dummy variable for "food & beverages"* can be explained by the fact that this sector is represented by extremely dynamic companies in the sample[24].

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[20] It explains about 74 % of the investment variation among companies.

[21] The positive influence of *variation of the net income* can be expressed by the fact that 8 companies among 32 in the sample demonstrate a significant growth of the net income, 4 of them demonstrate a steady decline of the net income from 1999 to 2003 (38 % of all companies in the sample). But we should interpret this result cautiously because the level of the net income and its variation depends strongly on the accounting method used by the company.

[22] They can play the role only as a part of the net cash flow from operations.

[23] To understand if the standard deviation really describes the *volatility* of CFOA we calculate how often the dynamics of this indicator changes its sign (from growth to decline and back, and vice versa). Such "movements" compose 36 % of all CFOA data for separate years. So, one can say that the standard deviation detects mostly the *volatility* of CFOA, not a steady growth.

[24] One can mention such companies as "Baltika", "Sun Interbrew" (breweries), "Kalina" (the producer of perfumery and washing powder, soap, etc.), and "Wimm-Bill-Dann" (juices and milk products) and "Parnas" (meat products). The sector "food and beverages" is on the first place in investments (13 % of the average ratio to assets) and in the asset utilization, though only on the third position in ROA and on the sixth position in CFOA.

## Conclusions: Policy Implications and Links with National Innovation System

The investments in PP&P in the Russian industry can be adequately explained by the statistical data. The main factor of investments is the *real money* the companies get from their main activities. The *instability* in this flow has a negative influence. That means that economic, social and political measures to increase stability of society are of critical importance. The President Message to the Russian Federal Congress on the 25th of April 2005 contains the immediate steps in this field.

In spite of the general weakness of the Russian financial markets the successful companies can get money from internal and external markets. The cost of capital like the dividend policy is of critical importance for these companies. That is why the Bank of Russia's policy oriented on decreasing inflation and interest rates can bring fruitful results. The access of foreign financial institutions to the Russian market should be reevaluated seriously in the direction of further liberalization. The Russian Ministry of Finance should strengthen the policy that have a purpose to increase the transparency of companies and implement the International Accounting Standards.

The critical importance of such factor as the cash flow from operations in investments and weak influence of the net tax payments means that not only political and social factors but *economic factors* determine the Russian future development, and that the depressive role of tax payments is exaggerated in the Russian economic debates as well.

The sectors' and companies' differences are not very considerable when the factors of investments are considered. That means that the laws of the market economy become more and more common for Russia, and that the Russian innovation policy should support private innovational institutions. In the market conditions they can be more effective than traditional government-sponsored institutions.

**Supplement 1. Full Estimation Output, Serial Correlation and Unit Root Tests for All-Russian Investment Econometric Equation[25].**

**1a) Estimation Output**

| **Dependent Variable: I** | | | | |
|---|---|---|---|---|
| **Method: Least Squares** | | | | |
| **Sample: 140** | | | | |
| **Included observations: 40** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **C** | **38.31210** | **19.20223** | **1.995190** | **0.0532** |
| **POTENTIAL** | **0.150315** | **0.008723** | **17.23224** | **0.0000** |
| **R-squared** | **0.886550** | **Mean dependent variance** | | **286.9350** |
| **Adjusted R-squared** | **0.883565** | **S.D. dependent variance** | | **234.8622** |
| **S.E. of regression** | **80.14112** | **Akaike info criterion** | | **11.65416** |
| **Sum squared residuals** | **244058.8** | **Schwarz criterion** | | **11.73861** |
| **Log likelihood** | **-231.0832** | **F-statistics** | | **296.9501** |
| **Durbin-Watson statistics** | **2.167745** | **Prob. (F-statistics)** | | **0.000000** |

[25] The econometric procedures were taken from such classic handbooks as [2] and [3]. The equations were estimated by EViews4 econometric program package.

### 1b) Breusch-Godfrey Serial Correlation LM Test:

| | | | | |
|---|---|---|---|---|
| **F-statistics** | **0.769430** | **Probability** | | **0.470745** |
| **Obs*R-squared** | **1.639751** | **Probability** | | **0.440486** |
| **Test Equation:** | | | | |
| **Dependent Variable: RESID** | | | | |
| **Method: Least Squares** | | | | |
| **Presample missing value lagged residuals set to zero.** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **C** | **3.188232** | **19.49184** | **0.163568** | **0.8710** |
| **POT** | **-0.002350** | **0.008979** | **-0.261708** | **0.7950** |
| **RESID(-1)** | **-0.130193** | **0.168668** | **-0.771888** | **0.4452** |
| **RESID(-2)** | **-0.180422** | **0.170331** | **-1.059244** | **0.2965** |
| **R-squared** | **0.040994** | **Mean dependent variance** | | **4.09E-14** |
| **Adjusted R-squared** | **-0.038923** | **S.D. dependent variance** | | **79.10700** |
| **S.E. of regression** | **80.63186** | **Akaike info criterion** | | **11.71230** |
| **Sum squared residuals** | **234053.9** | **Schwarz criterion** | | **11.88119** |
| **Log likelihood** | **-230.2461** | **F-statistics** | | **0.512953** |
| **Durbin-Watson statistics** | **2.062032** | **Prob(F-statistics)** | | **0.675939** |

One can see that the Breusch-Godfrey test rejects the serial correlation existence.

## 1c) Unit Root Tests

## Augmented Dickey-Fuller Unit Root Test on I:

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: I has a unit root** | | | | |
| **Exogenous: Constant, Linear Trend** | | | | |
| **Lag Length: 0 (Automatic based on SIC, MAXLAG=2)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **-3.599433** | **0.0429** |
| **Test critical values:** | **1% level** | | **-4.211868** | |
| | **5% level** | | **-3.529758** | |
| | **10% level** | | **-3.196411** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(I)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 2 40 IF I>21** | | | | |
| **Included observations: 39 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **I(-1)** | **-0.655024** | **0.181980** | **-3.599433** | **0.0010** |
| **C** | **-51.60846** | **36.94451** | **-1.396918** | **0.1710** |
| **@TREND(1)** | **12.56316** | **3.345838** | **3.754862** | **0.0006** |
| **R-squared** | **0.286262** | **Mean dependent variance** | | **23.21154** |
| **Adjusted R-squared** | **0.246610** | **S.D. dependent variance** | | **125.1591** |
| **S.E. of regression** | **108.6357** | **Akaike info criterion** | | **12.28768** |
| **Sum squared residuals** | **424861.6** | **Schwarz criterion** | | **12.41565** |
| **Log likelihood** | **-236.6098** | **F-statistics** | | **7.219338** |
| **Durbin-Watson statistics** | **1.802553** | **Prob. (F-statistics)** | | **0.002310** |

## Augmented Dickey-Fuller Unit Root Test on POTENTIAL:

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: POT has a unit root** | | | | |
| **Exogenous: Constant, Linear Trend** | | | | |
| **Lag Length: 7 (Automatic based on SIC, MAXLAG=9)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **3.588652** | **1.0000** |
| **Test critical values:** | **1% level** | | **-4.273277** | |
| | **5% level** | | **-3.557759** | |
| | **10% level** | | **-3.212361** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(POT)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 9 40 IF I>21** | | | | |
| **Included observations: 32 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **POT(-1)** | **0.294563** | **0.082082** | **3.588652** | **0.0016** |
| **D(POT(-1))** | **-1.133547** | **0.280142** | **-4.046335** | **0.0005** |
| **D(POT(-2))** | **-0.508793** | **0.285873** | **-1.779790** | **0.0889** |
| **D(POT(-3))** | **-0.849038** | **0.280539** | **-3.026448** | **0.0062** |
| **D(POT(-4))** | **-0.301627** | **0.331406** | **-0.910144** | **0.3726** |
| **D(POT(-5))** | **-0.160665** | **0.298670** | **-0.537935** | **0.5960** |
| **D(POT(-6))** | **-0.963227** | **0.291648** | **-3.302702** | **0.0032** |
| **D(POT(-7))** | **-0.639517** | **0.295828** | **-2.161790** | **0.0418** |
| **C** | **-74.79338** | **87.90530** | **-0.850840** | **0.4040** |
| **@TREND(1)** | **9.345629** | **7.595004** | **1.230497** | **0.2315** |
| **R-squared** | **0.856608** | **Mean dependent variance** | | **163.3665** |
| **Adjusted R-squared** | **0.797948** | **S.D. dependent variance** | | **219.5606** |
| **S.E. of regression** | **98.69301** | **Akaike info criterion** | | **12.27221** |
| **Sum squared residuals** | **214286.8** | **Schwarz criterion** | | **12.73025** |
| **Log likelihood** | **-186.3554** | **F-statistics** | | **14.60284** |
| **Durbin-Watson statistics** | **1.702866** | **Prob. (F-statistics)** | | **0.000000** |

ADF-tests allow to reject the unit root hypothesis on I and POTENTIAL.

**Supplement 2. Full Estimation Output, Serial Correlation and Unit Root Tests for Credits from Russian Banks Econometric Equation.**

**2a) Estimation Output**

| Dependent Variable: RCR | Method: Least Squares | Sample(adjusted): 2 33 | Included observations: 31 | Excluded observations: 1 after adjusting endpoints |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **C** | **1128.245** | **206.8752** | **5.453747** | **0.0000** |
| **IN** | **0.461077** | **0.124399** | **3.706433** | **0.0010** |
| **GI** | **0.748273** | **0.175828** | **4.255718** | **0.0003** |
| **R** | **9.259400** | **2.432505** | **3.806530** | **0.0008** |
| **V** | **-164.5323** | **41.17356** | **-3.996066** | **0.0005** |
| **V1** | **-71.38708** | **28.75167** | **-2.482884** | **0.0201** |

| | | | |
|---|---|---|---|
| **R-squared** | **0.993313** | **Mean dependent variation** | **1078.032** |
| **Adjusted R-squared** | **0.991976** | **S.D. dependent variation** | **906.4724** |
| **S.E. of regression** | **81.20084** | **Akaike info criterion** | **11.80371** |
| **Sum squared residuals** | **164839.4** | **Schwarz criterion** | **12.08126** |
| **Log likelihood** | **-176.9576** | **F-statistics** | **742.7207** |
| **Durbin-Watson statistics** | **1.226062** | **Prob. (F-statistics)** | **0.000000** |

**2b) Breusch-Godfrey Serial Correlation LM Test:**

| **Breusch-Godfrey Serial Correlation LM Test:** | | | | |
|---|---|---|---|---|
| **F-statistics** | **1.722802** | **Probability** | | **0.200819** |
| **Obs*R-squared** | **4.038997** | **Probability** | | **0.132722** |
| **Test Equation:** | | | | |
| **Dependent Variable: RESID** | | | | |
| **Method: Least Squares** | | | | |
| **Presample and interior missing value lagged residuals set to zero.** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **C** | **-68.75925** | **204.0558** | **-0.336963** | **0.7392** |
| **IN** | **0.075054** | **0.128707** | **0.583140** | **0.5655** |
| **PK** | **-0.104422** | **0.184074** | **-0.567282** | **0.5760** |
| **R** | **-0.431104** | **2.453155** | **-0.175735** | **0.8620** |
| **V** | **21.37793** | **41.57940** | **0.514147** | **0.6121** |
| **V1** | **-10.18330** | **28.55432** | **-0.356629** | **0.7246** |
| **RESID(-1)** | **0.480730** | **0.229176** | **2.097649** | **0.0471** |
| **RESID(-2)** | **-0.192881** | **0.227863** | **-0.846481** | **0.4060** |
| **R-squared** | **0.130290** | **Mean dependent variance** | | **-3.86E-13** |
| **Adjusted R-squared** | **-0.134404** | **S.D. dependent variance** | | **74.12588** |
| **S.E. of regression** | **78.95030** | **Akaike info criterion** | | **11.79315** |
| **Sum squared residuals** | **143362.4** | **Schwarz criterion** | | **12.16321** |
| **Log likelihood** | **-174.7938** | **F-statistics** | | **0.492229** |
| **Durbin-Watson statistics** | **1.930165** | **Prob. (F-statistics)** | | **0.830400** |

The Breusch-Godfrey test rejects the serial correlation existence.

## 2c) Unit Root Tests

### Augmented Dickey-Fuller Unit Root Test on RCR:

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: RCR has a unit root** | | | | |
| **Exogenous: Constant** | | | | |
| **Lag Length: 0 (Automatic based on SIC, MAXLAG=9)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **9.065481** | **1.0000** |
| **Test critical values:** | **1% level** | | **-3.653730** | |
| | **5% level** | | **-2.957110** | |
| | **10% level** | | **-2.617434** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(RCR)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 2 33** | | | | |
| **Included observations: 32 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **RCR(-1)** | **0.087293** | **0.009629** | **9.065481** | **0.0000** |
| **C** | **7.826211** | **12.31802** | **0.635347** | **0.5300** |
| **R-squared** | **0.732580** | **Mean dependent variance** | | **94.43750** |
| **Adjusted R-squared** | **0.723666** | **S.D. dependent variance** | | **83.67099** |
| **S.E. of regression** | **43.98376** | **Akaike info criterion** | | **10.46598** |
| **Sum squared residuals** | **58037.13** | **Schwarz criterion** | | **10.55759** |
| **Log likelihood** | **-165.4557** | **F-statistics** | | **82.18295** |
| **Durbin-Watson statistics** | **2.286883** | **Prob. (F-statistics)** | | **0.000000** |

**Augmented Dickey-Fuller Unit Root Test on IN:**

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: IN has a unit root** | | | | |
| **Exogenous: Constant** | | | | |
| **Lag Length: 3 (Automatic based on SIC, MAXLAG=9)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **5.734239** | **1.0000** |
| **Test critical values:** | **1% level** | | **-3.679322** | |
| | **5% level** | | **-2.967767** | |
| | **10% level** | | **-2.622989** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(IN)** | | | | |
| **Method: Least Squares** | | | | |
| **Date: 06/07/05 Time: 15:25** | | | | |
| **Sample(adjusted): 5 33** | | | | |
| **Included observations: 29 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **IN(-1)** | **0.171000** | **0.029821** | **5.734239** | **0.0000** |
| **D(IN(-1))** | **-0.831301** | **0.142734** | **-5.824142** | **0.0000** |
| **D(IN(-2))** | **-0.745963** | **0.164000** | **-4.548552** | **0.0001** |
| **D(IN(-3))** | **-0.950339** | **0.136880** | **-6.942841** | **0.0000** |
| **C** | **54.11870** | **37.27052** | **1.452051** | **0.1594** |
| **R-squared** | **0.763721** | **Mean dependent variance** | | **94.84828** |
| **Adjusted R-squared** | **0.724341** | **S.D. dependent variance** | | **184.5630** |
| **S.E. of regression** | **96.90157** | **Akaike info criterion** | | **12.14085** |
| **Sum squared residuals** | **225358.0** | **Schwarz criterion** | | **12.37659** |
| **Log likelihood** | **-171.0424** | **F-statistics** | | **19.39368** |
| **Durbin-Watson statistics** | **1.149259** | **Prob. (F-statistics)** | | **0.000000** |

**Augmented Dickey-Fuller Unit Root Test on GI:**

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: GI has a unit root** | | | | |
| **Exogenous: Constant, Linear Trend** | | | | |
| **Lag Length: 0 (Automatic based on SIC, MAXLAG=2)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **-3.682509** | **0.0383** |
| **Test critical values:** | **1% level** | | **-4.273277** | |
| | **5% level** | | **-3.557759** | |
| | **10% level** | | **-3.212361** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D (PK)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 233** | | | | |
| **Included observations: 32 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **PK(-1)** | **-0.682610** | **0.185365** | **-3.682509** | **0.0009** |
| **C** | **-17.09641** | **48.65280** | **-0.351396** | **0.7278** |
| **@TREND(1)** | **36.87810** | **9.626899** | **3.830735** | **0.0006** |
| **R-squared** | **0.336030** | **Mean dependent variance** | | **54.83750** |
| **Adjusted R-squared** | **0.290239** | **S.D. dependent variance** | | **157.6204** |
| **S.E. of regression** | **132.7909** | **Akaike info criterion** | | **12.70449** |
| **Sum squared residuals** | **511369.6** | **Schwarz criterion** | | **12.84190** |
| **Log likelihood** | **-200.2718** | **F-statistics** | | **7.338338** |
| **Durbin-Watson statistics** | **1.982180** | **Prob. (F-statistics)** | | **0.002637** |

**Augmented Dickey-Fuller Unit Root Test on R:**

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: R has a unit root** | | | | |
| **Exogenous: Constant** | | | | |
| **Lag Length: 9 (Automatic based on SIC, MAXLAG=9)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **-3.735631** | **0.0189** |
| **Test critical values:** | **1% level** | | **-4.121990** | |
| | **5% level** | | **-3.144920** | |
| | **10% level** | | **-2.713751** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Warning: Probabilities and critical values calculated for 20 observations** | | | | |
| **and may not be accurate for a sample size of 12** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(R)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 11 22** | | | | |
| **Included observations: 12 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **R(-1)** | **-0.417463** | **0.111752** | **-3.735631** | **0.1665** |
| **D(R(-1))** | **-0.203218** | **0.290647** | **-0.699192** | **0.6115** |
| **D(R(-2))** | **0.094523** | **0.145528** | **0.649521** | **0.6333** |
| **D(R(-3))** | **-0.007521** | **0.170013** | **-0.044235** | **0.9719** |
| **D(R(-4))** | **-0.077373** | **0.153554** | **-0.503881** | **0.7029** |
| **D(R(-5))** | **0.158565** | **0.126751** | **1.250994** | **0.4293** |
| **D(R(-6))** | **0.291926** | **0.080853** | **3.610563** | **0.1720** |
| **D(R(-7))** | **0.076793** | **0.117013** | **0.656277** | **0.6303** |
| **D(R(-8))** | **-0.005329** | **0.106778** | **-0.049911** | **0.9683** |
| **D(R(-9))** | **-0.197510** | **0.096991** | **-2.036374** | **0.2906** |
| **C** | **8.312997** | **3.006043** | **2.765429** | **0.2209** |
| **R-squared** | **0.990512** | **Mean dependent variance** | | **-2.383333** |
| **Adjusted R-squared** | **0.895635** | **S.D. dependent variance** | | **2.077075** |
| **S.E. of regression** | **0.671011** | **Akaike info criterion** | | **1.388363** |
| **Sum squared residuals** | **0.450255** | **Schwarz criterion** | | **1.832861** |
| **Log likelihood** | **2.669823** | **F-statistics** | | **10.43995** |
| **Durbin-Watson statistics** | **2.804992** | **Prob. (F-statistics)** | | **0.236701** |

**Augmented Dickey-Fuller Unit Root Test on V:**

| | | | | |
|---|---|---|---|---|
| **Null Hypothesis: V has a unit root** | | | | |
| **Exogenous: Constant, Linear Trend** | | | | |
| **Lag Length: 8 (Automatic based on SIC, MAXLAG=9)** | | | | |
| | | | **t-statistics** | **Prob.*** |
| **Augmented Dickey-Fuller test statistics** | | | **-6.781097** | **0.0001** |
| **Test critical values:** | **1% level** | | **-4.394309** | |
| | **5% level** | | **-3.612199** | |
| | **10% level** | | **-3.243079** | |
| ***MacKinnon (1996) one-sided p-values.** | | | | |
| **Augmented Dickey-Fuller Test Equation** | | | | |
| **Dependent Variable: D(V)** | | | | |
| **Method: Least Squares** | | | | |
| **Sample(adjusted): 10 33** | | | | |
| **Included observations: 24 after adjusting endpoints** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **V(-1)** | **-0.724950** | **0.106907** | **-6.781097** | **0.0000** |
| **D(V(-1))** | **0.019092** | **0.124582** | **0.153246** | **0.8806** |
| **D(V(-2))** | **0.435479** | **0.123627** | **3.522528** | **0.0037** |
| **D(V(-3))** | **-0.095415** | **0.105617** | **-0.903402** | **0.3827** |
| **D(V(-4))** | **0.340840** | **0.101026** | **3.373772** | **0.0050** |
| **D(V(-5))** | **0.239010** | **0.113813** | **2.100023** | **0.0558** |
| **D(V(-6))** | **-0.379002** | **0.109916** | **-3.448095** | **0.0043** |
| **D(V(-7))** | **-0.018519** | **0.117355** | **-0.157799** | **0.8770** |
| **D(V(-8))** | **0.322506** | **0.114459** | **2.817648** | **0.0145** |
| **C** | **7.255367** | **1.007226** | **7.203312** | **0.0000** |
| **@TREND(1)** | **-0.130763** | **0.016731** | **-7.815637** | **0.0000** |
| **R-squared** | **0.952227** | **Mean dependent variance** | | **-0.113719** |
| **Adjusted R-squared** | **0.915478** | **S.D. dependent variance** | | **0.623016** |
| **S.E. of regression** | **0.181127** | **Akaike info criterion** | | **-0.275677** |
| **Sum squared residuals** | **0.426490** | **Schwarz criterion** | | **0.264265** |
| **Log likelihood** | **14.30812** | **F-statistics** | | **25.91199** |
| **Durbin-Watson statistics** | **1.420864** | **Prob(F-statistics)** | | **0.000001** |

Unit root tests allow rejecting the unit root hypothesis for all the variables of the equation on RCR.

**Supplement 3. The Heteroscedasticity Test for Company-Level Model.**

The White's test on heteroscedasticity allows rejecting the presence of it (to accept the null hypothesis). The results of the test are demonstrated below.

**White's Heteroscedasticity Test**

| | | | | |
|---|---|---|---|---|
| **F-statistics** | **1.357581** | **Probability** | | **0.268977** |
| **Obs*R-squared** | **15.84226** | **Probability** | | **0.257753** |
| **Test Equation:** | | | | |
| **Dependent Variable: RESID^2** | | | | |
| **Method: Least Squares** | | | | |
| **Sample: 132** | | | | |
| **Included observations: 32** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | **t-statistics** | **Prob.** |
| **C** | **-5.05E-05** | **0.000300** | **-0.168478** | **0.8681** |
| **CVROA** | **3.13E-06** | **1.50E-05** | **0.209137** | **0.8367** |
| **CVROA^2** | **-1.42E-06** | **8.52E-07** | **-1.665284** | **0.1132** |
| **DF** | **-3.97E-05** | **0.000194** | **-0.204820** | **0.8400** |
| **DIV** | **-0.012650** | **0.007129** | **-1.774381** | **0.0929** |
| **DIV^2** | **0.057907** | **0.047924** | **1.208301** | **0.2426** |
| **ECFOA** | **0.000265** | **0.004152** | **0.063931** | **0.9497** |
| **ECFOA^2** | **-0.001483** | **0.018442** | **-0.080408** | **0.9368** |
| **ECRA** | **0.006662** | **0.003101** | **2.148197** | **0.0456** |
| **ECRA^2** | **-0.029664** | **0.024699** | **-1.201057** | **0.2453** |
| **I** | **0.003000** | **0.003796** | **0.790393** | **0.4396** |
| **I^2** | **-0.010130** | **0.020845** | **-0.485980** | **0.6328** |
| **SCFOA** | **0.007555** | **0.012400** | **0.609307** | **0.5499** |
| **SCFOA^2** | **-0.044366** | **0.137132** | **-0.323527** | **0.7500** |
| **R-squared** | **0.495071** | **Mean dependent variance** | | **0.000226** |
| **Adjusted R-squared** | **0.130399** | **S.D. dependent variance** | | **0.000257** |
| **S.E. of regression** | **0.000240** | **Akaike info criterion** | | **-13.53400** |
| **Sum squared residuals** | **1.03E-06** | **Schwarz criterion** | | **-12.89275** |
| **Log likelihood** | **230.5441** | **F-statistics** | | **1.357581** |
| **Durbin-Watson statistics** | **2.154341** | **Prob. (F-statistics)** | | **0.268977** |

**Supplement 4. The List of the Companies in the Sample.**

| Company | Industry |
|---|---|
| Dalsvyaz | Telecommunications |
| MGTS | Telecommunications |
| North-Western Telecom | Telecommunications |
| Rostelecom | Telecommunications |
| Vimpelcom | Telecommunications |
| Southern Telecommunications company | Telecommunications |
| Uralsvyazinform | Telecommunications |
| MTS | Telecommunications |
| Volgatelecom | Telecommunications |
| Golden Telecom | Telecommunications |
| Zavolzhskii Motornii zavod (ZMZ) | Machinery |
| Silovie machiny | Machinery |
| OMZ | Machinery |
| VAZ | Machinery |
| Wimm-Bill-Dann | Food & beverages |
| Kalina | Food & beverages |
| Sun Interbrew | Food & beverages |
| Parnas-M | Food & beverages |
| Baltika | Food & beverages |
| TNK | Oil & gas |
| Sibneft | Oil & gas |
| LUKOIL | Oil & gas |
| Surgutneftegas | Oil & gas |
| Tatneft | Oil & gas |
| Mosenergo | Electric energy & heating |
| Lenenergo | Electric energy & heating |
| Irkutskenergo | Electric energy & heating |
| MMC | Ferrous metallurgy |
| ALROSA | Nonferrous metallurgy |
| Norilskii Nickel | Nonferrous metallurgy |
| Transnefteproduct | Transportation |
| Ackron | Mineral fertilizer |

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